United States Environmental Protection Agency

An Organizational Guide to Pollution Prevention

Traditional Approach Checklists

There are three sets of checklists for those choosing the Traditional Approach in Chapter 4 of the companion P2 Guide.

- The "Waste Minimization" choice refers to the checklists in *Waste Minimization Opportunity Assessment Manual* (EPA/625/7-88/003).
  Waste Minimization

- When you select the "Facility P2" choice, you will be able to access the checklists in *Facility Pollution Prevention Guide* (EPA/600/R-92/088).
  Facility P2

- The "DOE P2" choice will provide you with the checklists from the *Model Pollution Prevention Assessment Guidance* published in 1993 by the U.S. Department of Energy.
  DOE P2

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Back to P2 Checklists

P2 Checklists

Pollution prevention (P2) checklists are provided on this CD-ROM. You may print them out and use them in your P2 program. Select the checklists from the menu bars to the right.

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Trad. Approach Checklists

Green Zia Worksheets

The following worksheets are in Microsoft Excel (. XLS) format. Use your Excel-compatible spreadsheet program to view them.

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Back to P2 Checklists

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Minnesota Guide to Pollution Prevention Planning

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2nd Edition

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Authors

Robert Lundquist, MnTAP
Mark Snyder, OEA

Staff Team

Kenneth Brown, OEA
David Cera, OEA
Cindy McComas, MnTAP
Kevin McDonald, OEA
John Polanski, MnTAP

Editing/Layout

Deb McKinley, MnTAP
Lisa Mlinarcik, MnTAP

Contributors

Terry Foecke, Materials Productivity, LLC
Daniel P. Reinke, Environmental Resources Management
Larry Sibik, Pinnacle Engineering, Inc.
Steve Tomlyanovich, ERC

Introduction

The Minnesota Guide to Pollution Prevention Planning has been developed to help companies comply with the Minnesota Toxic Pollution Prevention Act. Compliance is only a minimum for the company that is serious about being competitive and profitable. Waste is lost profit and pollution prevention (P2) is another way of saying "no" to waste.

How a company prepares its P2 plan will be related its culture and the way it implements major projects. A plan may be simply an opportunity to document the amount of waste generated per product. The Guide is structured as if a company is developing a plan for the first time. It is designed so that you can "fast forward" to the chapter most appropriate to your needs.

No company or facility is identical in how it operates its processes. However, pollution prevention is a prescription for any company to increase efficiency as well as avoid environmental regulations and waste.

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Chapter 1 - Why Pollution Prevention is Good Business

Every company understands the benefits that come from reducing waste, which include lowering costs and increasing profits. One way to achieve these is through pollution prevention, defined in the 1990 Minnesota Toxic Pollution Prevention Act as "the elimination or reduction, at the source, of the use, generation, or release of toxic pollutants, hazardous substances, and hazardous wastes." The key words in this definition are "at the source." The intent of the Act is that true pollution prevention occurs only "at the source" which means within any process or operation that uses or generates a hazardous material.

To make the distinction between pollution prevention and pollution control/waste management more clear, one can ask:

"Does this activity reduce the use, generation or release of hazardous materials or toxic chemicals at their source?"

If YES = POLLUTION PREVENTION

-OR-

"Does this activity manage waste after it is created?"

If YES = NOT POLLUTION PREVENTION

Pollution prevention is preferred over waste management because it has been repeatedly shown that preventing the generation of regulated chemicals can be much less costly in the long run than managing them as waste or pollution. While there are waste management techniques that effectively reduce generation or release of one waste type, they nearly always result in a generation or release of another type. For instance, contaminants removed from wastewater prior to discharge generally end up as sludge needing to be landfilled. The discharge water is cleaner, but the hazard has been transferred from water to land. To truly reduce the amount of waste to be managed, and to avoid shifting hazards between air, water, and land, companies must implement pollution prevention techniques. A good way to clearly identify your options and a good first step is to develop a pollution prevention plan.

Pollution prevention planning is not a stand-alone process. It's an activity that complements existing efforts to improve productivity. By analyzing current manufacturing processes and identifying alternatives that reduce or eliminate the use of a toxic chemical or generate fewer hazardous wastes, companies can avoid the costs of managing those chemicals and wastes. They also escape the regulatory compliance requirements that using those chemicals and wastes will trigger.

Pollution Prevention Saves Money

A Minnesota floor cleaning equipment manufacturer successfully reduced their discharge of wastewater to the sanitary sewer by diverting non-contact cooling water to the washer in their paint system. This change resulted in savings of $55,800 in reduced sewer and water fees.

The pollution prevention planning process is a way for businesses to lessen their impact on the environment. More importantly from a business perspective, it lets them see how raw materials can be used more efficiently or how a process can be changed or replaced to make a product or service more productive. This is why pollution prevention is an integral and critical business activity. Though the environmental manager may coordinate pollution prevention planning, every employee has a responsibility to prevent waste.

Integrating Pollution Prevention with Business Planning

Most companies are experienced with developing long-term business plans to ensure their future growth and success. Developing a business plan involves identifying the company's strengths, the competition's weaknesses, and potential markets where these differences can be capitalized on. Performance goals are set based on the characteristics of the markets identified and this information is used to create strategies for manufacturing and marketing that will achieve the company's goals.

A pollution prevention plan should be integrated into a business plan. The pollution prevention plan focuses on developing and then profiting from the company's good environmental performance. By thinking of pollution prevention in terms of business planning and efficient resource management, it becomes easier for employees to see why pollution prevention is good business. When a company eliminates a hazard or a waste, it also eliminates the costs and risks associated with them. Companies that do this will also be able to promote their "clean" products and take advantage of market resistance to products perceived to harm people and the environment. They will also minimize the costs of public and regulatory burden.

Efficiency and Pollution Prevention

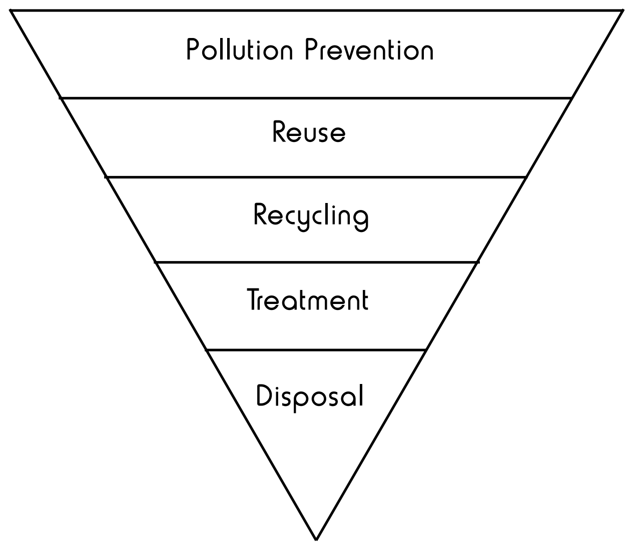
The highest level of efficiency a business can reach is to generate zero waste. An unattainable goal? Don't tell that to the companies that are discharging process water cleaner than they receive it. If a company accepts wastes and emissions as inevitable by-products of its operations, the company will continue to face rising costs for waste management and will continue to be at risk for problems such as permit violations. Every waste should be seen not only as a problem but as an opportunity.

With zero waste being the ultimate goal, a company should look for ways to reduce waste as much as possible. Changing procedures, processes or the way products are manufactured are a few options for waste prevention.

The next level of efficiency is recycling. Recycling can either be accomplished within the same manufacturing process by methods such as distilling a spent solvent for reuse. Or, it may involve sending waste materials off-site for recycling if the company is unable to reuse the material on-site, as in the case of spent lead-acid batteries. An often overlooked part of recycling is the need to close the recycling loop by emphasizing the use of recycled materials wherever feasible.

Treatment of wastes can include incineration, neutralization, precipitation, or other chemical or physical methods to prepare a waste for release to the environment by making it less hazardous.

The lowest level of efficiency is the release of a pollutant or waste. This includes incineration, precipitation, landfilling, air emissions, wastewater discharges, and treatment. In practical terms, releasing waste means paying to buy a resource, and then paying again to get rid of it. In other words, no further value is gained from the resource.



Quality and Pollution Prevention

Quality improvement is another important business factor that should be considered in conjunction with resource management. Virtually all management and quality professionals agree that optimizing resources and reducing wastes and pollution leads directly to improved product quality. Therefore, any pollution prevention planning and implementation should be integrated in the company's quality program. As in pollution prevention, all quality schemes are cyclic. These cycles involve planning, doing, evaluating, and innovating. These four activities may have different names, but they are the essence of improving quality and preventing pollution. Effective quality programs are integrated across all company departments just as pollution prevention planning should be.

Environmental Management Systems, ISO 14000 and Pollution Prevention Planning

Many businesses that have benefited from Environmental Management Systems (EMSs) are exploring the idea of having their facilities ISO 14000-registered. Like other EMSs, ISO 14000 is a series of specifications that guide organizations to improved environmental performance and compliance. ISO 14000 stands out because its standards for the creation of a management structure and environmental policy are internationally recognized. Although ISO 14000 registration does not ensure environmental compliance, it does certify that the organization has a working management system in place that promotes proper environmental performance and compliance.

Pollution prevention planning is related to ISO 14000 registration in that both have the same goal of improving environmental performance. Although successful pollution prevention planning and implementation requires steps that go beyond those required for ISO 14000 registration, there are similarities. The first step is the self-assessment, where areas of concern are identified and solutions are proposed. Then, the proposed solutions are evaluated for feasibility and those which are chosen are implemented. Finally, the cycle completes when solutions are evaluated again for their effectiveness and new ideas are proposed for implementation where needed. The ISO process documents waste which is an opportunity for pollution prevention.

Chapter 2 - Recognizing Pollution Prevention Opportunities

Organizing Pollution Prevention Options

Pollution can be prevented in many different ways. All these methods can be organized into five categories. They are:

- chemical substitution
- material flow
- process control
- automation
- technology

These categories will likely overlap with each other as they are examined and implemented. Using these categories will help during the options analysis step in the pollution prevention planning process.

Chemical Substitution

Chemicals may be substituted that are less hazardous and polluting. This can be viewed in three different ways. First simple substitution can directly impact the level or hazard of the pollutant. For example, many facilities replaced chlorinated solvent cleaning systems several years ago with aqueous-based cleaning systems when the Montreal Protocol phased out the manufacture of chlorinated fluorocarbons and some other chlorinated solvents due to their ozone-depletion potential.

Second, less hazardous carrier or solvent chemicals can be used. Virtually all coating operations use a carrier to dissolve and transport (by brushing or spraying) the desired coating. Waterbased or powder paints may be used instead of solvent-based paints that contain volatile organic compounds (VOCs) such as toluene.

The third situation involves chemicals that are changed during the process into a more hazardous polluting material. In this case, there may be a substitute that will not be transformed in such a way. An example would be a curing process where initially non-toxic chemicals are changed to more hazardous chemicals when reacting or polymerizing under ultraviolet light. These situations can be difficult to find substitutes for because of the many interactions that are going on in the process and the desired results.

Whenever chemicals are substituted it will affect other parameters of the process. Equipment may have to be modified, the process itself may need to change, training on how to handle the new chemical may be needed. Rarely will a direct substitution not require other process changes.

Material Flow

Tracking and controlling how a chemical flows through a facility and its processes is an important way to prevent pollution. Material flow includes activities like water conservation practices, inventory control, efficient use of chemicals and storage.

In many cases, how water is used and routed through a facility is intertwined with pollution and waste issues. Water is prevalent in rinsing, cleaning and other common industrial operations. As a result, many pollutants end up in wastewater, requiring it to be treated before being discharged from a facility. By tracing where water enters a facility, where it flows internally, how it is sent to the various areas for use and how it is used may reveal ways that pollutants are introduced. In addition, because water is a resource that must be paid for, doing a water flow analysis may reveal areas where water can be conserved.

Like water, chemicals should also be tracked through the system to identify areas where use or generation can be reduced. In chemical process solutions, optimize the concentrations of chemicals to the minimum required to obtain the desired results. Work with vendors to minimize storing chemicals on site by implementing "just in time" (JIT) delivery practices. Inspect chemical transport systems and storage areas for leaks and other losses. Develop an effective tracking system of chemicals shipped, stored, transported, used and treated or emitted. Other typical factors that must be monitored include expiration dates, rotation of stock and worker safety.

Small quantities of chemicals, whether used or not, are expensive to dispose. Companies should have a restrictive policy on accepting samples to avoid the accumulation of small quantities of obscure or rarely used materials. Preferably, no samples should be allowed. In lieu of this, vendors should be required to accept returns of any unused samples. Vendors may also suggest installing an entire process line to test their capabilities. Companies should have a clear agreement with vendors who will be responsible for removing any unused or generated chemicals during the trial period. Even if a vendor agrees to pay for removal, the host company is seen as the generator and must comply with all relevant regulations.

In general, any and all systems that transport, store, dispense and otherwise move water and other chemicals through a facility are necessary for the company to function. These systems must be given the attention that is required in order to prevent pollution and losses that make the company less profitable. Focus on the source of the waste—at least—as much as on the waste itself.

Process Control

Process control is about people and ensuring that jobs are done properly so that waste and pollution are minimized. It involves examining the system and work environment to see if it allows employees to do the job effectively. Key elements in process control are written procedures and documentation of completed tasks, training and auditing to prove that jobs are being done correctly.

First, determine if the materials that document the process are accurate, complete and understandable. This includes process control sheets, raw material and use logs, training materials, engineering schematics, and step-by-step production procedures. From these documents it should be clear what materials to use and how to identify, measure, and move them. The documents should contain all the other relevant information that describes what must be done. They should also include information on what to do if something unexpected happens. If the process in question is missing any part of the documentation, then it should be developed.

Once it is clear that all the documentation is available, then evaluate the method that is used to communicate this information to the workers. How are workers trained in the process? Is training clear and convenient? Is it regularly updated and completion documented? Is process-related procedure documentation easily available at the work site? Are preventative maintenance procedures being followed? How do workers provide feedback and suggestions to supervisors or engineers? Workers must have a clear understanding of how the job is done and the consequences—both to themselves and the company—of not following their training.

Auditing should be done to verify that the production processes are being performed properly. If a job is not being done as prescribed, then the reason why should be determined. Documentation may be faulty, the equipment may be malfunctioning or training may be insufficient. In any case, deviations from the expected should be analyzed and corrective action implemented to improve the system. Results from auditing can be used to plan further enhancements to the production process. Again, focus on the source of any waste or pollution.

Automation

Especially for redundant and repetitive procedures, automation can be used to eliminate human error or inaccuracies in process performance. It may decrease worker exposure to hazardous chemicals. Automated processes can be controlled or programmed to easily test and improve a process to minimize waste.

For example, water conservation techniques can be greatly automated. Inexpensive equipment such as flow restrictors, timers and solenoid valves can be used to activate and control processes that use water. Painting operations can be precisely controlled with automated spray guns and conveyorized systems. Many sequential chemical dipping operations such as plating have been automated to minimize chemical wastes and conserve water.

Technology
The most creative and radical way to prevent pollution is to change the technology that is used to make a product. This will involve all four of the other ways to prevent pollution. It may mean a totally new mindset in how to do something. It may mean using no chemicals at all, instead using mechanical methods to accomplish what chemicals had done. Due to the changes in employee roles and responsibilities that accompany a technology change, it may be the most difficult but is often the most effective way to prevent pollution.

Technology changes can also prevent pollution through the design stage. The concepts of Design for the Environment (DfE) can be used either to design a new product or redesign an existing product. DfE allows design teams to take a new, creative and resource-efficient look at specifications and features. The concepts of DfE consider the environmental impacts of the design of a product not only in manufacturing but in its entire life cycle. The benefits of DfE include improved market position, reduced manufacturing and user costs and reduced regulations and liability because the product is designed to minimize waste from the start.

Chapter 3 - How to Write a Pollution Prevention Plan

Who is Required to Write a Plan

The 1990 Minnesota Toxic Pollution Prevention Act (TPPA) provides a definition for pollution prevention and also establishes a requirement for certain industrial facilities in Minnesota to prepare toxic pollution prevention plans. In addition to preparing pollution prevention plans, facility managers are required to submit annual reports detailing progress with their facilities pollution prevention efforts. Pollution prevention plans are required for all Minnesota facilities that are required to submit Form R reports for Toxic Release Inventory (TRI) chemicals under the state and federal Emergency Planning and Community Right-to-Know Act (EPCRA). Pollution prevention plans are also required of companies participating in the MPCA Environmental Auditing (Greenstar) Program.

If you have questions about whether your facility is required to prepare a pollution prevention plan, please contact the Emergency Response Commission (ERC) at 651-297-7372.

For more information on the Greenstar Program call the MPCA at 651-296-6300 or visit their Web site at www.pca.state.mn.us/programs/audit_p.html.

Basic Requirements of a Plan

Required contents of pollution prevention plans include:

A **policy statement** expressing management support for eliminating or reducing the generation or release of toxic chemicals (pollutants) at the facility.

A description of **the current processes generating or releasing toxic chemicals (pollutants)** that specifically describes the types, sources, and quantities of toxic chemicals (pollutants) currently being generated or released by the facility.

A description of the **current and past practices used to eliminate or reduce the generation or release of toxic pollutants** at the facility and an evaluation of the effectiveness of these practices.

An **assessment of the technically and economically practicable options** available to eliminate or reduce the generation or release of toxic chemicals (pollutants) at the facility, including options such as changing the raw materials, operating techniques, equipment and technology; personnel training; and other practices used at the facility.

A **statement of objectives and a schedule for achieving those objectives.** The TPPA requires companies to express objectives in numeric terms wherever technically and economically feasible. Otherwise, non-numeric objectives can be stated; however, they must include a clearly stated list of actions designed to lead to establishing numeric objectives as soon as they become feasible. Facility pollution prevention plans must contain objectives for each chemical for which a facility submits a TRI Form R report. Pollution prevention plans may also contain objectives for other chemicals as well.

An explanation of the rationale for each objective established for the facility.

A **listing of options that were considered not to be economically and technically feasible.**

A **certification**, signed and dated by the facility manager and an officer of the company, attesting to the accuracy of the information in the plan.

Pollution prevention plans are required to be updated by January 1 of every even numbered year.

Step One: Getting Started

How a company gets started on a pollution prevention program and institutes it in all business planning and operations will vary. Implementation must be customized to each individual facility situation. Many aspects of a business such as capitalization, number of employees, organizational structure and location may be considered when integrating pollution prevention into a business. The steps in this guide are numbered simply as a way to identify them. They do not necessarily need to be carried out in this order, nor do all businesses need to perform each step.

One of the required first steps in starting a pollution prevention program is to gain management support for the effort. Once management recognizes the advantages of pollution prevention, commitment should be forthcoming for implementation. After a person or a group has management's support, action can be taken to investigate and evaluate options for pollution prevention.

Depending on the size of a business, one person or a team may be the focal point for implementing pollution prevention. In any case, the following should be done to get pollution prevention activity started.

1. Understand and document operations so that inefficiencies, as indicated by the amount of waste or pollution generated, are identified. This includes identifying the hidden costs and overhead of waste and pollution.

2. Based on the understanding of a business's situation and with management's input, develop a policy for efficient use of resources. This policy should be as specific as possible and should set a standard for all future environmental planning and action.

3. Based on the policy, develop company or facility-wide goals for pollution prevention activities. (Specific objectives for targeted chemicals are set in Step 5).

4. Inform and educate all employees of the intent and goals of the pollution prevention program.

Starting and maintaining a pollution prevention program requires the commitment and participation of each employee. To sustain this activity, contributions need to be rewarded. While progress made in pollution prevention efforts provides satisfaction for everyone involved, outstanding individual efforts should be recognized. Examples of recognition may include employee awards, commendation at special functions or a sincere thanks from the management group. Monetary awards have also been used, although it is recommended that these type of awards be shared among all employees involved in the pollution prevention program to encourage sharing of ideas and teamwork.

Step Two: Use a Team

A team approach is recommended for addressing pollution prevention, and those on the team must have the influence or be given the authority to make things happen. A team may evolve over time depending on changing circumstances. One way to start forming a team is to look at the organizational structure of the business. In an ideal situation, a member from each level of management and a member from each production/functional division would be part of the team. But keep the team a manageable size (5 to 8 members) by recruiting interested members from key functions playing roles such as:

- **Accounting:** Break out costs associated with toxic chemical use and waste generation to educate managers of the financial impacts of using or generating regulated chemicals.
- **Engineering/Design:** Evaluate manufacturing products and processes and propose redesign ideas to achieve pollution prevention objectives.
- **Finance:** Determine cost-effectiveness and payback for capital-intensive pollution prevention projects.
- **Health and Safety:** Evaluate substitute chemicals for employee health concerns. Provide training for other groups so they can get more involved.
- **Maintenance:** Evaluate maintenance practices and develop or modify preventive maintenance schedules to minimize or eliminate waste generation.
- **Production:** Evaluate production practices to determine how and why wastes are generated and develop ideas for reducing and eliminating waste.

- **Purchasing:** Review chemical constituents of new products purchased by a company against an approved list and assist with progress measurement by tracking use of target chemicals through raw material purchases.
- **Research and Development:** Develop and use innovative process technology to achieve pollution prevention objectives.
- **Sales:** Determine marketing advantages associated with new or modified products that reduce or eliminate waste generation. Get customer feedback on proposed alternatives.

These members would then be responsible for bringing issues to the team that are important for the area they represent. Many facilities have achieved great results in their pollution prevention efforts by involving personnel who work directly with the manufacturing processes being evaluated. They often serve as an excellent source of ideas on how current processes can be improved. In any case, the team must be effective at gathering and analyzing data that leads to the implementation of pollution prevention activities.

The team should make sure to involve the company's vendors in the planning process. They have the technical knowledge about the chemicals or equipment they supply. They also may have worked with other customers on similar projects and can share information and success stories. In addition, it may be helpful to include other outside members such as customers that have an interest in the business operation.

Mechanics of Teams

Teams go through four stages depending on how well members know each other at the start:

1. A **forming stage** is characterized by members being both excited and hesitant. Excited to be a part of the group but hesitant due to unknowns about work load and responsibilities.

2. A **storming stage** where tasks appear larger and more time-consuming than expected. Members may feel anxious and frustrated as little progress is made. Members focus on their own strengths and weaknesses as they get to know each other better.

3. As more communication takes place, a **norming stage** develops when the team starts to function as a cohesive unit. Individual skills, experiences and creativity are recognized and used to solve problems. Things start to happen.

4. In the **performing stage,** team goals are being met and results become visible to the whole organization.

An important team activity is brainstorming. When brainstorming, make clear:

- Any and all ideas are valid.
- No judgement or criticism is allowed during the brainstorming session.
- Build on the ideas generated by others.
- All ideas are written down so all participants can see them.

Brainstorming sessions work by describing problems in order to gain insight for solutions. The types of questions that are asked involve what is happening, how is it happening, and why is it happening. Examples include:

- What is the waste?
- Where in the process is it created?
- Why is it created?
- What can be changed to reduce or eliminate it?

In addition to brainstorming, the team also engages in problem solving. The most important activity in problem solving is to maintain communication among the team members. Without communication, participants will not feel involved in the process and will lose interest. Because ideas and learning occur through dialogue and discussion, maintaining a sense of ownership among the team members is a crucial component for success. As the problem solving process takes place, some obvious problems will be identified. Those can be fixed immediately while the team continues to look upstream in the process for sources of waste. Throughout the planning process the team will need to document progress as it occurs and problems that arise. Equally important will be to monitor changes in production levels and customer needs, as these can affect the direction that pollution prevention planning takes.

Step Three: Determine the Baseline

Any benchmark or baseline should be expressed as a pollution to production ratio. It will also be used to determine the cost of the pollution per unit of product.

A baseline needs a relevant unit of product for each product that is manufactured with the chemicals being studied. The unit of product must be an accurate measure of a characteristic of the product. If a process is used for the same part all the time, then number of pieces will make a good unit of product. However, if the process works on several parts, then a more specific measure will be needed, such as surface area or weight.

Units of Measure

How much waste is produced per product? Identifying the correct means of measuring the performance of a manufacturing process is one of the most important steps in pollution prevention planning. The measurement accurately portrays what is happening in the process and provides meaningful data to use in the options analysis step. Without measurement, pinpointing and solving problems would be difficult, as would documenting the impact of pollution prevention. Feedback from measurement will also help in making decisions on facility policies, developing new technologies, and choosing additional pollution prevention options.

The unit of product must be carefully chosen. Generally, valid units of product are count (numbers of pieces), surface area (square feet), volume (cubic feet), etc. Examples of units that are **not** valid are sales and run time. The unit of product must relate **directly** to the product or service being measured. In addition, in order to obtain accurate data on the amount of pollution generated during a production run or during a measured time period, **rejected product must be included** in the calculation of the production volume. This is why sales is not a good indicator of production rate. Conversely, run time is not a good indicator of production because a machine or a process may be operating, but product is not necessarily being produced nor is waste being generated. Sales underestimates production volume and run time overestimates it.

The Production Ratio

It is necessary to develop a basis of comparison for chemical waste generated in the production process over time. Simply comparing waste generated from year to year can be misleading if there was a significant change in the levels of production involving the chemical being targeted. Production ratio (PR) is used to normalize changes in production levels. It is calculated by dividing the production level for the reporting year by the production level for the previous year. Once a production ratio is determined, it is used as a factor when comparing target chemical waste generated between the two years.

Production Ratio Example

Production level change	PR
none	1
10% increase	1.1
10% decrease	0.9

Note: A good resource for determining production ratio: Malkin, M., Baskir, J. (1997). Developing and Using Production Adjusted Measurements of Pollution Prevention. U. S. Environmental Protection Agency, order # (EPA/600/R-97/048). To order call 513-569-7562.

Example 3-1:
A facility paints 1,600 parts in 1997. It paints 1,800 parts in 1998. The production ratio is:

1,800/1,600=1.13

Simply using units to determine the PR may not give an accurate result if the parts are not identical. In that case, a more specific attribute must be used such as surface area, weight or other relevant measure.

Example 3-2:
A facility fabricates control housings from sheet metal. There are two production lines in operation. One fabricates the front panel and the other fabricates the sides and back of the housing. The exteriors of the two parts are coated and then screwed together. The exterior surface area of the front panel is 12 square inches and the exterior surface area of the back and sides is 36 square inches.

Number of parts manufactured:

	1998	1997
Line 1 (front panels)	1,254	1,093
Line 2 (back and sides)	1,208	1,006

Note: numbers include parts rejected

Total surface area coated per production line (sq. in.):

	1998	1997
Line 1	15,048	13,116
Line 2	43,488	36,216
Totals:	58,536	49,332

The Production Ratio is:
58,536/49,332=1.19

Data Gathering
Either during or after a team has been organized, the performance of the current manufacturing processes must be determined. As a minimum, the processes that use or generate TRI chemicals are targeted for pollution prevention. This will be critical for the team to calculate a baseline for future comparisons and must be done prior to options analysis. An important first step is to decide the accurate and relevant units of measurement for the processes involved. The next section provides more details on measuring waste and pollution generation.

Data Gathering for Current Operations
For each and every process that uses a chemical reportable on the TRI Form R, gather and verify information related to the chemical's waste generation and releases. This information must be comprehensive in order to be as accurate and useful as possible. It should include information related to the product being manufactured, the process, the volume produced, and all associated costs.

Product Data - There should be a description of the product(s) or service(s) related to the chemical being addressed. This may include information about desired quality and the reason why the product manufacture requires the use of a TRI chemical. Customer input may be desired or required for specifications. Pollution prevention planning is a good way to question the design of a product and ask why the chemical is needed. Are there customer specifications or product quality issues that need to be considered? These will be factors when options are analyzed for pollution prevention.

Process Data - In order to further pinpoint how and why a chemical waste is being generated, process information must be gathered. Data on the process should include a description of the major steps.

Finding out how employees are involved in the process is often helpful. This can include information on employee function, training and safety/health considerations. Also, obtain whatever documentation is available about the process such as vendor literature, chemical analysis, preventive maintenance schedules, equipment specifications, etc. Any or all of the information will be needed for the options analysis step that studies the alternatives for making the process more efficient, thereby using less raw material or generating less waste or pollution.

Chemical Handling Data - Because waste can be generated as a result of transfers and spills, data should be gathered on how chemicals are stored, transferred, packaged and otherwise dispensed. These operations may be a part of the manufacturing process or they may be auxiliary operations that occur elsewhere in the facility.

Cost Data- During option analysis, in order to calculate the costs, savings and payback of any pollution prevention changes must be gathered on all operations that involve the TRI chemicals in question. Many hidden costs in the use of a chemical are instituted in overhead or department charges. However, these numbers must be isolated and identified in order for the option analysis to be comprehensive.

Some costs to consider are those related to "environmental compliance." This includes compliance issues such as analysis of waste, treatment of waste, license fees and the cost of disposal. As burdensome as these costs might be, they are only a fraction of the cost to manage TRI chemicals.

Many of these environmental compliance functions can be done externally or internally. If they are internal costs, remember to include the cost of the time it takes staff to perform these tasks.

Another cost is the purchase of the chemical. Add to this the cost to transport the chemical. This must include not only any external charges to get the chemical to the facility but the internal cost to transport it within the facility. Then add the cost to store the material, including the cost of the space it occupies.

Auxiliary costs to properly store and maintain the chemical must be included. Add any cost for temperature or humidity controls required for the chemicals storage and use. In addition, there might be costs to maintain the equipment that stores or transports the chemical, including preventive maintenance. Costs for risk management: insurance to protect against losses caused by accidental release and injury; health and safety equipment and training requirements so employees can work with the chemical as safely as possible; and for some chemicals significant costs due to absenteeism caused by perceived or real health effects of the chemical.

Finally, intangible costs should be assessed and recorded by asking:

- Are there any community concerns?
- Are there employee health or safety concerns about using the chemical?
- Are there emergency response concerns regarding the use of the chemical?
- Does the chemical contribute to unpleasant production work areas (i.e. odors)?
- Are there product marketing disadvantages?

In order to obtain a good baseline of the present situation, all this information must be gathered and be effectively organized. This can be done with charts, graphs, matrices, etc. Each facility will have a unique system to organize the data to fit its needs.

Production ratios and baselines must be determined for each process that generates the chemical being studied.

In addition to determining a baseline for measuring the cost of waste generation per unit of product, it is also essential to identify and document current and past pollution prevention efforts. Documenting these will allow the pollution prevention team to avoid repeating work unnecessarily and also provides the groundwork for future feasibility studies if changes in technology or increasing costs of environmental management make yesterday's discarded ideas more attractive today.

Next is to sum all the chemical waste generated data and divide it by the amount of production that generated those chemicals. The result of this operation is the amount of waste or pollution that is generated per unit of product.

Example 3-3:
From Example 3-1, toluene is used to thin the paint at one pound of toluene per gallon of paint. This toluene is released to the air as the paint dries. In 1997, 100 pounds of toluene was released in this way when the 1,600 parts were painted. So if 1997 is the baseline year, the pollution to production ratio is 100 divided by 1,600 or 0.063 pound of toluene released per part painted. If the toluene costs a dollar per pound, the cost is 6.3 cents per part painted.

During 1997, tests were performed and it was discovered that paint quality did not deteriorate by using 0.80 pound of toluene per gallon of paint. This reduced use of toluene per gallon of paint released 90 pounds in 1998. The pollution/production ratio is 90 divided by 1,800 or 0.05 pound of toluene released per part painted, and the cost is 5 cents per part. So compared to the baseline year, this is a savings of 1.3 cents per part, or $23.40 for 1,800 parts.

Sources for Data Gathering of Waste and Pollution Information

Waste generated from production processes can assume a variety of forms. Most notable among these are air emissions, process wastewaters, hazardous waste and scrap. It is important to be aware of all forms of waste that are produced through manufacturing to ensure an accurate assessment of a production process. One good approach for gathering this information is to develop a material balance or process map for target chemicals to account for each waste stream that comes from the process. This can start with a sketch showing the flow of raw materials, products, wastes and releases involving the target chemical. Make sure to include streams for wastes that are recycled, treated or otherwise managed on-site.

A common engineering principle is that what goes into a system must come out in some form or another. By measuring the material inputs, the total outputs that must be accounted for can be identified and through process of elimination, the unknowns can be determined. In some cases, the data needed to fully measure the amount of each waste stream may not be available. In these cases, it becomes necessary to use engineering judgement and knowledge of the production process to develop reasonable estimates of how the system is operating. This occurs more often with water and air releases, particularly "fugitive" (non-stack) air releases.

Hazardous Waste - The primary information source for waste shipped off-site, whether to be recycled, treated, or disposed, is the hazardous waste manifest. The manifest provides the type and quantities of hazardous wastes shipped. For mixed wastes or sludges that contain target chemicals, a useful tool for determining the fraction of the mixture that consists of the target chemical is to review the waste profile submitted to the off-site hazardous waste management firm when the waste stream was approved for acceptance. The waste management firm your facility is contracted with should supply, upon request, copies of the results of waste analysis that was performed when a shipment was received.

Scrap - Information for scrap waste can be found on the bill of lading for each shipment. These are often used in place of the hazardous waste manifest for wastes such as scrap metals, scrap circuit boards or spent lead-acid batteries that are sent to a metals recycler. Similar to the hazardous waste manifest, it will provide the type and quantities of scrap materials shipped. Product design specifications may be needed to help estimate the amount of the target chemical contained in the total waste shipped.

Wastewater Discharged to POTW - To discharge wastewater to a publicly-owned treatment works (POTW) generally requires an Industrial Discharge permit, which will include limits on the pollutant concentrations allowed in the wastewater discharge. Facilities are required to perform periodic sampling and analysis of their wastewater discharge to ensure compliance with the limits set. This information can also be used to estimate annual levels of a target chemical that is discharged to a POTW by using the concentration levels determined in sampling along with the cumulative volume of wastewater discharge from the facility. Some facilities perform in-house sampling and analysis on a more frequent basis than required by their permit. These results provide a good tool for estimating the volume of a target chemical that is discharged to a POTW.

Stack Air Emissions - Facilities that are required to hold air emissions permits should find that their permit application contains a great deal of information to help estimate a target chemical's volume of releases through stack air emissions. Each manufacturing process that vents emissions through a stack is required to be thoroughly described in the air permit application, with information regarding the chemicals used, the throughput of the process and the emissions associated with the process. The calculations contained in an air permit application are performed on a basis for "potential to emit," which assumes constant operation of the manufacturing process equipment and does not include emissions reductions due to pollution control equipment. Therefore, any use of air permit application data must include appropriate changes to reflect the actual operating conditions of the process.

Facilities that are not required to hold air emissions permits may estimate their stack air emissions using their knowledge of process conditions and materials balances. Quarterly or annual tests of stack emissions may be worthwhile to perform to provide data to compare to estimates.

Fugitive Air Emissions - Fugitive (non-stack) air emissions can be difficult to determine directly. They are commonly estimated through a materials balance with fugitive emissions representing the last remaining unknown after all other outputs have been directly measured or estimated. If a facility employs an industrial hygienist, he or she may have information on employee exposure levels that can also be used in estimating fugitive air emissions.

On-site Waste Management - There are several ways that wastes are managed on-site. Some wastes can be recycled, such as spent solvents or used oils and lubricants. Most facilities keep track of how many batches are processed by the recycling equipment or of the amount of regenerated material. Also track the amounts of solvents, used oils, or other flammable materials that are incinerated on-site. These should be identified in the air emissions permit application. Other wastes are treated on-site prior to disposal, such as spent acids and caustics or polymer waste. Information for measuring the amounts of waste generated should be obtained either from the treatment process description, or from direct observation of the process.

Some employees may be hesitant to take all of the necessary steps involved in gathering the information needed for a complete material balance, as it can initially appear to be a daunting task. A recommended first step in performing the material balance is to simply document material inputs minus the materials included in the product stream. This result will show the amount of waste that is generated and can serve as a driving force for finding the specific sources of waste in a process.

Step Four: Determine and Analyze Alternatives

Once there is a good baseline of how the present processes generate waste or pollution and how much it costs, options for reducing these may be explored. The analysis of these options can be done concurrently with the gathering and analysis of the data, but a meaningful options analysis will need the data analysis done and a baseline determined before the options can be effectively screened.

Critical Point!

Options analysis is the heart of the pollution prevention planning process. All other steps and all benefits will be affected by how well this step is done.

Options analysis should include an examination of all the methods of pollution prevention covered in Chapter 2: Looking at substitutes for the chemical, how the chemical moves through the manufacturing system, how a process is performed, automation and alternative technologies for the manufacture of the product.

This analysis may also include developing criteria for determining which alternatives may be implemented. These will depend on the culture of the company and other factors. However, some tangible factors to consider are how much an alternative will reduce Form R reporting requirements, how much an alternative will reduce hazardous waste generation and the return on investment for a project. Other considerations include compatibility of the pollution prevention option with the current manufacturing process, ability to maintain product quality requirements and storage or process layout considerations.

Just like costs associated with current manufacturing processes that are determined in the baseline research, costs will be associated with each pollution prevention idea and should be considered during options analysis. Among these include costs for design, testing and implementation. These should be weighed against the savings that would result if the option is selected. Savings can come from reductions in chemical purchases, compliance costs and disposal costs. Changes in labor cost should also be taken into account.

Tap all the available public and private resources for information on alternatives and how they meet your criteria. These include technical assistance sources such as the Minnesota Technical Assistance Program (MnTAP), the Minnesota Office of Environmental Assistance (OEA), trade/professional groups, trade publications and vendors. In addition, regulatory agencies can help determine how alternatives may impact compliance and fees.

After a complete options analysis, the option(s) that meet the criteria for acceptance should get a final verification for feasibility. The reasons that the other options were not selected should be obvious at the conclusion of the analysis. Each step of the options analysis needs to be documented, including whether options are rejected on technical or economic grounds. By maintaining records of all options that have been explored and why some were rejected, it will be easier to revisit these should future developments warrant further consideration.

Step Five: Set Objectives for Implementation

Once the most promising option(s) has been chosen for implementation, objectives can be determined. Some broad objectives may have already been set during the formation of the pollution prevention team or policy development at the start of the planning process. In that case, this stage can consist of refining those objectives and developing the implementation schedule for the option(s) chosen. But whenever the objectives are set, they should have the following characteristics.

As detailed in Minnesota statute 115D.07(5), the objective(s) should be numeric. The TPPA allows non-numeric objectives if it is not possible to establish numeric objectives. However, they must include a clearly stated list of actions designed to lead to establishing numeric objectives as soon as feasible. A good starting point for objective setting may be with the waste generation levels reported on the TRI Form R.

The objective should state the planned reduction in the TRI waste generation for the chemical involved. It should be clear how this reduction relates to the waste generated per unit of production. **Remember that pollution prevention requires not the absolute reduction of waste generated, but the reduction of waste generated per unit of product.**

The objective should state the schedule for the planned reductions. This may include the use of a timeline or other tool to clarify when implementation is planned. The objective should state how much the organization may benefit as a result of full implementation. This may include not only cost savings, but other tangible and intangible benefits upon reaching the objective. In addition, all assumptions and rationale used in setting these objectives should be documented in the plan.

Finally, list the options that were not chosen for implementation and brief summary explaining why they were not selected.

Critical Point!

Objectives are not legally binding or enforceable in any way by any organization. They should be considered as reasonable yet challenging goals that will make a process or company more profitable.

Step Six: Certification

Two company officers must put their signatures on the plan to certify the accuracy of it. In almost all cases, this will NOT be the environmental manager. It can be the facility or general manager, the president, a vice-president, or other responsible ranking position. For a sole proprietorship, the owner's signature will suffice.

Chapter 4 - Pollution Prevention Progress Reports

Monitor Progress

As implementation ensues, data should continue to be gathered to compare against the original baseline. This will show actual reductions and savings and will be needed to generate the progress report. Pollution prevention planning is an on-going, cyclic process.

Pollution Prevention Progress Report Requirements
Pollution Prevention Progress Reports (P2PRs) are required to be submitted in conjunction with the Form R for each chemical reported.

Every year, each facility should get a preprinted or electronic progress report form from the Emergency Response Commission (ERC). Basic facility information should be preprinted on the forms based on information currently in the ERC database. If the information is incorrect, changes should be made in the appropriate places on the form.

The five requirements of the progress report are explained below. Refer to the progress report instructions for details on how to prepare it.

1. **Summary of each objective**
   Each chemical reported must have a pollution prevention objective in the plan. Summarize these objectives and their schedules for implementation in the progress report.

2. **Summary of progress made for each objective**
   Indicate what progress has been made, even if none has been made. This should include the amount of generation or releases reduced per unit of production.

3. **Methods used to reduce pollution**
   Describe how pollution prevention was implemented.

4. **Obstacles to reaching objectives**
   Describe any barriers in implementing pollution prevention objectives.

5. **Certification**
   The P2PR forms need to be certified by a facility manager (defined as the highest ranking manager responsible for operations/production at the facility) and by a responsible officer (defined as the company officer with responsibility for facility management and who is authorized to certify, on behalf of the company, that all statements are believed to be true, accurate, and complete). Both certifications should be accompanied by the date of certification and a phone number for contacting the signatories.

How Pollution Prevention Progress Report Information Is Used

Pollution Prevention Progress Report information is summarized with Toxic Release Inventory data in the annual ERC Right-To-Know Chemical Information Report (Form R). This report is prepared to provide citizens awareness about toxic chemicals in their communities and enhance accessibility to data.

OEA and MnTAP review the P2PRs for the purposes of understanding statewide trends, targeting technical assistance and identifying companies who have had success, including those who could be candidates for the Governor's Awards for Excellence in Pollution and Waste Prevention.

Appendix

Pollution Prevention Planning Assistance Programs

In addition to planning requirements, the TPPA also features provisions for establishing a pollution prevention assistance program, known as the Minnesota Technical Assistance Program (MnTAP). The Minnesota Office of Environmental Assistance (OEA) coordinates a Governor's Awards for Excellence in Pollution and Waste Prevention, and an Environmental Assistance Grant program. A pollution prevention fees collection program for facilities that are identified as TRI reporters or as large quantity generators (LQGs) of hazardous waste is jointly administered by the ERC and the OEA to help fund these programs.

Minnesota Technical Assistance Program
MnTAP implements the technical assistance provisions of the Waste Management Act (WMA) and TPPA. It is a non-regulatory organization that helps businesses prevent pollution, manage waste better and save money. MnTAP is located at the University of Minnesota and has a staff with a solid background in science and engineering, plus many years of industry experience. MnTAP's main services include:

On-site consultations to identify pollution prevention opportunities.

A student intern program which helps companies dive deeply into examining pollution prevention problems and solutions.

Seminars, workshops, training programs and other similar activities designed to provide pollution prevention information and assistance.

From 1996 to 1998 MnTAP helped companies reduce waste by over 48 million pounds and save companies over $2.5 million.

To learn more about how MnTAP can assist in your facility's pollution prevention and waste reduction efforts, please contact them at 612-624-1300 or at 800-247-0015 or visit their Web site at www.mntap.umn.edu.

The Minnesota Office of Environmental Assistance
The OEA is a service organization that helps businesses, local governments, institutions and others solve environmental problems.

The Governor's Awards for Excellence in Waste and Pollution Prevention honor private and public organizations that have demonstrated outstanding achievements in pollution and waste prevention. Nominees are evaluated by a panel of judges selected by the OEA. Judges are chosen to represent industry, government, and environmental and community organizations. Applications are evaluated on environmental and economic benefits, innovation, and commitment and leadership displayed in the area of waste and pollution prevention. Preference is shown to applications and organizations that can serve as models for others.

In addition to administering the Governor's Awards program, the OEA also administers an Environmental Assistance Grant program. Businesses and other organizations can apply for grant funds for the purpose of researching, developing, and implementing projects or practices related to pollution prevention and other environmental improvement initiatives. Grant requests for proposal are sent out in July each year, with applications due in October. Since 1985, the OEA has awarded more than $10 million in grants to organizations throughout Minnesota.

The OEA also can provide technical assistance resources such as the DfE toolkit, which provides a systematic method for incorporating environmental attributes into the design of a product.

For more information about the Governor's Awards program, the DfE toolkit or the Environmental Assistance Grant program, please contact the OEA at 651-296-3417 or at 800-657-3843 or visit their Web site at www.moea.state.mn.us. The OEA works with management and trade associations to identify issues and barriers to implementing pollution prevention.

Pollution Prevention Fees

Pollution Prevention Fees are used to fund the state's technical assistance and research activities with regards to waste reduction and pollution prevention. As mentioned above, a portion of MnTAP's funding comes from pollution prevention fees. In addition, these fees also fund the state's efforts in identifying priority chemicals for pollution prevention initiatives, as well as identifying priority industries for offering technical and financial assistance.

The pollution prevention fees program is administered jointly by ERC and OEA. ERC collects fees from TRI reporters and OEA collects fees from large quantity generators (LQGs) of hazardous wastes. The fees are calculated as follows:

LQGs: Flat fee of $500 per facility.

TRI reporters:
$150 for each toxic pollutant reported to TRI, plus $500 for facilities reporting less than 25,000 pounds of releases and off-site transfers or a graduated fee of two cents per pounds for facilities that report releases and off-site transfers in excess of 25,000 pounds. (Releases and off-site transfers are determined from the sum of Section 5 and 6 from the EPA Form R reports submitted by a facility.)

Example A-1:
A facility submits Form R reports for one chemical, with total releases and transfers of 110,860 pounds. The fees due are:

a. $150.00 for each chemical reported: $150.00

plus

b. $0.02 per pound for > 25,000 pounds of releases and transfers: $2,217.20

c. Total: $2,367.20

Example A-2:
A facility submits Form R reports for two chemicals, with total releases and transfers of 20,873 pounds. The fees due are:

a. $150.00 for each chemical reported: $300.00

plus

b. $500.00 for < 25,000 pounds of releases and transfers: $500.00

c. Total: $800.00

Example A-3:
A facility submits Form R reports for eight chemicals, with total releases and transfers of 960,784 pounds. The fees due are:

a. $150.00 for each chemical reported: $1,200.00

plus

b. $0.02 per pound for > 25,000 pounds of releases and transfers: $19,215.68

c. Total: $20,415.68

Suggested Resources

The following are only examples that barely scratch the surface of a very large and growing body of literature on resource management, business management and quality.

Brown, K. (1993). *Source Reduction Now.* Minnesota Office of Environmental Assistance. (available at www.moea.state.mn.us/berc/srn.cfm).

Callenbach, E., Capra, F., Goldman, L., Lutz, R., Marburg, S. (1993). *EcoManagement.* Berrett-Koehler Publishers, Inc.

Cattanach, R., Holdreith, J., Reinke, D., Sibik, L. (1995). *The Handbook of Environmentally Conscious Manufacturing.* Irwin Professional Publishing.

Graedel, T., Allenby, B., (1995). *Industrial Ecology.* Prentice Hall Publishers.

Hawken, P. (1993). *The Ecology of Commerce.* HarperBusiness.

Malkin, M., Baskir, J. (1997) *Developing and Using Production Adjusted Measurements of Pollution Prevention.* U.S. Environmental Protection Agency order # (EPA/600/R-97/048).

McInerney, F., White, S. (1995). *The Total Quality Corporation.* Truman Talley Books/Dutton.

Mullins, L. J. (1996). *Management and Organizational Behavior.* Pitman Publishing.

Prokop, M. (1992). *Managing to be Green.* Pfeiffer & Co.

Schonberger, R. (1982). *Japanese Manufacturing Techniques.* Free Press.

Shiba, S., Graham, A., Walden, D. (1993). *A New American TQM.* Productivity Press.

Walton, M. (1986). *The Deming Management Method.* Perigee Books.

Willig, J. (1994). *Environmental TQM.* McGraw-Hill, Inc.

Yarwood, J., Eagan, P., Kurk, F. (1998). *Design for Environment Toolkit.* Minnesota Office of Environmental Assistance (available at www.moea.state.mn.us/berc/DFEtoolkit.cfm).

Please Note:
This is the first page of this Sample P2 Plan.

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CERTIFICATION OF COMPLETENESS

I hereby certify to the best of my knowledge that this Pollution Prevention Plan meets the requirements of Executive Order 12856. As documented by this plan, the Naval Aviation Depot (NADEP) Jacksonville, as a tenant of the Naval Air Station, Jacksonville, Florida, will reduce total production unit releases and off-sight transfers of toxic chemicals by 50 percent by the end of 1999. Based on 1994 data, I further certify that the information provided herein is correct and complete, and that I have the authority to commit the NADEP's corporate resources necessary to implement this plan.

____

D. S. RICE, Captain, USN　　　　　　Date
Commanding Officer
Naval Aviation Depot
Naval Air Station
Jacksonville, Florida

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NAVAL AVIATION DEPOT
JACKSONVILLE, FLORIDA

POLLUTION PREVENTION PLAN

EXECUTIVE SUMMARY

INTRODUCTION

Pollution prevention offers a cost-effective means of meeting environmental objectives in an era in which federal facilities are subject to stricter levels of regulation, greater public scrutiny of their environmental records, and tighter budgetary constraints. The cost of failing to prevent pollution in the federal sector have become dramatically evident; in some cases, cleanup costs are estimated in the hundreds of billions of dollars.

On August 3, 1993, the President signed Executive Order (E.O.) 12856 that directed all federal agencies to comply with the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and the Pollution Prevention Act of 1990 (PPA). The E.O. emphasized that the Federal Government must demonstrate pollution prevention (P2) leadership by improving facility management, incorporating environmental principles in acquisition practices, establishing comprehensive P2 Plans, and developing innovative technologies.

E.O. 12856 requires federal facilities to prepare P2 Plans. E.O. 12856 also calls on federal agencies to develop a 50 percent reduction goal by 1999 for their releases of toxic chemicals, with the baseline being no later than 1994.

The PPA establishes a new environmental management hierarchy as national policy. This hierarchy, also incorporated into E.O. 12856, calls for the following:

* Pollution should be prevented or reduced at the source whenever possible;

* Pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible;

* Pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenev feasible; and,

* Disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner.

This Pollution Prevention Plan will implement our program to coordinate and manage our P2 efforts which will minimize the adverse impact on human health and the environment and meet the requirements of E.O. 12856.

CHAPTER 1

PURPOSE

This Pollution Prevention (P2) Plan has been developed to assist the Naval Aviation Depot (NADEP), Jacksonville, in reducing by a minimum of 50 percent, the release or offset transfer of the toxic pollutants referenced in appendix A, based on production units. This reduction, based on baseline 1994 data, will be achieved by 31 December 1999, and will be accomplished by:

* Identification of the measures and management procedures that will be used to comply with the requirements of DOD and DoN directives and federal, state, and local codes, standards, and regulations.

* Identification of all major processes that use toxic chemicals or generate hazardous wastes that are transferred off-site; and,

* Development of technically and economically feasible options for reducing the transfer of pollutants referenced in appendix A.

It is also the purpose of this plan to document past performance in the area of P2 and to account for our current volume of work so that fluctuations in this important parameter can be considered when measuring progress toward our goal.

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CHAPTER 2

POLICY STATEMENT

For the past 5 years, this command has supported the Naval Aviation Systems Team policy that Pollution Prevention through source reduction is our primary strategy for achieving compliance with environmental law. When source reduction is not possible, we will recycle/reuse materials or capture and dispose of materials in an environmentally sound and regulatory compliant manner. We will maintain solid relationships with our regulatory agencies and we will promote environmental awareness among Depot personnel and provide training to ensure understanding of our environmental goals.

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CHAPTER 3

APPLICABILITY AND SCOPE

NADEP Jacksonville is a tenant command of the Naval Air Station (NAS), Jacksonville. This plan addresses all processes within the NADEP utilizing chemicals referenced in appendix A and is a sub-set of the NAS Jacksonville P2 Plan. NAS Jacksonville meets the definition of “facility” as defined by the Emergency Planning and Community Right-to-Know Act (EPCRA) and is required to report toxic releases annually to the Environmental Protection Agency (EPA) and to the State of Florida. NADEP Jacksonville provides Toxic Release Inventory (TRI) reports to the NAS Facilities & Environmental Department for inclusion in the NAS TRI report. Contractors working within the Depot are regulated by the Regional Officer-in-Charge of Construction Command (ROICC) residing aboard NAS Jacksonville. NAS Jacksonville and NADEP Jacksonville are under the auspices of the following regulatory agencies:

* Environmental Protection Agency Region IV, Atlanta, Georgia
* Florida Department of Environmental Protection, Tallahassee, Florida
* Florida Department of Environmental Protection, Jacksonville, Florida
* Bio-Environmental Services, City of Jacksonville, Florida
* St. Johns River Water Management District, Jacksonville, Florida

The Naval Air Station as the host for NADEP Jacksonville, is the holder of all required environmental discharge and operating permits concerning water and waste. Air permits for the NADEP are held by the NADEP. Within Naval Air Station’s purview, NADEP operates under the environmental statutes and regulations as defined by the NADEP Environmental Management Plan.

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CHAPTER 4

DESCRIPTION OF ACTIVITY

The Naval Aviation Depot, Jacksonville, is a tenant command of the Naval Air Station, Jacksonville, Florida. The base is located in the northeast corner of Florida along the western bank of the massive St. Johns River on the southern edge of the City of Jacksonville in Duval County. In 1939, the citizens of Jacksonville voted a million dollar bond issue to purchase the site for the Naval Air Station, Jacksonville (NAS JAX). The Naval Aviation Depot, Jacksonville (NADEP JAX), began operating in 1940 as an Overhaul and Repair Department maintenance facility and during World War II there were 7,300 working at the facility, 4,500 of them military. Today, the Depot has a total land area of 102 acres on NAS JAX and occupies 51 buildings having a total area of 36 acres. NADEP JAX is today the largest industrial employer in Northeast Florida, employing over 3,200 civilian and 33 military personnel.

The mission of NADEP JAX is to provide a full range of the highest quality maintenance, engineering, logistics, and support services to the fleet at a competitive price. The mission is carried out under the authority of the Aircraft Maintenance Program directives issued by the Naval Air Systems Command (NAVAIR). The NADEP performs rework on aircraft, engines, avionics, aeronautical components, ground support equipment, aircraft accessories and systems. These operations include Standard Depot Level Maintenance (SDLM), emergency repair, overhaul, conversion, modernization, and analytical rework. Support functions include evaluation and examination, testing and calibration, manufacture of parts and equipment, inspection and flight test, preservation and packaging, maintenance, automatic test equipment test equipment and electronic systems.

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CHAPTER 5

MANAGEMENT RESPONSIBILITIES AND PRACTICES

INTRODUCTION

This chapter describes management roles, responsibilities, and practices for implementation, tracking and reporting, training and awareness, and annual updating.

IMPLEMENTING THE POLLUTION PREVENTION PLAN

Implementation of the P2 Plan will be directed and coordinated as part of the NADEP Environmental Management Plan (EMP). The EMP is a compilation of the aggregate environmental goals and objectives of the various functional organizations within NADEP. The EMP is managed by the NADEP Environmental Management Board (EMB) as defined in the EMP with organizational structure shown on Figure(s) 5.1 and 5.2 of the EMP.

The EMB, headed by the Commanding Officer (CO), establishes policy and ensures compliance with environmental regulations. The EMB is comprised of senior management and is structured to assure close coordination of resources among the departments having first line responsibility to execute the plan through technical and managerial efforts. The EMB is supported by the NADEP JAX Pollution Prevention Team headed by the Director of Operations with members from Materials Engineering (Code 340), Production Engineering (Code 46), the Environmental Program Manager (Code 003), the Environmental Control Center (Code 723), and the Occupational Safety and Health Office (Code 001). This team reports monthly progress and brings to the EMB resources or other issues impending progress for resolution. Team members have responsibilities commensurate with their normal functions as follows:

* The Environmental Program Manager, working directly under the Commanding Officer and Executive Officer, keeps the Command aware of current and pending regulations and Depot compliance posture. Code 003 is also responsible for translating regulations into functional requirements and ensuring the responsible organization is aware of resulting environmental goals.

* Materials Engineering writes technical process requirements, tests and approves new materials for implementation and advises the team on the technical feasibility of using alternative processes. Assisting in this effort is the Lead Maintenance Technology Center for the Environment (LMTCE) (Code 343), a NAVAIR corporate resource residing at NADEP Jacksonville as a functional element of the Materials Engineering Laboratory. The LMTCE serves as a focal point for identifying and fulfilling NAVAIR requirements for compliance with environmental regulations through P2 initiatives and leads in the development of the P2 Plan.

* The NADEP Legal Counsel serves as a resource to the overall EMB and provides legal advice on the meaning and intent of various environmental statutes and regulations.

* Production Engineering designs, specifies, procures and installs equipment, optimizes process and workflow, and plans for new workload being accepted by the Depot.

* The Environmental Control Center (ECC) is discussed below under “Hazardous Materials Management Procedures”.

* The Occupational Safety and Health Office ensures that all operations in the Depot comply with local, state, and federal regulations to ensure worker safety.

The EMB will also be responsible for ensuring that the plan elements are included in all installation Plan of Actions and Milestones (POA&Ms) and in the Program Objective Memorandum (POM) process to ensure funding requirements are submitted for FY-96 and subsequent years.

PROVISIONS FOR UPDATING THE PLAN AND MEASURING/REPORTING PROGRESS

As directed by the EMB, the NADEP P2 Plan will be updated annually by the end of the first quarter of the calendar year. The update will require revision of the project completion path for all Projects listed in Chapter 6 as well as documentation of any new initiatives taken or planned since the last update. Annual summary reports will be issued to NAVAIRSYSCOM in graphic form documenting the amount, in pounds, of emissions or off-site transfers for the following:

* Hazardous Air Pollutants (HAPS)

* HAPS amounts broken out by EPA top 17 chemicals (minus Benzene)

* Class I and II ODS materials

* Resource Conservation and Recovery Act (RCRA) listed materials

* EPCRA chemicals

The success of the program will be measured in one or a combination of the following methods:

* Changes in waste shipped off-site or treated on-site

* Changes in quantity of materials brought on-site

* Changes in quantity of waste generated

* Analysis of changes made to specific processes

* Analysis of specific pollution prevention projects

* Changes in the amount of toxic constituents released

* Changes in material toxicity

* Changes in production levels that could affect material/waste levels

These changes will be reported and documented using a combination of the activity's hazardous waste annual reports, material procurement records, toxic release inventory Form R reports, and hazardous material authorized use lists.

Comparison of these reports with similar reports from previous years and TRI reports will provide a method for measuring progress in meeting P2 goals.

HAZARDOUS MATERIALS MANAGEMENT PROCEDURES

NADEP Jacksonville's Environmental Control Center (ECC) is a leading edge prototype for efficient management of the hazardous material life cycle. The ECC, located in Code 723, controls the authorization, requisitioning, warehousing and physical distribution of all hazardous materials used by the Depot. The ECC manages associated programs such as the Hazard Communication Program (labels, Material Safety Data Sheets, and the Authorized Use List), the Reutilization Program (diverting excess HAZMAT from the waste stream), and the Emergency Response Program (NADEP spill response team).

The ECC also manages the command's Hazardous Waste Program, servicing all waste accumulation sites, screening waste containers for regulatory compliance, coordinating waste stream testing, and transferring waste to the appropriate permitted storage facility. Used oil is collected and recycled by the ECC, generating direct revenue and avoiding waste disposal costs.

The ECC has implemented stringent controls on access to HAZMAT type and quantity. The "Just-in-Time" concept stages HAZMAT in production shops in quantities sufficient to meet short-term production requirements. When standard supply channels cannot provide small enough containers, the ECC dispenses hazardous materials into new packages and issues the appropriate quantities to production shops.

These controls have enabled a major reduction in HAZMAT procurement costs. From a baseline of $7 million in FY-91, the ECC reduced the command's HAZMAT cost to $3.6

million in FY-94. The reutilization program diverted $259K worth of HAZMAT from the waste stream, and allowed a cost avoidance of $82K for waste drums. The used oil recycling program generated savings of $412K over the same 3-year period. Conventional recycling (paper, cardboard, plastic, etc.) generated another $15K. The total cost savings (direct reduction + avoidance) achieved by the Depot over 3 years was approximately $4.09 million. HAZMAT procurement costs have been reduced by almost 50 percent over 3 years with the command's workload remaining steady state.

The ECC is currently involved in implementing a new, state-of-the-art information system that will allow on-line control and management of all hazardous material, chemical processes, and hazardous waste streams. This system will also generate menu-driven EPCRA reports (tier one, tier two, Form R). The system is designed to support a pharmacy-type distribution system, permitting HAZMAT to be issued only as needed, and only as authorized.

POLLUTION PREVENTION TRAINING AND AWARENESS

INTRODUCTION

Training and awareness are important elements of the Naval Aviation Depot (NADEP) Jacksonville's Pollution Prevention Program. A solid training and awareness program will promote sound management decisions and improve maintenance procedures. The result will be less hazardous waste and significant cost reductions in operations. In keeping with this understanding, NADEP will ensure that training is made available to its personnel at all levels.

While top echelons of management will have the responsibility to drive programmatic issues, many waste reductions will only be possible by training those at the shop level. Since personnel in the shops are directly involved with using hazardous materials, training them is a key to waste reduction at its very source. Training will also be provided for all other personnel on base so there is a common understanding of the advantages of a successful pollution prevention program.

In order for personnel at NADEP to stay aware of pollution prevention issues and what they can do to make beneficial changes, management will foster an environment of cooperation and proactive involvement amongst its various activities and supporting contractors. At a time of dwindling human and financial resources, sharing ideas and coordinating communication efforts will be a priority at NADEP.

SCOPE

This section of the pollution prevention plan will outline a Pollution Prevention Training and Awareness Program. The goal is to provide a plan to educate personnel on pollution prevention topics and to achieve measurable and significant reductions in the use of hazardous materials through better communication.

Specifically, the contents of this chapter will include an Introduction, Scope, Policy, Program Responsibilities, Awareness Requirements, Training Requirements, External Technical Information Sources, Training Sources, References, and Publications.

A training matrix under the "Training Requirements" section of this chapter will specifically detail what training will be provided to personnel. Project Completion Paths will also be included in this section to outline the steps and completion dates for the development of each training package identified or a schedule for hands-on training.

POLICY

Education about pollution prevention issues and technology will be made available to help develop a common understanding of the advantages of a successful program and to instill environmentally conscious thinking in everyday decision making. Educational materials will include videos, posters, training guides, pamphlets, etc., developed in-house or through outside government agencies and contractors.

PROGRAM RESPONSIBILITIES

The Pollution Prevention Training and Awareness Program will be managed by the Environmental Program Manager (code 003). It will be the responsibility of the base commanding officer and executive officer to make sure that this office has the resources and command support to manage a successful program.

Management of the program by Code 003 will include the following responsibilities:

1) Staying abreast of pollution prevention issues and technology.

Staying current on pollution prevention issues and technology, and knowing what future training and awareness is needed at NADEP will be accomplished three ways.

First, Code 003 will keep up-to-date DoD and Navy environmental training policies and guidelines, and a variety of current environmental periodicals in an in-house library. These government references, which are listed in the "References" section of this chapter, will be used to comply with DoD and Navy goals. The periodicals listed in the "Publications" section of this chapter will be used to provide insight into important pollution prevention issues, as well as identify sources of information and training.

Second, Code 003 personnel will familiarize themselves with new industrial technologies, materials and techniques that are scheduled to be implemented as a result of this plan. This will be accomplished by coordinating their efforts with the Lead Maintenance Technology Center for the Environment (LMTCE), Code 343 at the NADEP JAX. It will be Code 003's responsibility to provide needed information or training materials to shop personnel to support these industrial process improvements. Technical training and awareness materials to be developed are identified in the "Training Requirements" and "Awareness Requirements" sections, respectively.

Third, Code 003 will establish and chair a Environmental Training Team (ETT) made up of representatives who can assist with planning, coordinating and producing information materials in support of the training and awareness program.

2) Update training and awareness materials as necessary to keep pace with changing environmental regulations and technology.

At a minimum, all training and awareness materials will be updated every two years. Code 003 will be responsible for maintaining accurate records to track the need for and to schedule the development of new training and awareness materials to meet future information needs.

The Naval Air Station Human Resources Office (HRO) will play a role in the Depot's pollution prevention program. As a supporting agency, they will:

1) Maintain records of all pollution prevention training and awareness efforts conducted on base.

HRO will keep records of all pollution prevention training conducted at NADEP. These records will include information on how many hours of pollution prevention training are given to each Depot employee and in what topic areas.

As previously mentioned, Code 003 will form a ETT to support training and awareness efforts. This ETT will be made up of one member each from HRO (code 009T), and Depot codes 003 (Environmental Program Manager), 343 (LMTCE), 005 (Public Affairs Office), 225 (Communications Services Branch), 723 (Environmental Control Center Branch). The team's responsibilities will include:

1) Identify and coordinate the production of all future pollution prevention training and awareness needed by Depot employees. That includes videos, posters and training guides outlined for development later in this plan.

The ETT will meet monthly to discuss training and awareness issues. Environmental technical representatives will be responsible for identifying training and awareness requirements. Other members will provide guidance on the costs and production elements related to the training and awareness products discussed.

The type of information that will be conveyed to employees through the efforts of the ETT will include:

a. The definition of pollution prevention

b. The intent of Executive Order 12856

c. Department of Defense pollution prevention policy

d. The potential for pollution prevention to avoid costs, increase efficiency, improve readiness, increase product quality, and reduce the risk of environmental non compliance

e. New and emerging materials and technology, good ideas, and lessons learned by neighboring activities that can be used to further source reduction

f. Command goals for reduction, including specific targeted chemicals and the intent of the Depot's pollution prevention plan

g. The command's expectations of each individual who has a role in the pollution prevention plan's execution

h. Progress toward the command's source reduction goals

AWARENESS REQUIREMENTS

Code 003 will make every effort to improve awareness of pollution prevention issues to Depot personnel. Specific goals will include:

Goal 1 - Publish a pollution prevention related article in the base newsletter (*Network*) quarterly.

Goal 2 - Coordinate production of a poster with a pollution prevention theme at least twice a year (the first poster is to be completed three months after receiving the final version of this plan). The posters will be displayed throughout the Depot.

Goal 3 - Plan and conduct a special event in recognition of Earth Day each year. The event will feature pollution prevention efforts at NADEP JAX.

Goal 4 - Publicize the pollution prevention incentives program in the Depot newsletter, Plan of the Day, and flyers quarterly.

Goal 5 - Supply information on pollution prevention issues to the base Public Affairs Office so it can be included in the base's weekly newsletter (*Jax Air News*).

Goal 6 - Submit press releases quarterly to the local community newspaper (*Florida Times Union*) to keep the community abreast of pollution prevention efforts at NADEP JAX.

TRAINING REQUIREMENTS

In keeping with the commitment to offer pollution prevention training at all levels at the Depot, NADEP JAX will provide the following training:

PROJECT COMPLETION PATH

NADEP P^2 PROGRAM VIDEO/GUIDE

ACTION	CODE	ECD	MH ESTIMATE
Define scope of work	003/343/723	04/95	40
Identify who will develop products	003/005/225/343/723	05/95	80
Develop products	TBD	10/95	TBD
Conduct Training	003/009T/All Codes	12/95	TBD

PROJECT COMPLETION PATH

NAVY ENVIRONMENTAL PROGRAM VIDEO

ACTION	CODE	ECD	MH ESTIMATE
Obtain video copies	003/NAVSEA	03/95	2
Conduct training	003/009T/All Codes	05/95	TBD

PROJECT COMPLETION PATH

HVLP SPRAY GUN USE

ACTION	CODE	ECD	MH ESTIMATE
Perform artisan training	343/941/942/951/962	04/95	124

PROJECT COMPLETION PATH

PARTICLE COUNTER USE

ACTION	CODE	ECD	MH ESTIMATE
Perform artisan training	343/941/952/963	04/95	21

PROJECT COMPLETION PATH

VORTEX GENERATOR GUN USE

ACTION	CODE	ECD	MH ESTIMATE
Perform artisan training	343/654/942/943/944	12/95	9

Special emphasis in the future will be placed on providing specific technical training to those employees working in shops that use hazardous materials. Since these industrial operations generate the vast majority of hazardous waste at the Depot, they are a key to waste reduction at its very source.

EXTERNAL INFORMATION SOURCES

During the technical review of hazardous materials used at the Depot and the development of this pollution prevention plan, a number of external activities were called upon to lend assistance. Since they represent continuing sources of expertise in the area of pollution prevention, they will be used by NADEP JAX in the future to answer questions or offer advice. In addition, there are activities on board NAS Jacksonville that are included that might be of assistance because of their unique capabilities or environmental role. They include:

Naval Facilities Engineering Command
Southern Division
P.O. Box 190010
2155 Eagle Drive
North Charleston, SC 29419-9010
COM: (803) 743-0571
DSN: 563-0571

Naval Supply Systems Command
Code 452
Washington, D.C. 20376-5000
COM: (703) 607-0312
DSN: 327-0312

Naval Aviation Depot
Marine Corps Air Station
Cherry Point, NC 28533-5030
Attn: Code 354
COM: (919) 466-7346
DSN: 582-7346

National Defense Center for Environmental Excellence
1450 Scalp Avenue
Johnstown, PA 15904
COM: (814) 269-2803

Naval Facilities Engineering Service Center
1001 Lyons Street, Suite 1
Port Hueneme, CA 93043
COM: (805) 982-4897
DSN: 551-4897

Human Resources Office (Training & Services Dept.)
NAS Jacksonville
Jacksonville, FL 32212
COM: 772-3316

Navy Publishing & Printing Services Detachment Office (NPPSO)
NAS Jacksonville
Jacksonville, FL 32212
COM: 772-3447

Regional Environmental Coordinator (COMNAVAVNACTS JAX)
NAS Jacksonville
Jacksonville, FL 32212
COM: 772-5216

TRAINING SOURCES

In support of its training efforts, Code 003 will use existing DoD training when practical. The following activities have been identified as the primary DoD environmental training schools and will be sources of information regarding courses or training materials that have been developed or are being developed:

ARMY

Army Corps of Engineers, Army Environmental Training Support Center, P.O. Box, 1600, Huntsville, Alabama, 35807-4301, (205) 722-5837.

Army Logistics Management College (ALMC), Fort Lee, Virginia, 23801-6040, (804) 765-4965, DSN 539.

Army Artillery Center and Fort Sill, Center for Environmental Initiatives and Hands-On Training (CEIHOT), Fort Sill, Oklahoma, 73503-5100, (405) 442-2111, DSN 639.

NAVY

Naval School, Civil Engineer Corps Officers (CECOS), 3502 Goodspeed Street, Suite 1, Port Hueneme, California, 93043-3366, (805) 982-5655, DSN 551.

Naval Occupational Safety and Health, and Environmental Training Center, 9080 Breezy Point Crescent, Norfolk, Virginia, 23511-3998, (804) 445-8778, DSN 565.

AIR FORCE

Air Force Institute of Technology (AFIT), School of Civil Engineering and Services, Wright-Patterson Air Force Base, Dayton, Ohio, 45433-7765, (513) 255-8388, DSN 785.

Air Force School of Aerospace Medicine, 2513 Kennedy Circle, Brooks Air Force Base, San Antonio, Texas, 78235-5123, (210) 536-3831, DSN 240.

REFERENCES

The following references will be included in Code 003's environmental library:

OPNAVINST 5090.1B, Environmental and Natural Resources Program

NTP X-90-9201, Environmental and Natural Resources Program Navy Training Plan

NTP S-40-8603B, Navy Occupational and Safety, and Hazardous Material Control
and Management Navy Training Plan

OPNAVINST 4110.2, Hazardous Material Control and Management

CNETINST 1500C, Catalog of Navy training courses

OPNAVINST 1500.8M, Navy Training Plan Process

Directory of Environmental Training Courses (published by the Army Environmental Training Support Center in Huntsville, Alabama)

PUBLICATIONS

Code 003 will serve as the base repository for a variety of environmentally-related periodicals and other publications. Those to be kept will be determined by the Environmental Program Manager. However, a suggested listing of possible publications to consider include the following:

CFC-Halon News
NAVSEASYSCOM, Code 03VZ
2531 Jefferson Davis Highway
Arlington, VA 22242-5160
COM: (703) 602-0547
DSN: 332-0547

Air/Water Pollution Report
Business Publishers, Inc.
951 Pershing Drive
Silver Springs, MD 20910-4464

Hazardous Technical Information Service (HTIS) *Bulletin*
Defense General Supply Center
8000 Jefferson Davis Highway
Richmond, VA 23297-5670

The Environmental Manager's Compliance Advisor
Business and Legal Reports, Inc.
39 Academy Street
P.O. Box 1523
Madison, CT 06443-9988

Environmental Manager
Executive Enterprises
22 West 21st Street
New York, NY 10160-0172

Environmental Products Guide
General Services Administration Centralized Mailing List Service (7CAFL)
P.O. Box 6477
Ft. Worth, TX 76115

Marketips
General Services Administration Centralized Mailing List Service (7CAFL)
P.O. Box 6477
Fort Worth, TX 76115

Ozone Depleter
Thompson Publishing Group
1725 K Street, N.W., Suite 200
Washington, D.C. 20006

Clean Air Permits
Thompson Publishing Group
1725 K Street, N.W., Suite 200
Washington, D.C. 20006

RCRA Update
Waste Resource Associates, Inc.
2576 Seneca Avenue
Niagara Falls, NY 14305

Regulatory Update
J.J. Keller and Associates, Inc.
P.O. Box 368
Neenah, WI 54957-0368

The Minimizer
Naval Facilities Engineering Service Center (NFESC)
560 Center Drive
Port Hueneme, CA 93043-3366
COM: (805) 982-4067
DSN: 551-4832

XCHANGE
Naval Aviation Depot
Naval Air Station
Jacksonville, FL 32212-0016
Attn: LMTCE, Code 343
COM: (904) 772-2481
DSN: 942-2457

Federal Facilities Environmental Journal
Executive Enterprises Publication Company, Inc.
22 W 21st Street
New York, NY 10010-6904

The Southerner
Government Supply Administration
8400 Tatum Road
Palmetto, GA 30268

CHAPTER 6

PLANNED PROCESS IMPROVEMENTS

This chapter contains information relative to planned process improvements resulting from analysis of the survey data packages shown in appendix B. The data packages were generated by the shop artisans with assistance from the P2 Project coordinator from the Regulated Processes Branch, Code 343. The packages contain documentation on processes performed, materials used, and wastes generated in the shop. The materials list was then compared to an eight-quarter report of materials actually ordered by the shop. A "targeted" materials list for each shop was then generated for all materials used by the shop meeting the criteria for prioritization as listed in Chapter 7. The amounts of materials used in each process were then converted to "amount in pounds" in order to arrive at the desired units.

Due to a targeted material possibly appearing in numerous shops, it was decided that elimination/substitution of these materials would be approached from a pollution prevention project standpoint. The information contained in this chapter documents P2 projects in process as well as planned, the associated project completion path and responsible parties, and the shops within NADEP that will be affected by the project. A copy of the P2 Project report is also inserted into the shop survey data package. The resulting P2 Projects and project engineer/technician are as follows:

POLLUTION PREVENTION PROJECTS

PROJECT TITLE	PROJECT #	PROJECT LEAD
1. VORTEX GENERATOR GUN	1234-TEELCM-01	TERRY TAYLOR
2. ELIMINATION OF 1,1,1-TRICHLOROETHANE	CLSOGN-02	JIM DIXON
3. PARTICLE COUNTER	1236-TEHYEQ-01	CLARA HAGADORN
4 WATER TREATMENT PLANT	1237-FATRTW-01	JOHN DINKINS
5. ELIMINATE CHROME ACID ANODIZE COATING /ALUMINUM	1238-COANCM-01	BRUCE MOBLEY
6 AIRCRAFT FUEL CELL/TANK REPAIR	1210-CLENOT-01	ANDREW YANG
7. NAPHTHA REPLACEMENT	1110-CLAEPC-01	CARIDAD ROQUE
8. POST STRIP SOLVENT	1110-COPRPT-02	CARIDAD ROQUE
9. SPRAY PAINT EQUIPMENT SOLVENT/CLEANER	1110-CLEQOT-01	CARIDAD ROQUE

PROJECT TITLE	PROJECT #	PROJECT LEAD
10. RECYCLING P-D-680	1241-RCSOOT-01	CARIDAD ROQUE
11. MEK SUBSTITUTION	1243-CLSOGN-01	ANDREW YANG
12. TOLUENE SUBSTITUTION	1242-CLSOGN-01	ANDREW YANG
13. METHYLENE CHLORIDE REPLACEMENT	1300-READOT-02	ANDREW YANG
14. AIRCRAFT FUEL SYSTEMS PRESSURE/LEAK TESTING	1233-TEFULK-01	LAURA ROSSI
15. ELECTROCOAT PRIMER DEMO	1110-COPRPT-01	HANK BIRDSONG
16. POWDER COAT	1110-COPRPT-03	HANK BIRDSONG
17. PMB/CHEMICAL STRIP	1110-REPAAE-03	STEVE HARTLE
18. CADMIUM PLATING REPLACEMENT	COEPCD-01	MIKE ROMANELLI
19. ELIMINATE 1,1,1-TRICH/ BEARING CLEANING	CLBEEN-01	ROLLEN/BROOKS
20. ELIMINATE FREON-113/ BEARING CLEANING	CLBEEN-02	SOMORA/ROLLIN
21. ELIMINATE METH CHLORIDE/ BEARING CLEANING	CLBEEN-03	BROOKS/ROLLEN
22. ELIMINATE METH CHLORIDE/ BEARING CLEANING	CLBEEN-04	ROLLEN/SOMORA/PATIN
23. CIRCUIT BOARDS CLEAN	1300-CLELCB-01	MIKE LINN
24. PMB/CHEMICAL STRIP	1110-REPAAE-01	RICK BARNES
25. METHYLENE CHLORIDE REPLACEMENT	1110-REPAAE-05	RICK BARNES
26. LOW VOC COATING	1110-COPAAE-02	DAVID BROCK
27. HVLP PAINT EQUIP.	COPAEQ-01	DAVID BROCK
28. REFRIGERANTS REPLACEMENT	SFOPRF-01	CLARK/GREY/WOOD
29. ULTRA-HIGH PRESSURE WATERJET	RECOGN-01	R. JOHNSON/S. HARTLE
30. METH-CHL /POTTING REPLACEMENT	1300-READOT-01	MIKE LINN

PROJECT TITLE	PROJECT #	PROJECT LEAD
31. FREON-113 ELEMINATION/ INSTRUMENT BEARINGS	CLSOCM-01	JOYCE ROLLEN
32. SILVER CYANIDE PLATE	COEPAG-01	MIKE ROMANELLI
33. REMOVAL OF PLATED METAL COATINGS (ENSTRIP)	RECOEP-01	ESRA McDANIEL
34. ELIMINATE CHROMATE CONVERSION COATING/ALUMINUM	COINCV-01	JOHN DEITZEL
35. ELIMINATE CHROME CHEMICAL COATING/MAGNESIUM	COINCX-01	JIM DIXON

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PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Vortex Generator Gun
PROJECT NUMBER: 1234-TEELCM-01
PROJECT ENGINEER: Terry Taylor
PHONE NUMBER: (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Avionics components are often tested for thermal intermittance using a CFC or HCFC freezing compound. Testing of a component cooler that uses a vortex generator principal is complete and an Local Process Specification is currently going through TDRS. Equipment requirements include hoses, filters, adaptors, and other vortex generator guns. Line air pressure must be increased from current 30 PSI to 80 - 100 PSI.

RDT&E REQUIRED: Complete
SPECIAL FUNDING: None

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$287/station	4hrs/station	- 0 -

YEARLY CBA: Current material cost = $13.50/lb x 192 lbs = $2,592
ANNUAL DISPOSAL COST: None
MEDIA SHIFT: None

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Issue LPS	343	10/94	40
Order Guns	Shops (49)	03/95	4
Install	650	10/95	80
Implement	49	12/95	

PROJECT TITLE: Vortex Generator Gun
PROJECT NUMBER: 1234-TEELCM-01
PROJECT ENGINEER: Terry Taylor

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
65400	1	LL-HAZ-0495	Freeze Mist Ii (Aerosol)	1	1	1
94217	1	01-333-1841	Freon, Quick Freeze	12	12	12
94217	2	01-333-1841	Freon, Quick Freeze	12	12	12
94217	4	01-333-1841	Freon, Quick Freeze	12	12	12
94243	1	01-333-1841	Freezing Compound	6	6	6
94244	1	01-333-1841	Freezing Compound	5	5	5
94342	2	01-333-1841	Freon, Quick Freeze	18	18	18
94462	2	01-333-1841	Freon, Quick Freeze	126	126	126
		TOTAL		192	192	192

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Eliminate 1,1,1-Trichloroethane for Cleaning
PROJECT NUMBER: CLSOGN-02
PROJECT ENGINEER: Jim Dixon
PHONE NUMBER: (904) 772-4516/3444
SHOP: 342
PROJECT DESCRIPTION: ODS elimination - 1,1,1-Trichloroethane is used throughout the Depot for handwiping and general"fine" cleaning to remove residual oils, maskants, fingerprints, and other contaminants. Implementation of water/detergent wash, isopropyl in water, terpene-based cleaners and other non-ODS products will replace 1,1,1-Trichloroethane.

RDT&E REQUIRED: None; research complete.
SPECIAL FUNDING:

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
None	None	None

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Identify shops	340/03/723	11/94	80
Identify use/purpose	340	01/95	480
Provide alternatives	340	02/95	120
Follow-up	340	04/95	120
Issue report	340	06/95	40

PROJECT TITLE: Eliminate 1,1,1-Trichloroethane for Cleaning
PROJECT NUMBER: CLSOGN-02
PROJECT ENGINEER: Jim Dixon

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94338		292-9625	1,1,1-Trichloroethane	71.5	71.5	71.5
96225		476-5613	1,1,1-Trichloroethane	500	500	500
95300		476-5613	1,1,1-Trichloroethane	4179	4179	4179
94325		476-5613	1,1,1-Trichloroethane	1770	1770	1770
TOTALS				6520.5	6520.5	6520.5

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Particle Counter
PROJECT NUMBER: PC-1236-TEHYEQ-01
PROJECT ENGINEER: Clara Hagadorn
PHONE NUMBER: (904) 772-2457
SHOP: 343
PROJECT DESCRIPTION: CFC-113 or P-D-680 is currently used to dilute hydraulic fluid samples for patch test analysis. A particle counter is a piece of electronic equipment in which a hydraulic fluid sample is placed in the counter chamber where a tube retrieves it and an electronic sensor counts the number of particles. This number is displayed by channel on a LED display and the reading is matched to NAVAIR standards for acceptance.

RDT&E REQUIRED: None, RDT&E is complete
SPECIAL FUNDING: $65K

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$ 65,000 (3 units)	$ 0	$0

YEARLY CBA: TBD
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Procure Counters	343	03/94	24
		10/94	
		09/95	

PROJECT TITLE: Particle Counter
PROJECT NUMBER: PC-1236-TEHYEQ-01
PROJECT ENGINEER: Clara Hagadorn

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94121	1	00-274-5421	P-D-680	24	24	24
94121	2	002745421	P-D-680	74	24	74
94121	3	002745421	P-D-680	74	74	74
95245	1	002858011	P-D-680	353	353	353
96351	1	002745421	P-D-680	4807	4807	4807
TOTALS				5332	5332	5332

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Water Treatment Plant
PROJECT NUMBER MILCON-1237-FATRTW-01
PROJECT ENGINEER: John Dinkins
PHONE NUMBER: (904) 772-4455
SHOP: 624
PROJECT DESCRIPTION: Military construction projects have been established for three hazardous waste sources to remove and/or recover contaminants at the source, and hence eliminate discharge to the NAS Jacksonville industrial waste water treatment plant and ultimately the St. Johns River. The three closed-looped projects eliminate the discharge of:
(1) electroplating and metal cleaning waste streams, (2) chemical (wet) paint stripping and metal finishing waste, and (3) paint waste. Treatment plants (2) and (3) are 100 percent operational. Treatment plant (1) is under construction.

RDT&E REQUIRED: None
SPECIAL FUNDING: None

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$14.2M *	(Included in $14.2M)	

* For Equipment and Installation for Treatment Plant (2) and (3)

YEARLY CBA: Reduced operational/disposal cost by $300K year
ANNUAL DISPOSAL COST: $750,000.00
MEDIA SHIFT:

PROJECT COMPLETION PATH

Note: None available for Treatment Plant (1)

ACTION	CODE	ECD	MH ESTIMATE
NAVFAC SOUTHDIV		None	

PROJECT TITLE: Water Treatment Plant
PROJECT NUMBER MILCON-1237-FATRTW-01
PROJECT ENGINEER: John Dinkins

TARGETED MATERIALS/PROCESSES

SHOP #	P	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94111			Hazardous Waste Sludge			
94112						
94344						
96223						
96225						
96233						
TP 2 & 3				600K		

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Eliminate Chromic Acid Anodize Coating on Aluminum
PROJECT NUMBER: 1238-COANCM-01
PROJECT ENGINEER: Bruce Mobley
PHONE NUMBER: (904) 779-3831
SHOP: 621
PROJECT DESCRIPTION: Currently, chrome is used for Type I anodize coating on aluminum. The current process would require MACT in order to continue the operation. The current process will be replaced with sulfuric boric acid anodize, a compliant process. Initially the process will be prototyped in the Plating Shop area on the "J" line. Process will be expanded to large scale operation by the end of CY-96 and fully implemented by the end of CY-97.

RDT&E REQUIRED: None; RDT&E is complete.
SPECIAL FUNDING: None available

PROJECT COST

(For prototype only)

EQUIPMENT	INSTALLATION	MATERIAL
$25,000	$5,000	$2,000

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Acquire signed license agreement	007	02/95	4
Procure materials	96225	02/95	2
Retrofit tanks	600	03/95	80
Set up line	96225	03/95	16
Prototype process	343/96225	05/95	360
Issue instructions	342	05/95	40
Expand process	46/342	12/96	200
Implement		12/97	180

PROJECT TITLE: Eliminate Chromic Acid Anodize Coating on Aluminum
PROJECT NUMBER: 1238-COANCM-01
PROJECT ENGINEER: Bruce Mobley

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94113		00-264-3939	Chromic Trioxide	1500	1500	1500
TOTALS				1500	1500	1500

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Aircraft Fuel Cell and Fuel Tank Repair
PROJECT NUMBER: 1210-CLENOT-01
PROJECT ENGINEER: Andrew Yang
PHONE NUMBER: (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Aircraft fuel tank and fuel cell repair/overhaul require general cleaning, cleaning prior to and after sealing/cementing. These cleaning solvents are used in other non-fuel applications which require cleaning prior to other critical processes such as sealing, cementing, bonding, coating, etc. The cleaning solvents/cleaners currently used are either ozone depleting substances (ODS's) or hazardous air pollutants (HAPS). Alternative non-ODS and non-HAP solvents/cleaners are currently available in industry, and will be recommended for these applications.

RDT&E REQUIRED: Compatibility and mechanical testing
SPECIAL FUNDING: ODS Elimination Project ($75K fromNAWC-AD Warminster

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
- 0 -	- 0 -	$3500

YEARLY CBA: TBD
ANNUAL DISPOSAL COST: TBD
MEDIA SHIFT: From ODS's & HAP's to non-ODS and non-HAP

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Identify cleaners/solvents	343	01/95	120
Testing	343	06/95	250
Prototype	49	08/95	80
Implement	49	08/95	80

PROJECT TITLE: Aircraft Fuel Cell and Fuel Tank Repair
PROJECT NUMBER: 1210-CLENOT-01
PROJECT ENGINEER: Andrew Yang

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94120	1	00-476-5612	1,1,1-Trichloroethane	80	80	80
94131	1	00-664-0388	1,1,1-Tricholorethane	200	200	200
94131	2	00-664-388	1,1,1-Tricholorethane	24	24	24
94131	1	00-930-6311	1,1,1-Tricholorethane	32	32	32
94131	2	00-306-11	1,1,1-Tricholorethane	20	20	20
94135	1	00-2812-762	Methyl Ethyl Ketone	50	50	50
94135	2	00-2812-762	Methyl Ethyl Ketone	10	10	10
94135	4	00-281-2762	Methyl Ethyl Ketone	10	10	10
94135	0	00-2812-762	Methyl Ethyl Ketone	70	70	70
94136	1	00-664-0388	1,1,1-Trichloroethane	5	5	5
94136	2	00-664-0388	1,1,1-Trichloroethane	5	5	5
94136	3	00-6640-388	1,1,1-Trichloroethane	5	5	5
94136	4	00-6640-388	1,1,1-Trichloroethane	5	5	5
94221	1	00-6640-388	Solvent, 1,1,1-Trichlorothane	325	325	325
94325	1	00-4765-613	Solvent, 1,1,1-Trichloroethane	1770	1770	1770
94336	3	00-476-5612	1,1,1-Trichloroethane	28	28	28
94337	2	00-476-5612	1,1,1-Trichloroethane	27	27	27
94344	3	00-476-5162	1,1,1-Trichloroethane	55	55	55
95300	1	00-476-5613	Solvent, 1,1,1-Trichloroethane	2969	2969	2969
95300	1	00-551-1487	Solvent, 1,1,1-Trichloroethane	1210	1210	1210
		Total		6900	6900	6900

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE Aliphatic Naphtha Replacement
PROJECT NUMBER: 1110-CLAEPC-01
PROJECT ENGINEER: Cary Roque
PHONE NUMBER: 772-4519
SHOP: 343
PROJECT DESCRIPTION: Aliphatic naphtha, TT-N-95, is widely used to clean aircraft and components prior to painting to remove heavy organic soils. Moreover, naphtha is the only approved solvent for cleaning canopy transparencies. The CAAA Aerospace NESHAP will impose compliance with either composition requirements or have a vapor pressure less than 45 mm Hg for these types of hand-wipe cleaning operations. Because of distillation procedures, TT-N-95 contains certain per cent of haps; also, its vapor pressure is higher than the 7 mm Hg allowed for petroleum distillates.

RDT&E REQUIRED: Materials compatibility and performance
SPECIAL FUNDING: $34,120

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
None	None	1000

YEARLY CBA: TBD
ANNUAL DISPOSAL COST: TBD
MEDIA SHIFT: TBD

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Application testing	343	04/95	80
Shop prototype	343/003/72300/ applicable shops	08/95	120
Compatibility testing	343/NAWC	08/95	80
Issue instructions	343	09/95	18
Implementation	343/applicable shop/72300	10/95	60

PROJECT TITLE Aliphatic Naphtha Replacement
PROJECT NUMBER: 1110-CLAEPC-01
PROJECT ENGINEER: Cary Roque

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS*1* OUT	LBS*2* SAVED
94115	1	00-265-0664	TT-N-95	2811	2108	2811
94116	2	00-265-0664	Naphtha	415	311	415
94116	3	00-265-0664	Naphtha	277	208	277
94116	5	00-2650664	Naphtha	185	139	185
94242	1	00-238-8119	Naphtha, Aliphatic	8	6	8
94242	2	00-238-8119	Naphtha, Aliphatic	7	5	7
94337	1	00-238-8119	Naphtha	18	14	18
94342	2	00-265-0664	Naphtha	44	33	44
95113	1	00-265-0664	Naphtha	94	71	94
96226	3	00-265-0664	Naphtha	188	141	188
TOTALS				4047	3036	4047

NOTE: 1 Assume 25% loss due to evaporation i.e. emitted to the air.
2 Assume that pounds saved will be pounds of high vapor pressure solvent saved by substituting with compliant material.

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Post Strip Solvent
PROJECT NUMBER: 1110-COPRPT-02
PROJECT ENGINEER: Cary Roque
PHONE NUMBER: (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Currently the only suitable solvent for cleaning residual primer from aircraft exteriors after stripping and stripper residue contains approximately 35% Hazardous Air Pollutants (HAP). The CAAA Aerospace NESHAP will require that this material be changed to a hap-free solvent or that hard controls be placed over the operation to capture pollutants in addition to extensive daily reporting. This project will attempt to define a new method of removing primer and stripper residues after stripping operations with zero hap content.

RDT&E REQUIRED: Evaluate alternatives
SPECIAL FUNDING: 37,000

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
None	None	1000

YEARLY CBA:
ANNUAL DISPOSAL COST: TBD
MEDIA SHIFT: TBD

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Test plan	343	01/95	60
Application testing	343	05/95	120
Compatibility	343/NAWC	05/95	120
Prototype in shop	343/94111	07/95	40
Evaluate feasibility	343/003	06/95	13
Write instructions	343	08/95	16
Implement	003/72300/94111	09/95	20

PROJECT TITLE: Post Strip Solvent
PROJECT NUMBER: 1110-COPRPT-02
PROJECT ENGINEER: Cary Roque

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS1 OUT	LBS2 SAVED
94111	1	00-165-5592	Thinner, Butyrate	3285	1149.75	3285
94111	2	00-165-5592	Thinner, Butyrate	6570	2299.5	6570
94111	3	00-165-5592	Thinner, Butyrate	9855	3449.25	9855
TOTALS				19710	6899	19710

NOTES:

1. Pounds out are only those released into the air and are estimated from evaporation, assuming 35% (by wt.) hazardous air pollutants content. The rest of the material is currently processed through the closed-loop water treatment plant.
2. Pounds saved refer to pounds of non-compliant solvent saved by substituting with a compliant solvent.

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Spray Paint Equipment Solvent
PROJECT NUMBER: 1110-CLEQOT-01
PROJECT ENGINEER: Cary Roque
PHONE NUMBER: (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Paint gun cleaning is currently carried out using either MIL-T-81772 paint thinner or MIL-T-6096 , Butyrate solvent. Both solvents contain hazardous air pollutants (HAP). The CAAA Aerospace NESHAP will not only require that paint guns be cleaned in a closed paint gun washer, but it will also require that the cleaning solvent be either a HAP-free solvent or extensive daily reporting will be mandated.

RDT&E REQUIRED: Prototype, at a production scale, proposed HAP-free alternative.
SPECIAL FUNDING: 49,080

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
1,000	1,000	1000

YEARLY CBA: $422 (See calculation and note at the end)
ANNUAL DISPOSAL COST: $3149
MEDIA SHIFT: TBD

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Test plan	343	02/95	24
Application testing	343/72300	03/95	80
Prototype in shop	343/94115/94116/ 96226	09/95	344
Write instructions	343	09/95	24
Full implementation	343/72300/96226/ 94116/95113/003	10/95	40

PROJECT TITLE: Spray Paint Equipment Solvent
PROJECT NUMBER: 1110-CLEQOT-01
PROJECT ENGINEER: Cary Roque

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS1 SAVED
96226	1	00-165-5591	Thinner, Butyrate	35	35	12.25
96226	6	00-165-5591	Thinner, Butyrate	35	35	12.25
96226	7	00-165-5591	Thinner, Butyrate	35	35	12.25
96226	6	00-165-5591	Thinner, Butyrate	35	35	12.25
96226	7	00-165-5591	Thinner, Butyrate	35	35	12.25
94116	2	00-165-5592	Thinner, Butyrate	754	754	263.9
94116	4	00-165-5592	Thinner, Butyrate	660	660	231
94116	6	00-165-5592	Thinner, Butyrate	1697	1697	593.95
95113	1	00-165-5591	Thinner, Butyrate	212	212	74
TOTALS				3498	3498	1224.1

NOTE: 1. Pounds saved refers to pounds of HAP saved that otherwise would be emitted to the air via evaporation (assume 100% evaporation of the 35% hap content by weight) of the cleaning solvent.

COST BENEFIT ANALYSIS

Specific gravity of MIL-T-6096: 7.17 Lb/gal
Specific gravity of proposed alternative: 7.46 lb/gal
Cost of disposal: $1.20 per pound (same cost for both materials since RCRA i.e. flash point less than 140 deg F.

Cost of business now:
3498 lbs used of butyrate = 488 gallons
Assume 25% loss due to evaporation during handling (vapor pressure appr. 76 mm Hg) :
488 gal - 25% (loss) = 366 gal used and disposed off.
Cost of disposal: 366 gal x 7.17 lb/gal = 2624 lb x $1.20/lb = $3149
Cost of material procurement: 488 gal @ $300/55 gal = $2662
Total cost: $2662 + $3149 = $5811

Cost of new process:
488 gallons of butyrate needed hence assume same quantity of new material needed.
Assume 30% reusability/recycle: 342 gal needed.
Assume 5% loss due to evaporation during handling (vapor pressure less than 7 mm Hg):
342 gal - 5% (loss) = 325 gal used.
Disposal cost: 325 gal x 7.46 lb/gal = 2425 lb x $1.2 /lb = $2909

PROJECT TITLE: Spray Paint Equipment Solvent
PROJECT NUMBER: 1110-CLEQOT-01
PROJECT ENGINEER: Cary Roque

Total cost:
Material procurement: 342 gal @ \$400/55gal = \$2480
Material + Disposal: \$2480 + \$2909 = \$5389

SAVINGS FROM CHANGING PROCESS/MATERIAL:
\$5811 - \$5389 =\$422

NOTE: Cost savings do not reflect savings from daily reporting requirements.

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PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Recycling P-D-680
PROJECT NUMBER: 1241-RCSOOT-01
PROJECT ENGINEER: Cary Roque
PHONE NUMBER: (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Dry cleaning/degreasing solvent consisting of petroleum distillates. These solvents are widely used for degreasing machine parts in equipment maintenance and as general cleaning of aircraft components. P-D-680 could be recycled/reused.

RDT&E REQUIRED: TBD
SPECIAL FUNDING: None available

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
TBD	TBD	None

YEARLY CBA: TBD
ANNUAL DISPOSAL COST: $23365.
MEDIA SHIFT: N/A

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
TBD	TBD	TBE	TBD

PROJECT TITLE: Recycling P-D-680
PROJECT NUMBER: 1241-RCSOOT-01
PROJECT ENGINEER: Cary Roque

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS*1* SAVED
65630	1	00-2745-421	Dry Cleaning Solvent	235	235	70.5
94111	1	00-285-8011	Dry Cleaning	117	117	35.1
94111	2	00-285-8011	Dry Cleaning Solvent	234	234	70.2
94111	3	00-2858-011	Dry Cleaning Solvent	351	351	105.3
94118	1	00-274-5421	Dry Cleaning Solvent	51	51	15.3
94118	2	00-274-5421	Dry Cleaning Solvent	9	9	2.7
94118	3	00-285-8011	Dry Cleaning Solvent	36	36	10.8
94118	4	00-274-5421	Dry Cleaning Solvent	171	171	51.3
94118	1	00-285-8011	Dry Cleaning Solvent	1085	1085	325.5
94118	2	00-285-8011	Dry Cleaning Solvent	181	181	54.3
94118	3	002858011	Dry Cleaning Solvent	760	760	228
94118	4	002858011	Dry Cleaning Solvent	3617	3617	1085.1
94120	1	002745421	Dry Cleaning Solvent	10	10	3
94121	3	002745421	Dry Cleaning Solvent	74	74	22.2
94121	1	002745421	Dry Cleaning Solvent	24	24	7.2
94121	2	002745421	Dry Cleaning Solvent	74	74	22.2
94131	1	002745421	Dry Cleaning Solvent	532	532	159.6
94131	2	002745421	Dry Cleaning Solvent	332	332	99.6
94133	2	002858011	Dry Cleaning Solvent	617	617	185.1
94133	1	002858011	Dry Cleaning Solvent	617	617	185.1
94221	1	002745421	Dry Cleaning Solvent	167	167	50.1
94332	2	002745421	Dry Cleaning Solvent	134	134	40.2
94342	1	002745421	Dry Cleaning Solvent	64	64	19.2
94342	2	002745421	Dry Cleaning Solvent	65	65	19.5
94342	3	002745421	Dry Cleaning Solvent	65	65	19.2
96103	1	002745421	Dry Cleaning Solvent	434	434	130.2
96108	1	002745421	Dry Cleaning Solvent	7	7	2.1
96108	2	002745421	Dry Cleaning Solvent	10	10	3
96108	3	002745421	Dry Cleaning Solvent	7	7	2.1
96108	4	002745421	Dry Cleaning Solvent	7	7	2.1
96108	5	002745421	Dry Cleaning Solvent	3	3	.9
96351	1	002745421	Dry Cleaning Solvent	4807	4807	1442.1
96352	1	002858011	Dry Cleaning Solvent	352	352	105.6
99013	1	002858011	Dry Cleaning Solvent	4222	4222	1266
TOTALS				19471	19471	5841

NOTE: 1. Assume 30% reusability.

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Substitution of Methyl Ethyl Ketone (MEK)
PROJECT NUMER: 1243-CLSOGN-01
PROJECT ENGINEER: Andrew Yang
PHONE NUMBER: (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Methyl Ethyl Ketone (MEK), ASTM D 740-94 (formerly federal specification TT-M-261) is primarily used as a solvent or thinner for protective coatings, but also in adhesives, printing inks, varnish removers, and other chemical intermediates. In addition, it is also referenced in many Navy repair manuals as a cleaning solvent prior to sealing, cementing, bonding, coating, etc. Although MEK is specified as a solvent and/or cleaner in many aircraft repair operations, it is a hazardous air pollutant (HAP) which will be heavily regulated under OSHA requirements and EPA's targeted list of chemicals for reduction/elimination. As a result of these requirements, it is advantageous to seek alternatives for those cleaning applications where more environmentally compliant solvents are technically feasible.

RDT&E REQUIRED: Yes.
SPECIAL FUNDING: None currently identified.

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
Unknown	Unknown	Unknown

YEARLY CBA: TBD
ANNUAL DISPOSAL COST TBD
MEDIA SHIFT: From MEK (HAP) to non-HAP solvent.

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Identify replacement solvents	343	06/95	120
Fund RDT&E	AIR 8.0Y	10/95	NA
R & D	NAWC	10/95	1000
T & E	NADEP	04/96	200
Implement	NADEP	09/96	80

PROJECT TITLE: Substitution of Methyl Ethyl Ketone (MEK)
PROJECT NUMER: 1243-CLSOGN-01
PROJECT ENGINEER: Andrew Yang

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94115	1	00-281-2762	Methyl Ethyl Ketone	68	68	68
94135	1	00-281-2762	Methyl Ethyl Ketone	50	50	50
94135	2	00-281-2762	Methyl Ethyl Ketone	10	10	10
94135	4	00-281-2762	Methyl Ethyl Ketone	10	10	10
94135	0	00-281-2762	Methyl Ethyl Ketone	70	70	70
94242	1	00-281-2762	Methyl Ethyl Ketone	17	17	17
94242	2	00-281-2762	Methyl Ethyl Ketone	50	50	50
94243	1	00-281-2762	Methyl Ethyl Ketone	20	20	20
94243	2	00-281-2762	Methyl Ethyl Ketone	7	7	7
94337	1	00-281-2762	M.E.K. Technical	34	34	34
94342	3	00-281-2762	M.E.K. Technical	14	14	14
94344	3	00-687-8429	Methyl Ethyl Ketone	20	20	20
TOTALS				370	370	370

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Substitution of Toluene
PROJECT NUMER: 1242-CLSOGN-01
PROJECT ENGINEER: Andrew Yang
PHONE NUMBER: (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Toluene, TT-T-548, is used as a solvent or thinner for organic coatings, various resins, and chlorinated rubber. It is also used as a diluent for some cellulosic lacquers and dopes. Toluene is specified as a solvent and/or cleaner in many aircraft repair operations, but it is a hazardous air pollutant (HAP) which will be heavily regulated under OSHA requirements and EPA's targeted list of chemicals for reduction/elimination. As a result of these requirements, it is advantageous to seek alternatives.

RDT&E REQUIRED: Yes.
SPECIAL FUNDING: None currently identified

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
Unknown	Unknown	Unknown

YEARLY CBA: TBD
ANNUAL DISPOSAL COST: TBD
MEDIA SHIFT: From toluene (HAP) to non-HAP solvent.

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Identify replacement solvents	343	06/95	120
Fund RDT&E	AIR 8.0Y	10/95	NA
R & D	NAWC	1095	1000
T & E	NADEP	04/96	200
Implement	NADEP	09/96	80

PROJECT TITLE: Substitution of Toluene
PROJECT NUMER: 1242-CLSOGN-01
PROJECT ENGINEER: Andrew Yang

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94116	6	00-281-2002	Toluene, Technical	92	92	92
94120	1	00-281-2002	Toluene, Technical	11	11	11
94135	3	00-281-2002	Toluene, Technical	85	85	85
94135	0	00-281-2002	Toluene, Technical	72	72	72
94217	2	00-281-2002	Toulene, Technical	4	4	4
94217	3	00-281-2002	Toulene, Technical	4	4	4
94332	2	00-281-2002	Toulene, Technical	416	416	416
94337	1	00-281-2002	Toulene, Technical	69	69	69
95111	1	00-281-2002	Toulene, Technical	15	15	15
95113	1	00-281-2002	Toluene, Technical	239	239	239
94116	4	00-579-8431	Toluene, Technical	58	58	58
94116	6	00-579-8431	Toluene, Technical	50	50	50
94332	2	00-579-8431	Toulene, Technical	508	508	508
94336	3	00-579-8431	Toulene, Technical	108	108	108
94337	2	00-579-8431	Toulene, Technical	108	108	108
95113	1	00-579-8431	Toluene, Technical	112	112	112
96103	1	00-711-2185	Technical Toloune	1	1	1
TOTAL				1952	1952	1952

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Methylene Chloride Elimination/Replacement
PROJECT NUMBER: 1300-READOT-02
PROJECT ENGINEER: Andrew Yang
PHONE NUMBER: (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Methylene chloride is used to remove potting materials from electrical connectors. Since this chemical is a hazardous air pollutant, and one that is going to be regulated heavily under OSHA requirements, it is advantageous to seek alternatives. Though the immediate cost payback for limited use at NADEP JAX does not warrant the RDT&E cost, it may be cost effective if worked on a corporate level. Though this project is still in the RDT&E phase, NADEP Jacksonville will implement alternatives as they are developed.

RDT&E REQUIRED: Yes
SPECIAL FUNDING: Non currently identified.

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
Unknown	Unknown	Unknown

YEARLY CBA: TBD
ANNUAL DISPOSAL COST: TBD
MEDIA SHIFT: From HAP's to non-HAP

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Define RDT&E requirements	343	05/95	20
Fund RDT&E	AIR-8.0Y	10/95	
Perform R&D	NAWC/NADEP	10/96	1500
Perform T&E	NADEP	06/96	100
Implement	NADEP	07/96	40

PROJECT TITLE: Methylene Chloride Elimination/Replacement
PROJECT NUMBER: 1300-READOT-02
PROJECT ENGINEER: Andrew Yang

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94241	3	00-244-0290	Dichloromethane, Technical	7	7	7
94241	1	00-244-0290	Dichloromethane, Technical	6	6	6
94336	3	00-244-0290	Dichloromethane, Technical	88	88	88
94337	2	00-244-0290	Dichloromethane, Technical	88	88	88
94344	3	00-244-0290	Dichloromethane, Technical	499	499	499
TOTALS				688	688	688

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Aircraft Fuel Systems Pressure/Leak Testing
PROJECT NUMBER: 1233-TEFULK-01
PROJECT ENGINEER: Laura Rossi
PHONE NUMBER: (904) 772-2457
SHOP: 343
PROJECT DESCRIPTION: Class II ODS submstances are currently used for pressure leak testing of aircraft fuel systems after installation and aircraft rework/repair. Ozone depleting substances are being phased-out of use by the Navy. It would be advantageous to seek more environmentally compliant materials and/or other methods to leak test aircraft fuel systems.

RDT&E REQUIRED: Yes
SPECIAL FUNDING: None currently identified.

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
Unknown	Unknown	Unknown

YEARLY CBA: TBD
ANNUAL DISPOSAL COST: TBD
MEDIA SHIFT: From ODS to non-HAP

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Define RDT&E Requirement	343	05/95	20
Fund RDT&E	AIR-8.0Y	10/95	N/A
Perform R & D	NAWC/NADEP	10/96	1000
Perform T & E	NADEP	06/96	200
Implement	NADEP	09/96	40

PROJECT TITLE: Aircraft Fuel Systems Pressure/Leak Testing
PROJECT NUMBER: 1233-TEFULK-01
PROJECT ENGINEER: Laura Rossi

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
95312	1	LL-HAZ-1058	Detector, Leak (Gen Solvent)	52	52	52
TOTALS				52	52	52

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Electrocoat Primer Demo
PROJECT NUMBER: 1110-COPRPT-01
PROJECT ENGINEER: Hank Birdsong
PHONE NUMBER: (904) 772-2469
SHOP: 343
PROJECT DESCRIPTION: This project seeks to demonstrate the application of electrocoat primer to naval aviation parts repaired or manufactured within NADEP. The part is placed in a tank containing specialy formulated electrocoat suspension. Voltage is applied and the coating of resin and pigment is deposited on the part. The deposited film is cured in an oven to obtain final film properties.

RDT&E REQUIRED: This is a demonstration effort sponsored by NAWCADWAR
SPECIAL FUNDING: This project has been funded $50K FY95.NADEP JAX must invest in this technology to demonstrate leadership, improve product quality, reduce costs and prevent pollution. To be succesfull this project requires the Depot to: (1) allow utilization of existing equipment/shop space, Building 794 C-line, tanks C-3 through C-15, which has been stood down due to process changes is a probable location, (2) provide engineer/artisan labor resources to modify equipment and set-up process.

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL

YEARLY CBA:
ANNUAL DISPOSAL COST: $71,714.16 (57,834 lbs solid waste x $1.24/lb for disposal cost
MEDIA SHIFT: NONE

PROJECT TITLE: Electrocoat Primer Demo
PROJECT NUMBER: 1110-COPRPT-01
PROJECT ENGINEER: Hank Birdsong

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Document equip. requirements	343	04/17/95	180
Estimate location	621	05/03/95	20
Buy equipment	343	05/22/95	80
ID parts	343	07/14/95	160
Install equipment	620	08/04/95	140
Develop instructions	343	08/04/95	100
Start demonstration	343	09/29/95	

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS * OUT	LBS SAVED**
94115	1	00-877-6415	Paint Gray	231	159	72
94115	1	01-265-9142	Paint Poly	463	301	162
94115	1	01-265-9143	Paint Poly	7279	4,731	2548
94115	1	01-265-9151	Paint Poly	4816	3,130	1686
94115	1	01-285-3048	Paint Poly	450	293	157
94115	1	01-285-3554	Paint Poly	468	304	164
94115	1	01-3296752	Paint Poly	216	140	76
94115	1	01-334-45119	Paint Alum	485	315	170
94115	1	00-181-8079	Thin Poly	631	410	221
94115	1	LL-HAZ-O88O	Paint Acry	416	271	145
94221	1	01-265-9151	Paint Poly	184	120	64
94321	1	00-558-5177	Paint Enam	300	195	105
96226	6	01-0306162	Glyp Reduc	40	26	14
96226	1	01-285-3035	Paint Poly	52	34	18
96226	6	LL-LOR-6343	Glyp Clr	158	103	55
TOTALS				16,189	10,523	5,657

* Lbs Out based on 35 percent transfer efficiency for lbs in coating material.
**Lbs Saved not applicable until Depot-wide implementation.

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Powder Coat
PROJECT NUMBER: 1110-COPRPT-03
PROJECT ENGINEER: Hank Birdsong
PHONE NUMBER: (904) 772-2469
SHOP: 343
PROJECT DESCRIPTION: This project seeks to demonstrate Powder Coat application of coatings to NADEP reworked and manufactured parts.

RDT&E REQUIRED: This is a demonstration project sponsored by NAWCADWAR
SPECIAL FUNDING: This project has special funding of $25K FY-95. The NADEP will be required to invest in this technology by: (1) allocating shop space and (2) providing engineer/artisan labor.

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$25,000		

YEARLY CBA: TBD
ANNUAL DISPOSAL COST: $71,714.16 (57,834 lbs solid waste x $1.24/lb for disposal cost
MEDIA SHIFT: NONE

PROJECT TITLE: Powder Coat
PROJECT NUMBER: 1110-COPRPT-03
PROJECT ENGINEER: Hank Birdsong

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Document equip. requirements	343	04/17/95	120
Establish location	624	05/03/95	4
Buy equipment	343	05/22/95	6
ID parts	343	07/14/95	160
Install equipment	620	08/04/95	120
Develop instructions	343	08/04/95	80
Start demonstration	343	09/29/95	

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS * OUT	LBS SAVED**
94115	1	00-877-6415	Paint Gray	231	150	81
94115	1	01-265-9142	Paint Poly	463	301	162
94115	1	01-265-9143	Paint Poly	7279	4,731	2548
94115	1	01-265-9151	Paint Poly	4816	3,130	1686
94115	1	01-285-3048	Paint Poly	450	293	157
94115	1	01-285-3554	Paint Poly	468	304	164
94115	1	01-3296752	Paint Poly	216	140	76
94115	1	01-334-45119	Paint Alum	485	315	170
94115	1	00-181-8079	Thin Poly	631	410	221
94115	1	LL-HAZ-O88O	Paint Acry	416	271	145
94221	1	01-265-9151	Paint Poly	184	120	64
94321	1	00-558-5177	Paint Enam	300	195	105
96226	6	01-0306162	Glyp Reduc	40	26	14
96226	1	01-285-3035	Paint Poly	52	34	18
96226	6	LL-LOR-6343	Glyp Clr	158	103	55
TOTALS				16,189	10,523	5,666

* Lbs Out based on 35 percent transfer efficiency for lbs in coating material.
**Lbs Saved not applicable until Depot-wide implementation.

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: PMB/Chemical Strip
PROJECT NUMBER: 1110-REPAAE-03
PROJECT ENGINEER: Steve Hartle
PHONE NUMBER: (904) 772-2457/4516
SHOP: 340
PROJECT DESCRIPTION: Elimate Use of PMB and Chemical Paint removers for Depainting aircraft

RDT&E REQUIRED: $850,000
SPECIAL FUNDING: None

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$2.2 million	$20,000	$20,000

YEARLY CBA: $1.3 million
ANNUAL DISPOSAL COST: $5,000
MEDIA SHIFT: Chemical/PMB to Ash

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Obtain funds	343	04/95	100
Contract	343	06/95	150
System assembly	Contractor/343	10/95	150
System testing	Contractor/343	12/95	100
System install	Contractor/46	06/96	200
System demo	Contractor/343	08/96	180
System validation	Contractor/343	12/96	300
System improve	Contractor/46	04/97	100
System training	Contractor/940	08/97	600
System implementation	940/46/343	01/98	400

PROJECT TITLE: PMB/Chemical Strip
PROJECT NUMBER: 1110-REPAAE-03
PROJECT ENGINEER: Steve Hartle

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94112		8010-01-380-2330	Paint Remover	321,000	321,000	321,000
		8010-01-023-0343				
		8010-01-341-0793				
		8010-00-926-1489				
TOTALS				321,000	321,000	321,000

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Cadmium Plating Replacement
PROJECT NUMBER: COEPCD-01
PROJECT ENGINEER: Mike Romanelli
PHONE NUMBER: (904) 772-3444
SHOP: 342
PROJECT DESCRIPTION: Cadmium plating - about 80 percent of cadmium plating has been replaced with IVD aluminum. However, ZnNi is being researched to determine if it can be a viable substitute for the remaining 20 percent of the formerly cadmium plated items.

RDT&E REQUIRED:
SPECIAL FUNDING:

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Acquire test material	342	06/95	4
Pilot process	342	12/95	320
Prototype in shop	342/96225	06/96	80
Issue LPS	340	07/96	40
Implement	340/96225	12/97	80
Final report	340	01/98	80

PROJECT TITLE: Cadmium Plating Replacement
PROJECT NUMBER: COEPCD-01
PROJECT ENGINEER: Mike Romanelli

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
96225			Cadmium Oxide	50	50	50
			Sodium Cyanide	150	150	150
		6810-01-051-3150	Sodium Hydroxide	1411	1411	1411
TOTALS				1611	1611	1611

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Elimination of 1,1,1-Trichloroethane from Bearing Cleaning
PROJECT NUMBER: CLBEEN-01
PROJECT ENGINEER: Joyce Rollen/Carol Brooks
PHONE NUMBER: (904) 772-3444
SHOP: Code 342/Code 624
PROJECT DESCRIPTION: ODS Elimination. 1,1,1 Trichloroethane is used in the Bearing Shop, 94133 in the initial cleaning step. New tanks will be installed to accomodate VVL-800 to replace TCA in this step.

RDT&E REQUIRED: None, RDT&E is complete
SPECIAL FUNDING: None available

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$24,000	$6,000	$25,000

YEARLY CBA: $21,201 after equipment procurement & installation, materials cost increase

ANNUAL DISPOSAL COST: Waste oil can be disposed of at no cost
MEDIA SHIFT: Eliminate 1,1,1-Trichloroethane; replace with VV-L-800 oil and P-D-680 dry cleaning solvent

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Order tanks	624	06/95	100
Install	624/650	08/95	300
Order materials	720/94133	08/95	20
Optimize process	342/94133	11/95	300
Issue LPS	342	12/95	40

PROJECT TITLE: Elimination of 1,1,1-Trichloroethane from Bearing Cleaning
PROJECT NUMBER: CLBEEN-01
PROJECT ENGINEER: Joyce Rollen /Carol Brooks

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94133		476-5613	1,1,1 Trichloroethane	3445	3445	3445
TOTALS				3445	3445	3445

PROJECT TITLE: Elimination of 1,1,1-Trichloroethane from Bearing Cleaning

PROJECT NUMBER: CLBEEN-01

PROJECT ENGINEER: Joyce Rollen/Carol Brooks

CBA - 1,1,1-Trichloroethane Vapor Degreaser Replacement

Based on : (1) 8 quarter procurement pull , per S. Gillman , 10/11/94
(2) NSN prices - Don Greene, code 340, 12/94
(3) Waste estimate - K. Wood, code 003, 12/94
(4) Estimate from 503 bearing manual and estimated usage

Current Technology - Materials Cost per Year

1,1,1-Trichloroethane , #00-476-5613, 54-gal drum @ $875 per drum
$875/dr x 3 dr = $2,625 (3 dr) (54 gal/dr) (8.33 lb/gal) (1.32) = 1775 lbs
1,1,1-Trichloroethane, #00-476-5612, 5-gal can @ $68 per can
$68/can x 5 cans = $340 (5 cans) (5 gal/can) (8.33 lb/gal) (1.32) = 164 lbs
Total materials weight = 1939 lbs
Total materials cost = $2,625 + $340 = $2,965

Current Technology - Disposal Costs per Year

950 lbs waste 1,1,1-Trichloroethane @ $1.24/lb = $1,178

$4,143 Old

New Technology - Materials Cost per Year

VV-L-800 , #00-281-2060, 55-gal drum @ $251 per drum
Change tank every 2 weeks: 135 gal tank x 26 changes = 3,510 gals
3,510 gal divided by 55 gals = 64 drums
$251/drum x 64 drums = $16,064

P-D-680, #00-285-8011, 55 gal drum @ $145 per drum
Change tank every 2 weeks: 135-gal tank x 26 changes = 3,510 gals
3,510 gals divided by 55 gals = 64 drums
$145/drum x 64 drums = $9,280

New Technology - Disposal Costs per Year

Waste will be waste oil and can be disposed of at no cost

- $25,344 New

= - $21,201 CBA

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PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Elimination of Freon-113 in Bearing Cleaning
PROJECT NUMBER: CLBEEN-02
PROJECT ENGINEER: Bill Somora (624)/Joyce Rollen (342)
PHONE NUMBER: (904) 772-4453
SHOP: 94133
PROJECT DESCRIPTION: Bearings are currently dried using Freon-113 in an ultrasonic vapor degreaser. The Freon-113 vapor degreaser will be replaced by an isopropyl alcohol (IPA) dryer. The replacement equipment must be procured and installed and the process optimized before the existing degreaser can be removed.

RDT&E REQUIRED:
SPECIAL FUNDING:

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$165,000	$15,000	$740

YEARLY CBA: +$7,412 (for materials)
ANNUAL DISPOSAL COST: $447
MEDIA SHIFT: Waste will shift from Freon-113 to isopropyl hol

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Procure equipment	624	08/31/95	200
Procure materials	94133/720	09/30/95	20
Install dryer	624/650	10/31/95	600
Optimize process	94133/342/624	12/31/95	300

PROJECT TITLE: Elimination of Freon-113 in Bearing Cleaning
PROJECT NUMBER: CLBEEN-02
PROJECT ENGINEER: Bill Somora (624)/Joyce Rollen (342)

TARGETED MATERIALS/PROCESSES

(Per year)

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94133	1/2	00-551-0854	Freon-113	2919	715	715
TOTALS				2919	715	715

CBA - Freon-113 Vapor Degreaser Replacement

Based on: (1) 8 quarter procurement pull, per S. Gillman, 10-11-94
(2) NSN prices - Don Green, 12/94
(3) Waste estimate - K. Wood, code 003, 12/94
(4) Estimate of IPA usage

Current Technology - Materials Cost per Year

Freon-113, #00-551-0854, 15 gal drum @ $458 per drum
$458/15-gal drum x 11 drums = $5,038 (11 dr) (200 lb/dr) = 2,200 lbs
Freon-113, #00-983-0182, 55 gal drum @ $2,088 per drum
$2,088/55-gal drum x 1 drum = $2,088 (1 dr) (55-gal/dr) (1.57) = 719 lbs
Total materials weight = 2,919 lbs
Total materials cost = $7,126

Current Technology - Disposal Costs per Year

715 lbs waste Freon-113 @ $1.24/lb = $1,473

$8,599 Old

New Technology - Estimated Materials Cost per Year

Isopropyl Alcohol, #00-543-7915, 55 gal drum @ $185 per drum
$185 per 55-gal drum x 4 drums = $740 (4 dr) (55-gal/dr) (.78) = 1,429 lbs

PROJECT TITLE: Elimination of Freon-113 in Bearing Cleaning
PROJECT NUMBER: CLBEEN-02
PROJECT ENGINEER: Bill Somora (624)/Joyce Rollen (342)

<u>New Technology - Estimated Disposal Cost per Ye</u>ar

1 55-gal drum waste IPA = (1 drum) (55 gal) (8.3 lb/gal) (.78) = 357 lbs
357 lbs IPA x $1.24/lb = $447

$<u>1,187</u> New
+$7,412 CB

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PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Eliminate Methylene Chloride in Bearing Cleaning
PROJECT NUMBER: CLBEEN-03
PROJECT ENGINEER: Carol Brooks (624)/Joyce Rollen (342)
PHONE NUMBER: (904) 772-4453/(904) 772-3444
SHOP: 94133
PROJECT DESCRIPTION: Carbon on engine bearings is currently removed with a cleaner containing methylene chloride. This halagenated hydrocarbon, hazardous air pollutant (methylene chloride) will be replaced with a more environmentally compliant, non-halogenated solvent cleaner. The tanks must be bought and installed and the process optimized before the old system is completely removed.

RDT&E REQUIRED:
SPECIAL FUNDING:

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$24,000	$6,000	$4,788

YEARLY CBA: 7,152 (materials)
ANNUAL DISPOSAL COST: $8,407
MEDIA SHIFT: Halogenated hydrocarbon solvent to a mixed organic emulsion system.

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Research materials	342	05/30/95	20
Research VOC/HAPS	342	08/28/95	25
Purchase tanks	624	09/31/95	100
Evaluate materials	342	09/31/95	80
Install tanks	624/650	11/31/95	300
Procure materials	94133/342	11/31/95	20
Set up new process	94133/232/624	01/31/96	200
Optimize & evaluate	94133/342	03/30/96	300
Procure large materials	94311/720	06/31/96	20
Transfer process	94133/342/624	08/28/96	100

ECD update from originator

PROJECT TITLE: Eliminate Methylene Chloride in Bearing Cleaning
PROJECT NUMBER: CLBEEN-03
PROJECT ENGINEER: Carol Brooks (624)/Joyce Rollen (342)

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94133	2	00-550-7453	Cold Carbon Cleaner	3784*	5893	5893
94133	2	00-610-9188	Methylene Chloride**	1800	1800	1800
TOTALS				5584	7693	7693

*   Amount from 8 quarter pull is low
** Used to replenish Mecl2 lost from cdd carbon cleaner

CBA - Cold Carbon Cleaner Replacement

Based on: (1) 8 quarter procurement pull, per S. Gillman, 10-11-94 (7 drums is very low for cold carbon cleaner)
(2) NSN prices - Don Green, 12/94
(3) Waste estimate - past usage of tanks
(4) Estimated usage of new materials

Current Technology - Materials Cost per Year

Cold Carbon Cleaner, MIL-C-19853, #00-550-7453, 55 gal drum @ $395 per drum
$395/drum x 7 drums = $2,765 (7 dr) (55 gal) (8.33 lb/gal) (1.18) = 3,784 lbs
Methylene chloride 00-616-9188 - 55-gal drum @ $256 per drum
$265/drum x 3 drums = $768 (3 dr) (55 gal) (8.33 lb/gal) (1.31) = 1,800 lbs

Total materials cost = $2,765 + $768 = $3,533
Current Technology - Disposal Costs per Year
* 540 gal cold carbon cleaner (8.33 lb/gal) (1.31) = 5,893 lbs waste cold carbon cleaner
100 gal contaminated cleaning water (8.33 lb/gal) = 833 lbs cleaning water
5,893 lbs + 833 lbs = 6,726 lbs x $1.25/lb = $8,407
* Two 135-gal tanks twice a year

$11,940 Old

New Technology - Materials Cost per Year
Envirosolv 654CR, #01-388-9744 55-gal drum @ $798 per drum
$798 x 6 drums = $4,788

$ 4,788 New

PROJECT TITLE: Eliminate Methylene Chloride in Bearing Cleaning
PROJECT NUMBER: CLBEEN-03
PROJECT ENGINEER: Carol Brooks (624)/Joyce Rollen (342)

New Technology - Disposal Costs per Year

Biodegradable

+ $7,152 CBA

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PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Eliminate Methylene Chloride in Bearing Cleaning
PROJECT NUMBER: CLBEEN-04
PROJECT ENGINEER: Joyce Rollen (342)/Bill Somora (624)/Thad Patin (650)
PHONE NUMBER: (904) 772-3444/(904) 772-4453/(904) 772-3438
SHOP: 94133
PROJECT DESCRIPTION: Following the cold carbon cleaning the engine bearings are rinsed in water with nonionic soap and sodium chromate. This rinse water is contaminated with trace amounts of cold carbon cleaner which contains methylene chloride. The waste water is currently shipped out as hazardous waste. We hope to have this 120-gallons of contaminated water treated in the new waste treatment plants.

RDT&E REQUIRED: Feasibility study
SPECIAL FUNDING: None

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
None	None	None

YEARLY CBA: $73, 468
ANNUAL DISPOSAL COST: $82,048
MEDIA SHIFT: N/A

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Access Feasibility	650/624/342	11/94	20
* Approve	003/624/650	01/15/96	20
* Execute	94133/650	01/31/96	20

* Updated codes & ECD's, page 17

PROJECT TITLE: Eliminate Methylene Chloride in Bearing Cleaning
PROJECT NUMBER: CLBEEN-04
PROJECT ENGINEER: Joyce Rollen (342)/Bill Somura (624)/
Thad Patin (650)

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94133	2	N/A	Waste stream	N/A	* 66,167	66,167
TOTALS					66,167	66,167

* Error on page 16

CBA - Redirection of Contaminated Rinse Water to Water Treatment Plant II

Based on (1) Estimate of gallons dumped per week
(2) Cost of processing in treatment plant

Current Technology - Waste Disposal Costs per Year

One 135-gal rinse water tank weekly - containing sodium chromate, nonionic soap and traces of cold carbon cleaner
(135-gal/wk) (52 wk/yr) (8.5 lb/gal) = 59,670 lb/yr contaminated rinse water
(15 gal/wk) (52 wk/yr) (8.33 lb/gal) = 6,497 lb/yr contaminated cleaning water
66,167 lbs/yr waste
x $1.24 per lb
$82,048 waste cost

New Technology - Waste Treatment Plant #2

(165 gal waste/wk) (52 wks/yr) ($1/gal treatment cost) = $8,580

+ $73,468

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Circuit Board Cleaning
PROJECT NUMBER: 1300-CLELCB-01
PROJECT ENGINEER: Michael Linn
PHONE NUMBER: (904) 772-2469
SHOP: 343
PROJECT DESCRIPTION: Circuit boards require cleaning after soldering with rosin solder fluxes. Traditionally, the cleaning solvent used has been a Class I CFC but has recently been changed to isopropyl alcohol (IPA). Though IPA does an adequate job, it is not the ideal cleaner for rosin based fluxes. Detergents and terpenes used in conjunction with automatic spray washing equipment provides a better product, automates the cleaning process and reduces the use of IPA, a flammable material. Four washers will be strategically located in 101 U so that all shops can conveniently utilize automated washers.

RDT&E REQUIRED: None; RDT&E is complete.
SPECIAL FUNDING: None available

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$ 32 K (4 units)	$ 10 K	0

YEARLY CBA: TBD
ANNUAL DISPOSAL COST:
MEDIA SHIFT: NONE

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
ID equipment	343/46	06/95	40
ID cleaners	343	07/95	2
Procure 1	46	01/96	40
Prototype	940	03/96	80
Procure 3	46	09/96	40
Implement	940	10/96	

PROJECT TITLE: Circuit Board Cleaning
PROJECT NUMBER: 1300-CLELCB-01
PROJECT ENGINEER: Michael Linn

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94212	1	6150-00-286-5435	IPA	53	53	53
94215	1	6150-00-286-5435	IPA	40	40	40
94241	1	6150-00-286-5435	IPA	34	34	34
94241	2	6150-00-286-5435	IPA	12	12	12
94241	3	6150-00-286-5435	IPA	20	20	20
94242	1	6150-00-286-5435	IPA	190	190	190
94242	2	6150-00-286-5435	IPA	53	53	53
94243	1	6150-00-286-5435	IPA	20	20	20
94243	2	6150-00-286-5435	IPA	45	45	45
94244	1	6150-00-286-5435	IPA	21	21	21
TOTALS		6150-00-286-5435	IPA	965	965	965

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: PMB/Chemical Strip
PROJECT NUMBER: 1110-REPAAE-01
PROJECT ENGINEER: Rick Barnes
PHONE NUMBER: (904) 772-2457/4516
SHOP: 340
PROJECT DESCRIPTION: Reduction of PMB and Chemical Paint Removers
RDT&E REQUIRED: None
SPECIAL FUNDING: $85,000

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$85,000	N/A	Water

YEARLY CBA $50,000 waste reduction
ANNUAL DISPOSAL COST: $2,000
MEDIA SHIFT: PMB/chemical to water

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Coordinate WR/ALC	340	01/95	60
Literature search	340	03/95	20
Coordinate with NAVAIR	340	06/95	60
Define facility requirements	620	06/96	20
Contract and purchase	620	09/96	40
Installation	620	05/97	20

PROJECT TITLE: PMB/Chemical Strip
PROJECT NUMBER: 1110-REPAAE-01
PROJECT ENGINEER: Rick Barnes

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94112		8010-01-380-2330	Paint Remover	321,000	321,000	321,000
		8010-01-341-0793				
		8010-01-023-0343				
		8010-01-341-0793				
TOTALS				321,000	321,000	321,000

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Methylene Chloride Replacement
PROJECT NUMBER: 1110-REPAAE-05
PROJECT ENGINEER: Rick Barnes
PHONE NUMBER: (904) 772-2457/4516
SHOP: 343
PROJECT DESCRIPTION: Elimination Of Methylene Chloride Paint Remover

RDT&E REQUIRED: Industry/Navy Cooperative Effort
SPECIAL FUNDING: None

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
None	None	$147,000

YEARLY CBA: 500,000
ANNUAL DISPOSAL COST $275,000
MEDIA SHIFT: Reduction of 750,000 gallons of water to offsite treatment 80 tons of HAPS

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Process documentation	340	01/01/95	40
Implementation	94110	06/30/95	N/A
HGR MODS	650	09/30/95	200

PROJECT TITLE: Methylene Chloride Replacement
PROJECT NUMBER: 1110-REPAAE-05
PROJECT ENGINEER: Rick Barnes

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94112		8010-01-380-2330	Paint Remover	321,000	5,266K*	5,266k
		8010-00-926-1489				
		8010-01-380-3258				
		8010-01-341-0793				
TOTALS				321,000	5,266K*	5,266k

*5,266K lbs include H_2O and stripper without HAPS

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Low VOC Coating
PROJECT NUMBER: 1110-COPAAE-02
PROJECT ENGINEER David Brock
PHONE NUMBER (904) 772-4519
SHOP: 343
PROJECT DESCRIPTION: Hexavalent chromium is a known carcinogen. The EPA is currently writing regulations which will lower emissions limits to near zero levels. OSH permitted exposure levels will likely follow suit. This project seeks to transition previous R&D performed by NAWC Warminster to DEPOT level production use. Ultimately it is desired to remove hexavalent chrome from priming operations.

RDT&E REQUIRED: NAWC Warminster has been the primary R&D POC thus far. It is expected that they will continue to be heavily involved in product formulation.
SPECIAL FUNDING: FY-95 - $35,000

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
0	0	$10,000

YEARLY CBA: $72640 one time cost, $ 300,000 one time cost avoidance,
$ 75,000 annual maintenance avoidance
ANNUAL DISPOSAL COST: No change
MEDIA SHIFT: None

PROJECT TITLE: Low VOC Coating
PROJECT NUMBER: 1110-COPAAE-02
PROJECT ENGINEER David Brock

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Provide lab sample	NAWC Warminster	2/95	40
Perform local evaluation	343/941	6/95	80
Feedback to NAWC	343	8/95	24
Coordinate Prototype sample	NAWC Warminster/343	10/95	40
Coordinate Prototype aircraft	343/371/CFA	10/95	40
Coordinate line run in 94115	343/941	12/95	24
Provide feedback to NAWC Warminster	343/941	1/96	8
Create specification for material	343/NAWC Warminster	6/96	100
Propose specification to G-8	343	7/96	60
Establish Procurement Plan	723/343	12/96	80
Production capability established	940/941/94115/94116/96226/ 94221343/624	6/97	240

PROJECT TITLE: Low VOC Coating
PROJECT NUMBER: 1110-COPAAE-02
PROJECT ENGINEER David Brock

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS CHROME SAVED
94115	1	00-082-2450	Primer, Epoxy Type I Class I	117	0	60.8
94115	1	01-218-0856	Epoxy, Primer Green	96	0	15.4
94115	1	01-218-7354	Primer W/B	3951	0	632.2
94116	3	00-082-2450	Primer, Epoxy	704	0	366.1
94116	5	00-082-2450	Primer, Epoxy	470	0	244.4
94116	6	01-048-6539	Primer, Epoxy	52	0	27.0
94116	2	01-218-0857	Primer, W/B	3440	0	550.4
94116	4	01-218-0857	Primer, W/B	1529	0	244.6
94116	3	01-218-7354	Primer, W/B	2492	0	398.7
94116	5	01-218-7354	Primer, W/B	1661	0	265.8
94116	6	01-218-7354	Primer, W/B	1453	0	232.5
94221	1	01-218-0858	Primer, W/B	6	0	1.0
94221	1	LL-HAZ-0918	Paint, Zinc Chromate Primer	20	0	9.0
94332	2	LL-HAZ-0918	Primer, Zinc Chromate	90	0	14.4
94337	1	01-218-0858	Primer, W/B	6	0	1.0
94337	1	LL-HAZ-0918	Primer, Zinc Chromate	30	0	13.5
94463	0	00-082-2450	Primer, Epoxy	90	0	46.8
95111	1	LL-HAZ-0918	Primer, Zinc Chromate	310	0	139.5
95113	1	01-218-0856	Primer, Epoxy Green	32	0	16.6
95113	1	01-218-7354	Primer, W/B	231	0	37.0
TOTAL						3316.6

PROJECT TITLE: Low VOC Coating
PROJECT NUMBER: 1110-COPAAE-02
PROJECT ENGINEER David Brock

DETAIL 1

COST BENEFIT ANALYSIS FOR NO CHROME PRIMER

SHOP	ITEM	QUAN	UNIT COST	SUBTOTAL		
343, 941	Lab Evaluation	80	90.0	-7200		
343, 941	Develop Feedback	24	90.0	-2160		
NAWC, 343	Coordinate prototype sample	40	90.0	-3600		
343, 371, CFA	Coordinate Prototype aircraft	40	90.0	-3600		
343, 941	Coordinate line run in 94115	24	90.0	-2160		
343, 941	Provide feedback to NAWC Warminster	8	90.0	-720	-7264.0	ONE TIME COST
343, NAWC	Create Material Specification	100	90.0	-9000		
343	Propose specification to G8 Committe	60	90.0	-5400		
723, 343,	Establish Procurement Plan	80	90.0	-7200		
940, 941, 94115, 9	Producton Capability Established	240	90.0	-21600		
941	Prototype batch Purchase	1	10000.0	-10000		

941	**Avoid Control Technology**					
	Upgrade Transformer	1	75000.0	75000		
	Install HEPA Filters	1	100000.0	100000	300000	ONE TIME COST AVOIDANCE
	Upgrade fans for spray booths	4	31250.0	125000		
941	**Avoid annual maintenance cost of**					
	HEPA filters to catch chrome		75000.0	75,000	75,000	ANNUAL MAINTENANCE AVOIDANCE

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: High Volume Low Pressure Paint Spray Guns
PROJECT NUMBER COPAEQ-01
PROJECT ENGINEER: David Brock/Carol Brooks
PHONE NUMBER (904) 772-4519
SHOP: 343/624
PROJECT DESCRIPTION: NADEP Jacksonville currently uses conventional high pressure air spray guns to apply paint and coatings to aerospace equipment primed and painted. This project will replace the conventional guns with a more efficient gun commonly called "high volume low pressure" (HVLP). HVLP vendors claim paint transfer efficiencies of 65 percent as compared to the typical 20-40 percent associated with conventional equipment. This equates to a 30-50 percent reduction in the coating material required to perform a particular task. A corresponding reduction in volatile organic compounds released occurs.

RDT&E REQUIRED: HVLP technology is a relatively mature technology, R&D is not required. Test and evaluation of available equipment should be performed in the actual shops which will implement the technology. While this is required in order to evaluate the performance of equipment it is more important for the shop to be involved in all purchase decisions in order to insure artisan support. The project completion path is approximately 70 percent complete.

SPECIAL FUNDING: FY93 - $35,000
FY94 - $45,000
FY95 - -0-

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$ 69,300	$ 3,720	$ 9,025

YEARLY CBA: $82,045 one time cost, thereafter $ 121,691 annual savings

ANNUAL DISPOSAL COST: $ -3156

MEDIA SHIFT: None

PROJECT TITLE: High Volume Low Pressure Paint Spray Guns
PROJECT NUMBER COPAEQ-01
PROJECT ENGINEER: David Brock/Carol Brooks

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Perform market survey of available equipment.	343/624	12/93	60
Select potential equipment for Lab evaluation	343/624	01/94	8
Perform lab evaluation/intro to shop	343/624/941	06/94	50
Select strongest candidate for shop trial	343/624/941	08/94	8
Perform shop trial on components	343/624/941	09/94	40
Prime aircraft/Topcoat aircraft	343/624/941	09/94	80
Evaluate air supply/determine adjustments	343/624/941	09/94	40
Coordinate procurement	343/624	02/95	40
Facilitate shop distribution	941	03/95	40
Perform Artisan training	343/941	06/95	124

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94115	1	00-082-2450	Primer, Epoxy Type I Class I	117	75	42
94115	1	00-597-9770	Paint, Phosphorescent Tt-P-54	26	17	9
94115	1	00-877-6415	Paint, Gray 16376	231	148	83
94115	1	01-218-0856	Epoxy, Primer Green	96	61	35
94115	1	01-218-7354	Primer W/B	3951	2529	1422
94115	1	01-265-9142	Paint, Polyurethane, Gray, 16440	463	296	167
94115	1	01-265-9143	Paint, Polyurethane, White,17925	7279	4659	2620
94115	1	01-265-9151	Paint, Polyurethane, Gray	4816	3082	1734
94115	1	01-265-9154	Paint, Polyurethane, Red	139	89	50
94115	1	01-285-2495	Paint, Polyurethane, Blue	23	15	8
94115	1	01-285-3038	Paint, Polyurethane, Orlyel	139	89	50
94115	1	01-285-3048	Paint, Polyurethane, Black	450	288	162
94115	1	01-285-3554	Paint, Polyurethane, Black	468	300	168
94115	1	01-329-6298	Paint, Polyurethane, Orange	89	57	32
94115	1	01-329-6300	Paint, Polyurethane	64	41	23
94115	1	01-329-6304	Paint, Polyurethane	164	105	59
94115	1	01-329-6752	Paint, Polyurethane, Gray	216	138	78
94115	1	01-344-5119	Paint, Alum. Heat Resistant	485	310	175
94115	1	01-344-5311	Gray Silicone Enamel	46	29	17

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94115	1	01-350-4742	Epoxy, Coating Kit	51	33	18
94115	1	01-356-5171	Paint, Polyurethane Clear	87	56	31
94115	1	LL-HAZ-0880	Paint, Acrylic	416	266	150
94115	1	LL-HAZ-0886	Activator	56	36	20
94115	1	LL-HAZ-0909	Primer, Clear	208	133	75
94115	1	LL-HAZ-0940	Primer, Epoxy, Low Density	1066	682	384
94115	1	LL-HAZ-0972	Paint, Polyurethane, Dk Green	34	22	12
94115	1	LL-HAZ-0980	Coating, Thermal Lag	280	179	101
94115	1	LL-HAZ-1548	Paint, Poly Alkyd Enamel, Note: Imron	139	89	50
94115	1	LL-HAZ-1553	Paint, Teflon Enamel	664	425	239
94115	1	LL-HAZ-1653	Paint, Imron	125	80	45
94115	1	LL-HAZ-1807	Paint, Imron Poly Enamel	56	36	20
94115	1	LL-HAZ-1849	Primer, Polyamide	84	54	30
94116	3	00-082-2450	Primer, Epoxy	704	451	253
94116	5	00-082-2450	Primer, Epoxy	470	301	169
94116	6	01-048-6539	Primer, Epoxy	52	33	19
94116	3	01-058-0143	Coating, Polyurethane Blue	9	6	3
94116	2	01-218-0857	Primer, W/B	3440	2202	1238
94116	4	01-218-0857	Primer, W/B	1529	979	550
94116	3	01-218-7354	Primer, W/B	2492	1595	897
94116	5	01-218-7354	Primer, W/B	1661	1063	598
94116	6	01-218-7354	Primer, W/B	1453	930	523
94116	3	01-265-9140	Paint, Polyurethane, 35237	47	30	17
94116	3	01-265-9142	Paint, Polyurethane Gray,16440	1204	771	433
94116	3	01-265-9143	Paint, Polyurethane White	2776	1777	999
94116	5	01-265-9143	Paint, Polyurethane White	1851	1185	666
94116	6	01-265-9143	Paint, Polyurethane White	1619	1036	583
94116	4	01-265-9151	Paint, Polyurethane Gray, 36375	554	355	199
94116	5	01-265-9151	Paint, Polyurethane Gray, 36375	553	354	199
94116	3	01-265-9152	Paint, Polyurethane, 35320	143	92	51
94116	3	01-265-9154	Paint, Polyurethane Red, 11136	105	67	38
94116	3	01-285-2495	Paint, Polyurethane Blue, 35237	576	369	207
94116	3	01-285-3035	Paint, Polyurethane, 17925	25	16	9
94116	5	01-285-3035	Paint, Polyurethane White	25	16	9
94116	3	01-285-3048	Paint, Polyurethane Black, 17038	172	110	62
94116	3	01-285-3554	Paint, Polyurethane Black, 37038	111	71	40
94116	5	01-285-3554	Paint, Polyurethane Black, 37038	74	47	27
94116	5	01-285-3555	High Solid Polyurethane, 37038	40	26	14
94116	3	01-329-6301	Paint, Polyurethane Orange,12197	44	28	16
94116	4	01-329-6304	Paint, Polyurethane, 15044	109	70	39
94116	3	01-329-6752	Paint, Polyurethane Gray, 36231	108	69	39
94116	5	01-336-3036	Paint, Polyurethane Green, 34102	690	442	248
94116	3	01-340-8717	Paint, Unicoat, 36375	18389	11769	6620
94116	3	01-356-5171	Paint, Polyurethane Clear	26	17	9
94116	3	LL-HAZ-0666	Paint, Gold	9	6	3
94116	3	LL-HAZ-0717	Paint, Polyurethane Scarlet	12	8	4
94116	6	LL-HAZ0728	Agent, Flattening	4	3	1
94116	5	LL-HAZ-0832	Primer, Polyurethane High Solid	496	317	179

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94116	5	LL-HAZ-0886	Activator	16	10	6
94116	3	LL-HAZ-0909	Primer, Clear	96	61	35
94116	5	LL-HAZ-0940	Primer, Epoxy	983	629	354
94116	5	LL-HAZ-0954	Paint, Stencil Aquadex	36	23	13
94116	3	LL-HAZ-0970	Paint, Polyurethane Orlyel	11	7	4
94116	4	LL-HAZ-0972	Paint, Polyurethane, Dk Green, 3407	313	200	113
94116	5	LL-HAZ-0973	Paint, Polyurethane Tan,30219	234	150	84
94116	5	LL-HAZ-0974	Paint, Polyurethane Gray, 36622	816	522	294
94116	6	LL-HAZ-1652	Paint, Polyurethane	58	37	21
94116	3	LL-HAZ-1877	High Solid Polyurethane, 35450	354	227	127
94116	3	LL-HAZ-1878	High Solid Polyurethane, 35190	315	202	113
94116	6	LL-LOR-7888	PAINT, POLYURETHANE, Teflon Filled	159	102	57
94221	1	01-218-0858	Primer, W/B	6	4	2
94221	1	01-239-6752	Paint, Polyurethane, Gray	18	12	6
94221	1	01-265-9143	Paint, Polyurethane White	24	15	9
94221	1	01-265-9151	Paint, Polyurethane Gray	184	118	66
94221	1	01-285-2495	Paint, Polyurethane Blue	23	15	8
94221	1	LL-HAZ-0876	Paint, Aquadex Gray	40	26	14
94221	1	LL-HAZ-0918	Paint, Zinc Chromate Primer	20	13	7
94221	1	LL-HAZ-0954	Paint, Stencil, Aquadex Black	71	45	26
94221	1	LL-HAZ-1044	Paint, Aquadex Red	17	11	6
94221	1	LL-HAZ-1045	Paint, Aquadex Blue	9	6	3
95113	1	01-218-7354	Primer, W/B	231	148	83
95113	1	01-265-9143	Paint, Poly White	568	364	204
95113	1	01-265-9151	Paint, Poly Gray	82	52	30
95113	1	01-329-6752	Paint, Poly Gray	126	81	45
96226	6	00-200-6946	Coating, Resin	75	48	27
96226	6	00-200-6946	Coating, Resin	75	48	27
96226	1	00-409-3810	Paint, Touch Up Alum	12	8	4
96226	6	01-030-6162	Glyptal, Reducer	40	26	14
96226	6	01-030-6162	Glyptal, Reducer	40	26	14
96226	1	01-285-3035	Paint, Polyurethane White	52	33	19
96226	1	LL-HAZ-0250	Paint, Enamel Gray	8	5	3
96226	1	LL-HAZ-1818	Paint, Epoxy	92	59	33
96226	6	LL-LOR-6343	Glyptal, Clear	158	101	57
96226	6	LL-LOR-6343	Glyptal, Clear	158	101	57
Total				69,620	44,557	25,063

PROJECT TITLE: High Volume Low Pressure Paint Spray Guns
PROJECT NUMBER COPAEQ-01
PROJECT ENGINEER: David Brock/Carol Brooks

DETAIL 1

COST BENEFIT ANALYSIS HVLP

Shop	ITEM	Quantity	Unit Cost $	Subtotal $
94115	Maximum Performer V3	30	450	(13,500)
94116	Maximum Performer V3	100	450	(45,000)
94221	Maximum Performer V3	4	450	(1,800)
96226	Maximum Performer V3	20	450	(9,000)
94115	Air Hose Upgrade	500	1	(500)
94116	Air Hose Upgrade	2,400	1	(2,400)
94221	Air Hose Upgrade	25	1	(25)
96226	Air Hose Upgrade	100	1	(100)
94116	Upgrade fittings manifold	20	300	(6,000)
ALL	Training for 100 artisans 1 MH each	100	30	(3,000)
343	Prepare for training	24	30	(720)
ALL	Annaul Red. in Filter disposal cost	2,238	1	2,686
ALL	Annual Reduction in Paint Purchase		see detail	103566.94

(82,045)	ONE TIME COST
106,253	ANNUAL AVOIDANCE

PAINT COST

COST NOW

Annual Purchase	69,620
paint slop	(6,962)
Amount Sprayed	62,658
Convert to gallons	5,696
Cost per gallon	50
Cost last year $	284,809

COST AFTER HVLP

Annual Purchase	46,835
paint slop	(6,962)
Amount Sprayed	39,873
Convert to gallons	3,625
Cost per gallon	50
Cost next year $	181,242

(Blank)

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Refrigerant Replacement
PROJECT NUMBER: SFOPRF-01
PROJECT ENGINEER: Mike Clark/Adrian Gray/Kate Wood
PHONE NUMBER: (904) 772-5997/(904) 772-2200
SHOP: 651/003
PROJECT DESCRIPTION: The NADEP has five air conditioning systems that are each between 240 and 300 tons of R12. Preliminary analysis has determined replacement of these systems with R-22 systems will be preferred to retrofit with R-123. Before a decision is finalized there will be some investigation into doing one project through Energy Conservation which would replace one unit with natural gas cooled system. A meeting will be held 27 January 1995 to discuss.

RDT&E REQUIRED: None
SPECIAL FUNDING: Possibly for pilot project

PROJECT COST

If we do it all ourselves without the special project the following estimates are:

1. R12 system for Rubber Shop/Seat Shop/Landing Gear Shop to be replaced by two systems: R-22 system for Rubber Shop and old Seat Shop and air cool water chiller system for Landing Gear Shop. Both projects are ECD October 1995 through PAC.

EQUIPMENT	INSTALLATION	MATERIAL
$173,000	$150,000	With equipment

YEARLY CBA: One time expense
ANNUAL DISPOSAL COST: -0-
MEDIA SHIFT: From Class 1 ODs to Class 2 (R-22) or non-ODS

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Prepare/oversee contract to PWC to replace/retrofit systems	651	10/95	

PROJECT TITLE: Refrigerant Replacement
PROJECT NUMBER: SFOPRF-01
PROJECT ENGINEER: Mike Clark/Adrian Gray/Kate Wood

PROJECT COST

The remaining four systems are found in Building 101U and 101J. The projects are in the preliminary planning stages with the following estimates:

EQUIPMENT	INSTALLATION	MATERIAL
$300,000	$300,000	With equipment

YEARLY CBA: $600,000 one time cost
ANNUAL DISPOSAL COST: -0-
MEDIA SHIFT: From Class 1 ODS to Class 2 (R-22) or non-ODS

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Prepare/oversee contract to replace/retrofit systems	651	12/96	

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
TOTALS						

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Ultra High Pressure Waterjet Stripper
PROJECT NUMBER: RECOGN-01
PROJECT ENGINEER: Rick Johnston/John Zulich
PHONE NUMBER: (904) 772-4521
SHOP: 341/343
PROJECT DESCRIPTION: NADEP JAX currently uses a variety of mechanical (abrasive blasting, machining) and chemical (nitric acid solution) techniques to remove thermal spray coatings from engine components. Purely mechanical means (putty knife, wire brush) are used to remove abradable rubber from J52 strators. Waterjet stripping can remove almost any thermal spray coating and all abradable rubber coatings in minutes with no loss parent metal.

RDT&E REQUIRED: Mature, off-the-shelf technology. Components have already been stripped as demonstration projects.

SPECIAL FUNDING:

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$800,000	Turnkey	TBD

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Write specification	TBD	03/01/95	40
Let contract	NAWC Lakehurst		

PROJECT TITLE: Ultra High Pressure Waterjet Stripper
PROJECT NUMBER: RECOGN-01
PROJECT ENGINEER: Rick Johnston/John Zulich

TARGETED MATERIALS/PROCESSES

(Per year)

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
96225			Nitric acid	2400	2400	2400 gals
96225			Abrasive blast media	400	400	400
96223			Abrasive blast media	40,000	40,000	40,000
TOTALS				42,800	42,800	42,800

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Methylene Chloride Elimination/Replacement
PROJECT NUMBER: 1300-READOT-01
PROJECT ENGINEER: Michael Linn
PHONE NUMBER: (904) 772-2469
SHOP: 343
PROJECT DESCRIPTION: Methylene Chloride is used to remove potting materials from electrical connectors. Since this chemical is a Hazardous Air Pollutant, and one that is going to be regulated heavily under OSHA requirements, it is advantageous to seek alternatives. Though the immediate cost payback for limited use at NADEP JAX does not warrant the RDT&E cost, it may be cost effective if worked on a corporate level.. Though this project is still in the RDT&E phase, NADEP Jacksonville will implement alternatives as they are developed.

RDT&E REQUIRED: Yes
SPECIAL FUNDING: None currently identified

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
Unknown	Unknown	Unknown

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Define RDT&E Requirement	343	05/95	20
Fund RDT	AIR-8.0Y	10/95	
Perform R&D	NAWC/NADEP	10/96	1500
Perform T&E	NADEP	10/97	200

PROJECT TITLE: Methylene Chloride Elimination/Replacement
PROJECT NUMBER: 1300-READOT-01
PROJECT ENGINEER: Michael Linn

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94343	1	6810-00-244-0290	Methylene Chloride	20	20	TBD
94241	1	6810-00-244-0250	Methylene Chloride	6	6	TDB
TOTALS				26	26	TBD

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Eliminate Freon-113 from Instrument Bearing Cleaning
PROJECT NUMBER: CLSOCM-01
PROJECT ENGINEER: Joyce Rollen
PHONE NUMBER: (904) 772-3444
SHOP: 342
PROJECT DESCRIPTION: Precision cleaning - Instrument bearings are cleaned using Freon-113.The Freon-113 process will be changed to an aqueous, non-HAPS, non-ODS process.

RDT&E REQUIRED: None
SPECIAL FUNDING:

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
$30,000	$12,000	$1,000

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
ID/specify alternate process	342	02/95	160
Acquire equipment	46	04/95	4
Acquire materials	94221/723	04/95	4
Install equipment	46	06/95	80
Validate process	342/94221	07/95	160
Implement	342	09/95	40
Issue instructions	342	10/95	40

PROJECT TITLE: Eliminate Freon-113 from Instrument Bearing Cleaning
PROJECT NUMBER: CLSOCM-01
PROJECT ENGINEER: Joyce Rollen

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94221		551-0854	Freon -113	1000	1000	1000
94221		983-0282	Freon-113	220	220	220
TOTALS				1220	1220	1220

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Elimination of Silver Cyanide Plating
PROJECT NUMBER: COEPAG-01
PROJECT ENGINEER: Mike Romanelli
PHONE NUMBER: (904) 772-3444
SHOP: 342
PROJECT DESCRIPTION: Silver cyanide plating - Currently, silver is deposited on parts using a cyanide complex. Research is underway to replace silver cyanide with a less toxic process.

RDT&E REQUIRED: $50,000
SPECIAL FUNDING: Not available

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
		$10,000

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Industry search	342	03/95	80
Identify substitutes	342	05/95	80
Prototype	342/96225	09/95	320
Refine process	342/96225	11/95	
Issue report	342	01/96	80

PROJECT TITLE: Elimination of Silver Cyanide Plating
PROJECT NUMBER: COEPAG-01
PROJECT ENGINEER: Mike Romanelli

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
96225		00-242-6341	Silver Cyanide	25	25	25
96225		00-237-2910	Potassium Cyanide	150	150	150
96225		00-174-6581	Sodium Hydroxide	3100	3100	3100
TOTALS				3275	3275	3275

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Removal of Plated Metal Coatings
PROJECT NUMBER: RECOEP-01
PROJECT ENGINEER: Esra McDaniel
PHONE NUMBER: (904) 772-3444
SHOP: 342
PROJECT DESCRIPTION: Enstrip is used to remove Cadmium, nickel, and silver from plated parts prior to rework. Enstrip is a cyanide containing process. Will expand the current non-cyanide stripping process to include the remaining parts.

RDT&E REQUIRED: None
SPECIAL FUNDING: None

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Industry search	342	03/95	80
Identify subs.	342	05/95	80
Prototype	342/96225	09/95	320
Refine process	96225/342	11/95	80
Issue report	340	01/96	80

PROJECT TITLE: Removal of Plated Metal Coatings
PROJECT NUMBER: RECOEP-01
PROJECT ENGINEER: Esra McDaniel

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
96225		00-242-6341	Silver Cyanide	25	25	25
96225		00-237-2910	Potassium Cyanide	150	150	150
96225		00-174-6581	Sodium Hydroxide	3100	3100	3100
TOTALS				3275	3275	3275

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Eliminating Chromate-type Conversion Coating on Aluminum
PROJECT NUMBER: COINCV-01
PROJECT ENGINEER: John Deitzel
PHONE NUMBER: (215) 441-2033
SHOP: NAWC Warminster
PROJECT DESCRIPTION: Chemical conversion coating is required on aluminum surfaces prior to paint for paint adhesion and corrosion treatment. Currently, this process uses a material containing chromic trioxide. Implementation of a chrome-free process would eliminate this hazardous material.

RDT&E REQUIRED: On-going at NAWC Warminster
SPECIAL FUNDING: None

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
-0-	-0-	$1,000

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Identify alternatives	NAWC Warminster	08/95	300
Procure materials	720	10/95	40
Test & evaluate	340/94113	11/95	16
Implement	340/94113	11/95	40
Issue instructions	340	12/95	40

PROJECT TITLE: Eliminating Chromate-type Conversion Coating on Aluminum

PROJECT NUMBER: COINCV-01

PROJECT ENGINEER: John Deitzel

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94113		01-341-8609	Turcoat Alumigold	825	825	825
TOTALS				825	825	825

PROCESS IMPROVEMENT PLAN
NADEP JAX P^2

PROJECT TITLE: Elimination of Chrome Containing Chemical Conversion Coating on Magnesium
PROJECT NUMBER: COINCX-01
PROJECT ENGINEER: Jim Dixon
PHONE NUMBER: (904) 772-4516/3444
SHOP: 342
PROJECT DESCRIPTION: Chemical conversion coating is applied to magnesium surfaces for corrosion treatment. Current process utilizes sodium dichromate (chrome containing). Implementation of chrome-free coating would solve problem.

RDT&E REQUIRED: None
SPECIAL FUNDING: None

PROJECT COST

EQUIPMENT	INSTALLATION	MATERIAL
-0-	-0-	$2,000

YEARLY CBA:
ANNUAL DISPOSAL COST:
MEDIA SHIFT:

PROJECT COMPLETION PATH

ACTION	CODE	ECD	MH ESTIMATE
Identify alternatives	340	01/96	200
Modifying equipment	46	03/96	100
Procure materials	723	03/96	40
Prototype process	340	06/96	80
Optimize	340/94113	08/96	100
Implement	340	10/96	40
Issue instructions	340	12/96	40

PROJECT TITLE: Elimination of Chrome Containing Chemical Conversion Coating on Magnesium

PROJECT NUMBER: COINCX-01

PROJECT ENGINEER: Jim Dixon

TARGETED MATERIALS/PROCESSES

SHOP #	P #	NIIN	NOMENCLATURE	LBS IN	LBS OUT	LBS SAVED
94113		00-281-2686	Sodium Dichromate	2200	2200	2200
TOTALS				2200	2200	2200

CHAPTER 7

PRIORITIES

P2 Projects documented in Chapter 6 prioritized, as directed by NAVAIRSYSCOM, in the following order:

* Class I ODS
* RCRA Hazardous Waste
* HAPS Other Than ERA Top 17
* CLASS II ODS
* EPCRA

AGENCY PROJECT #	PROJECT TITLE	PROJECT #	PROJECT LEAD	PRIORITY
65886-002	Vortex Generator Gun	1234-TEELCM-01	Terry Taylor	1
65886-003	Elimination of 1,1,1-Trich	CLSOGN-02	Jim Dixon	1
65886-004	Particle Counter	1236-TEHYEQ-01	Clara Hagadorn	1
65886-001	Water Treatment Plant	1237-FATRTW-01	John Dinkins	1
65886-005	Eliminate Chromic Acid Anodize Coating on Aluminum	1238-COANCM-01	Bruce Mobley	1
65886-006	Aircraft Fuel Cell/Tank Repair	1210-CLENOT-01	Andrew Yang	1
65886-007	Naphtha Replacement	1110-CLAEPC-01	Caridad Roque	2
65886-008	Post Strip Solvent	1110-COPRPT-02	Caridad Roque	1
65886-009	Spray Paint Equipment Solvent	1110-CLEQOT-01	Caridad Roque	3
65886-010	Recycling P-D-680	1241-RCSOOT-01	Caridad Roque	2
65886-011	M.E.K. Substitution	1243-CLSOGN-01	Andrew Yang	3
65886-012	Toluene Substitution	1242-CLSOGN-01	Andrew Yant	3
65886-013	Methylene Chloride Replacement	1300-READOT-02	Andrew Yang	3
65886-014	A/C Fuel Systems Pressure/Leak Testing	1233-TEFULK-01	Laura Rossi	1
65886-015	Electrocoat Primer Demo	1110-COPRPT-01	Hank Birdsong	1
65886-016	Powder Coat	1110-COPRPT-03	Hank Birdsong	1
65886-017	PMB/Chemical Strip	1110-REPAAE-03	Steve Hartle	1
65886-018	Cadmium Plating Replacement	COEPCD-01	Mike Romanelli	2
65886-019	Eliminate 1,1,1-Trich/Bearing Cleaning	CLBEEN-01	Joyce Rollen/ Carol Brooks	1
65886-020	Eliminate Freon-113/Bearing Cleaning	CLBEEN-02	Joyce Rollen/Bill Somora	1
65886-021	Eliminate Meth Chloride/Bearing Cleaning	CLBEEN-03	Joyce Rollen/Carol Brooks	2
65886-022	Eliminate Meth Chloride/Bearing Cleaning	CLBEEN-04	Joyce Rollen/Bill. Somora/Thad Patin	1
65886-023	Circuit Boards Cleaning	1300-CLELCB-01	Mike Linn	1
65886-024	PMB/Chemical Strip	1110-REPAAE-01	Rick Barnes	1
65886-025	Methylene Chloride Replacement	1110-REPAAE-05	Rick Barnes	1
65886-026	Low VOC Coating	1110-COPAAE-02	David Brock	3

AGENCY PROJECT #	PROJECT TITLE	PROJECT #	PROJECT LEAD	PRIORITY
65886-027	HVLP Paint Equipment	COPAEQ-01	David Brock/Carol Brooks	1
65886-028	Refrigerant Replacement	SFOPRF-01	Mike Clark/Adrian Gray/Kate Wood	1
65886-029	Ultra-High Pressure Waterjet	RECOGN-01	R. Johnson/S. Hartle	2
65886-030	Meth-Chl/Potting Removal	1300-READOT-01	Mike Linn	3
65886-031	Freon-113 Elimination/Instrument Bearings	CLSOCM-01	Joyce Rollen	1
65886-032	Eliminate Silver Cyanide Plating	COEPAG-01	Mike Romanelli	2
65886-033	Removal of Plated Metal Coatings (Enstrip)	RECOEP-01	Esra McDaniel	2
65886-034	Eliminate Chrome Conversion Coating on Aluminum	COINCV-01	John Deitzel	3
65886-035	Chrome Conversion Coating on Magnesium	COINCX-01	Jim Dixon	3

CHAPTER 8

POTENTIAL BARRIERS TO PLAN

Barriers associated with the budget process, R&D, engineering approval, etc., are covered in the project POA&Ms discussed in Chapter 6.

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CHAPTER 9

OTHER RELEVANT PLAN REQUIREMENTS

SOLID WASTE REDUCTION AND RECYCLING

NADEP Jacksonville, with the assistance of the Environmental Management Office (code 003), is the DoD leader in finding innovative ways to reduce, reuse, and recycle solid waste. During FY-94 the Depot recycled over 1,400 tons of solid waste resulting in total revenues received or saved of more than $2.5 million. This far exceeded the CNO's 10 percent per year reduction for solid waste.

Through the efforts of the Clay County Association for the Retarded (CCAR), the Defense Reutilization and Marketing Office (DRMO), Naval Air Station, Jacksonvile MWR, and in-house equipment the Depot has developed outlets for 40 types of solid waste. These range from easily recycled newspaper, cardboard, and aluminum soda cans to the more difficult items such as machine tool coolants, tires, and plastic media blast (PMB) materials.

The Revenue generated from solid waste recycling is divided among the participants that collected and recycled the waste for the Depot. CCAR and NADEP Civilian Emplyee Welfare and Recreation Committee divided approximately $3,000 a year. NAS MWR provides a token payment to the NADEP general operating fund for cardboard and plastic, and all revenue generated through DRMO goes directly into the NADEP general operating fund. This $2.5 million reduces overhead and helps keep operating cost down.

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SOLID WASTE ANNUAL REPORT FY-94

RECYCLING REVENUE

MATERIAL RECYCLED THROUGH DRMO

MATERIAL	POUNDS	TONS	DOLLARS RECEIVED	SOURCE
Carbon Steel	00	.00	$ .00	DRMO
Light Steel	339,456	169.73	143,907.16	DRMO
Heavy Steel	00	.00	.00	DRMO
Aluminum	55,013	27.51	10,204.76	DRMO
Titanium	00	.00	.00	DRMO
High Temp Steel	216	.11	9,009.23	DRMO
Copper	9,685	4.84	1,689.12	DRMO
Stainless Steel	20,100	10.05	4,953.00	DRMO
Batteries (Lead Acid)	00	.00	.00	DRMO
Tires	00	.00	.00	DRMO
Brass	00	.00	.00	DRMO
Lead	00	.00	.00	DRMO
Magnesium	3,320	1.66	76.36	DRMO
Silver	00	.00	.00	DRMO
Nickel	00	.00	.00	DRMO
Mercury	40	.00	2,651.60	DRMO
Subtotal	427,830	213.90	$ 172,491.23	DRMO

MATERIALS RECYCLED THROUGH CCAR

MATERIAL	POUNDS	TONS	DOLLARS RECEIVED	SOURCE
White Ledger Paper	105,910	52.96	$ .00	CCAR
Color Ledger Paper	26,935	13.47	.00	CCAR
Computer Paper	21,470	10.74	.00	CCAR
Magazines	1,800	.90	.00	CCAR
Filestock	15,960	7.98	.00	CCAR
Color Computer Paper	2,415	1.21	.00	CCAR
Newspaper	35,829	17.91	.00	CCAR
Aluminum Cans	7,960	3.98	.00	CCAR
Subtotal	218,279	109.14	$ 5,8878.16	CCAR
GRAND TOTAL	646,109	323.04	$ 178,378.39	(1)

COST AVOIDANCE

(BY REDUCING NEW PRODUCT PROCUREMENT)

MATERIAL	GALLONS	POUNDS	COST AVOIDANCE	SOURCE
Machine Tool Collant @ $ 8.59/Gal	19,500	148,200	$ 167,505	65000
Plastic Media Blast Type V @ $ 1.06/lb		323,400	342,804	94100
Aluminum Oxide Blast				
220 Grit @ $ .71/lb		172,200	122,262	94100
120 Gril @ $ .43/lb		600	258	94100
Metcolite C @ $ 1.02/lb		43,050	43,911	94100
Metcolite VF @ $ .88/lb		3,600	3,168	94100
Glass Bead Blast				
#13 @ $ .24/lb		236,450	56,748	94100
#4 @ $ .56/lb		500	280	94100
Subtotal		779,800	$ 569,431	72300
GRAND TOTAL		928,000	$ 736,936	(2)

COST AVOIDANCE

(BY REDUCING LANDFILL DISPOSAL @ $150.00/tTON)

MATERIAL RECYCLED THROUGH DRMO

MATERIAL	TONS		COST AVOIDANCE	SOURCE
Metallic and Non-metallic	213.90	$	32,085	Duval Co.

MATERIAL RECYCLED THROUGH CCAR

MATERIAL	TONS		COST AVOIDANCE	SOURCE
Metallic and Non-metallic	109.14	$	16,371	Duval Co.

MATERIAL RECYCLED THROUGH 72300/NAS MWR

MATERIAL	TONS		COST AVOIDANCE	SOURCE
Cardboard	122.65	$	18,397	72300
Paper NADEP	.00			72300
Shredder Paper NADEP	1.43		214	72300
Clear Glass	.83		124	72300
Brown Glass	.37		55	72300
Plastic (Pet)	1.24		21	72300
Subtotal	125.42	$	18,813	Duval Co.
GRAND TOTAL	448.46	$	67,269 (3)	

COST AVOIDANCE

(BY REDUCING HAZARDOUS WASTE DISPOSAL @ $ 1.21/LB)

MATERIAL RECYCLED INTERNALLY BY NADEP

MATERIAL	POUNDS	COST AVOIDANCE	SOURCE
Blast Media	779,800	$ 943,558.00	94100

Machine

MATERIAL	GALLONS	POUNDS	COST AVOIDANCE	SOURCE
Machine Tool Coolant	9,100	69,160	$ 83,683	65000
Machine Pit Waste	10,400	79,040	95,638	65000
Subtotal	19,500	148,200	$ 179,322	00300

MATERIAL RECYCLED FOR NADEP BY OTHER COMMANDS

MATERIAL	GALLONS	POUNDS	COST AVOIDANCE	SOURCE
Used Oil	49,476	336,437	$ 407,088	DRMO
GRAND TOTAL		1,264,437	$ 1,529,968	(4)

TOTAL REVENUES RECEIVED OR SAVED

THROUGH RECYCLING AND COST AVOIDANCE

(1) Revenues - Recycling Generated (Actual Dollars)	$ 178,378
(2) Cost Avoidance - Reduction of New Procurement	736,936
(3) Cost Avoidance - Reduction of Landfill Disposal	67,269
(4) Cost Avoidance Reduction of HW Disposal	1,529,968
GRAND TOTAL	$ 2,512,551

****

Material Recycled During FY-94	1,403.72 Tons	12.8% Increase
Material Recycled During CY-93	1,244.27 Tons	74.0% Increase
Material Recycled During CY-92	712.68 Tons	148.0% Increase
Material Recycled During CY-91	287.00 Tons	63.4% Increase
Material Recycled During CY-90	104.97 Tons	Started Tracking

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APPENDIX A

TARGETED CHEMICALS REFERENCES

Class I ODS Materials	40 C.F.R. 82 Subpart A, Appendix A
Class II ODS Materials	40 C.F.R. 82 Subpart A, Appendix A
RCRA Materials	40 C.F.R. Part 261.3 through 261.33
EPCRA Materials	40 C.F.R. Ch 1, Part 372.65 and 40 C.F.R. Part 355
Hazardous Air Pollutants	Clean Air Act, Title I, Section 112 and CAA Amendment, Section 301

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NADEP JACKSONVILLE

SHOP PRODUCTION AND PROCESSES SURVEY

BASELINE 1994

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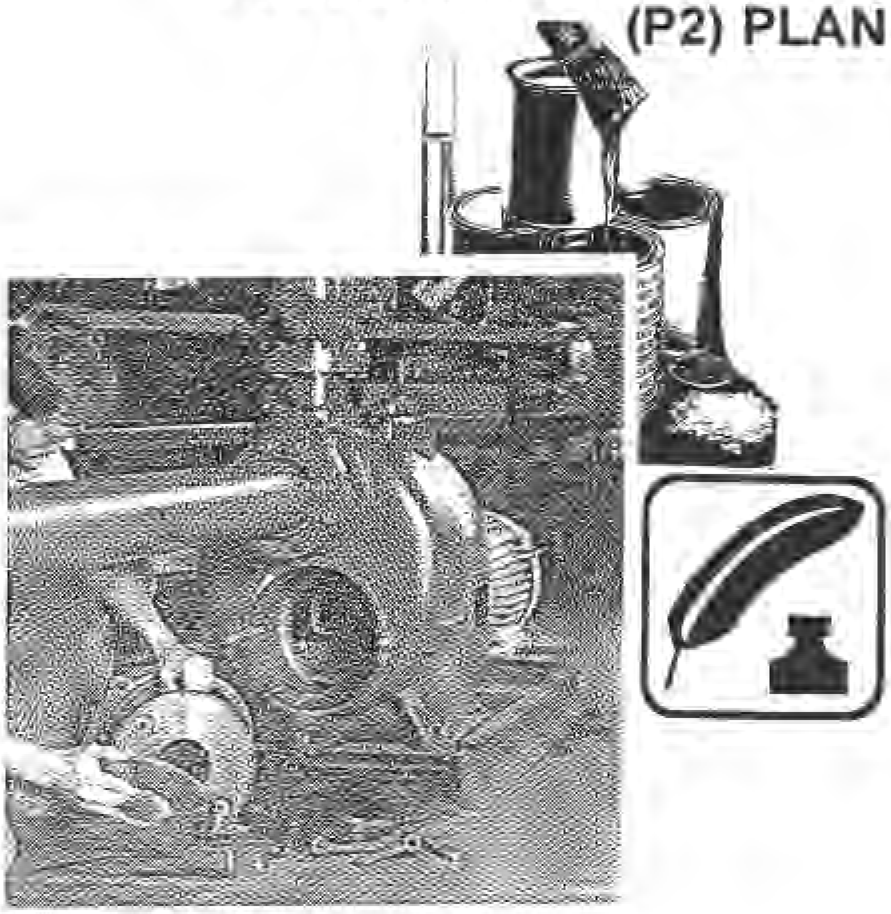
DEVELOPING A POLLUTION PREVENTION (P2) PLAN



A How-To Book for Kentucky Generators
Published by
The Kentucky Pollution Prevention Center (KPPC)
University of Louisville
August, 1995

ABOUT THIS HANDBOOK

This handbook will help you prepare a pollution prevention plan for your business or industry. Prepared to provide businesses with practical information on how to approach, plan, and implement a hazardous waste reduction program-in-place, the handbook motivates industry to search for administrative, material, or technology changes that result in less waste.

With this book, you'll walk through each step of reviewing operations, identifying and assessing pollution prevention options, and implementing and measuring your progress. And within this book you can find answers to questions like:

- **How do pollution prevention practices enhance regulatory compliance, reduce risk, and source reduce wastes?**
- **Does Kentucky law include EPA's requirements for a waste minimization "program-in-place?"**
- **How do I conduct a pollution prevention assessment?**
- **What steps are necessary in implementing various waste reduction practices?**
- **What specific pollution prevention practices are businesses successfully using?**
- **Where can I go with my questions on pollution prevention?**

Because individual industries' needs vary widely, we encourage you to modify procedures and techniques discussed here to meet your own unique requirements. This book serves as a point of reference or benchmark, rather than a set of rigid requirements.

The Kentucky Pollution Prevention Center (KPPC) staff developed this handbook for use at statewide facility planning workshops. The Center offers these workshops to help Kentucky industries and businesses comply with new environmental laws and reduce the cost of waste management. KPPC's ultimate goal is to promote pollution prevention and waste reduction through industrial training and on-site technical assistance. The training programs seek to integrate pollution prevention and toxics use reduction ethics into the industrial planning and decision-making process.

CONTENTS

INTRODUCTION

Kentucky Legislation and Policy

In the interest of protecting public health and the environment and responding to a growing concern that solid and hazardous waste problems needed more attention than they previously had received, the 1994 Kentucky General Assembly passed legislation establishing a Commonwealth pollution prevention policy to:

> *"Encourage environmental leadership in pollution prevention by source reduction when technically feasible and economically practicable, without shifting risks from one part of a process or environmental medium to another."*

In the Kentucky Revised Statutes Chapter 224 Environmental Protection (KRS 224.46-305 et. seq.), the General Assembly finds that the best means to achieve environmental leadership through pollution prevention for facilities generating hazardous waste or releasing toxic chemicals are by:

- Providing technical assistance to reduce the release of toxic chemicals and the generation of hazardous waste
- Encouraging facilities to adopt policies to prevent pollution, to prepare comprehensive plans, and to develop measurable performance goals
- Providing economic incentives to reduce the amount of hazardous waste generated and toxic chemicals released in the Commonwealth
- Using cabinet incentives to acknowledge the environmental leadership of facilities meeting the pollution prevention goal

The law encourages businesses that generate hazardous waste or release toxic chemicals regulated under Title III, Section 313 of the Superfund Amendments and Reauthorization Act (SARA) to develop a facility pollution prevention plan. Pollution prevention planning stimulates in-plant changes which avoid, eliminate or reduce toxic materials use and hazardous wastes. To be effective, the law encourages facility planning with measurable performance goals which should be based on production units for ease in comparing reduction efforts from year-to-year.

Kentucky's voluntary pollution prevention planning efforts are based on the elements of EPA's voluntary "program-in-place" federal guidelines. The "program-in-place" will help facilities meet the certification requirements found on the Hazardous Waste Manifest, a form which companies must use when shipping hazardous wastes off-site.

Although Kentucky's pollution prevention policy is based on environmental concerns, waste reduction also has positive incentives for industry. Pollution prevention reduces operating costs, waste handling and disposal costs, and liability risks. Companies that reduce wastestreams also improve their public image. Whatever the type of waste, it represents the loss of resources and the loss of money. Waste is an indication of inefficiency and as such, pollution prevention makes sense in today's competitive marketplace.

DEFINITIONS

In its broadest sense **waste reduction** includes all practices that reduce the amount of unwanted materials entering the environment — air, water or land; whether hazardous or not. For regulatory purposes in Kentucky, however, the term applies only to releases of hazardous waste and toxic chemicals. As used in KRS 224.46-315 to 224.46-325, pollution prevention means:

> "In-plant practices that reduce, avoid, or eliminate the generation of hazardous waste or the release of toxic chemicals at their source, rather than controlling, treating, or managing hazardous waste or toxic chemicals after their generation or release, to reduce the risks to employees, public health, and the environment."

More specifically, pollution prevention means in-plant practices, including, but not limited to:

- Process modifications
- Feedstock substitutions
- Product reformulation
- Management practices or housekeeping alterations
- Recycling within industrial processes
- Equipment replacement or modifications

The changes in management practices or housekeeping alterations would include maintenance and preventive maintenance, training, inventory control and improvements in housekeeping.

Pollution prevention and source reduction are used interchangeably throughout the US and mean the same thing. Methods for achieving waste reduction divide conveniently into two basic types: <u>pollution prevention or source reduction</u> and <u>recycling</u>.

Recycling is the use, reuse, or reclamation of a waste, either on-site or off-site, after it is generated. Recycling methods include:

- The effective use or reuse of a waste as a substitute for a commercial product
- Removing contaminants from a waste to allow its reuse
- Reclaiming useful constituent fractions within a waste material

KENTUCKY'S GOALS & KEY DATES

The Commonwealth's goal is to reduce the amount by weight of hazardous waste and toxic chemicals generated by each Kentucky facility in 1987 by 25% by January 1, 1997, and by 50% by January 1, 2002.

Each Kentucky facility which began operating after December 31, 1987, will have a goal to reduce the amount by weight of hazardous waste and of toxic chemicals generated by 25% within 10 years and 50% within 15 years after beginning the operation.

HOW DO I DO IT?

As you plan for the growth of your business and the changes in your product lines, include pollution prevention ideas. Unfocused, ill-timed, or poorly managed waste reduction efforts will lead to low performance and high cost. Don't make your waste reduction program a fad — make it a culture and the way you do business.

In some form, all of the companies that accept or exceed environmental regulations have an individual who takes the lead in environmental matters. This "Environmental Coordinator," by delegation or enthusiasm, is usually the pollution prevention "Cause Champion." The levels of commitment, creativity, and consistency demonstrated by this person will strongly influence the success of the environmental program and the pollution prevention planning effort.

Another influential factor is the allocation of resources -- time, money, equipment, and personnel. This allocation, in large part, is determined by the ability to justify the need. This may not be strictly financial return on investment; consideration must be given to the regulatory, liability, and cost avoidance aspects. The fear of fines, the likelihood of litigation, or the certainty of increasing costs may be sufficient to justify the expense, or it may be the desire to improve the business's public image. Regardless of the motivation, the risks accepted by management are based upon available data, and the long-term vision of the decision-makers.

It is the responsibility of the Champions to insure that the information provided is factual and in agreement with the company's current environmental policy. But, it is also their duty to help facilitate the changes in policy and practices necessary to continually improve the corporate vision of environmental responsibilities. Presenting these arguments to management, coaching employees in implementation, and recording the benefits of your efforts are part of changing the attitudes and perceptions of waste reduction in your company.

You probably have been designated as the Waste Coordinator for your facility or you would not be reading this manual. You will not be able to perform these duties by yourself. Pollution prevention requires that all options are considered; therefore, others in the organization can, and will, be affected by the program. Get everyone involved from the start.
A comprehensive plan will: determine options for pollution prevention, evaluate

the alternatives, and consider the feasibility of implementation. Final determinations of economic and technical feasibility, performance goals, and other aspects of the plan are left to you and your organization.

To be effective and incorporate the elements of a program-in-place, your pollution prevention plan should contain:

1) A written policy of management and corporate support for planning efforts and a commitment to implementation

2) Written scope and objectives of the plan and establishment of quantitative, production-related performance goals. (You can include a description of any hazardous waste or toxics reduction accomplished prior to the planning law.)

3) Options to be evaluated and a schedule for implementation, based on a pollution prevention assessment. Details of the plan should include:

   - A list of all hazardous wastestreams
   - Assessment of whether you need to set performance goals (If goal-setting isn't practical at this point, list actions which will lead to your facility's establishment of performance goals.)
   - Evaluation of processes, operations, and activities that involve toxic chemicals and create hazardous waste
   - Evaluation of reduction options for each waste that you targeted in your plan's performance goals

4) A cost allocation system for waste management. If feasible, the system should identify these:

   - Purchase price of hazardous and toxic materials in the waste stream;
   - Hazardous waste treatment, storage, and disposal costs
   - Associated environmental liability costs for use of hazardous materials and disposal of hazardous wastes
   - Oversight costs for maintaining environmental compliance

5) Employee awareness, involvement, and training programs for pollution prevention efforts

6) A description of your procedures to make pollution prevention an on-going

effort and evaluation of your program-in-place.

Writing and implementing a pollution prevention plan is similar to writing any other business plan. This handbook will help you begin writing your plan. Make sure your plan clearly reflects the reasoning behind the planning, what the plan requires, and who will implement it.

From our experiences working with industries interested in reducing their waste, we have found nine elements of a successful plan and program:

1) Obtaining management commitment

2) Defining scope, objectives, and goals

3) Using a team approach

4) Conducting a waste assessment

5) Tracking the wastestreams

6) Evaluating waste reduction options for technical and economic feasibility

7) Implementation

8) Measuring results

9) Long-term commitment

Let's examine these elements in more detail.

1) MANAGEMENT COMMITMENT

Since goals and policies are established by management, a successful pollution prevention program requires sincere corporate commitment. The program must become a functioning part of a firm's *standard operating procedures*, including product development, operational procedures, and training. High-level management commitment keeps the pollution prevention program active in all areas of the company by committing time, personnel, and financing. Management must be willing to give the pollution prevention team the authority and responsibility to implement the program. Lack of this commitment often becomes an obstacle to waste reduction.

A formal policy statement best conveys pollution prevention program objectives to employees. Consider including these points in your environmental policy statement or operating guidelines:

- **Environmental protection , Make the production line responsible for environmental protection. Measure employee performance against the set goal. In addition, make every employee as responsible for environmental protection as they are for safety or quality**.

- **Reducing or eliminating waste is a main goal in research, process design, and plant operations and is as important to management as safety, yield, and loss prevention.**

- **Consider reusing and recycling materials before classifying and disposing as a hazardous waste**.

In the policy statement for your facility, you may also want to list motivations for pollution prevention planning, such as regulatory requirements, product quality, cost and liability control, and worker health, safety, and risk reduction. Make the exact language appropriate to your facility.

EXAMPLE POLICY STATEMENTS

1. [Your Company] advocates a clean and safe environment. Its policy is to minimize the generation of hazardous and nonhazardous solid wastes and, insofar as possible, to eliminate air and water pollutants. It seeks the help of all employees in the achievement of these objectives. Further, [Company] wants its employees to be fully aware of all hazardous and potentially dangerous chemicals or equipment used in the work place and to use them in a completely safe manner. Finally, it is [Company]'s desire to operate in full compliance with all applicable Federal and State environmental regulations.

2. [Your Company] is committed to excellence and leadership in protecting the environment. In keeping with this policy, our objective is to reduce waste and emissions. We strive to minimize adverse impact on the air, water, and land through excellence in waste reduction. By successfully reducing waste at its source, we can achieve cost savings, increase operational efficiencies, improve the quality of our products and services, and maintain a safe and healthy workplace for our employees. Secondarily, [Your Company] promotes environmentally sound recycling, reuse, and reclamation of all wastestreams.

3. At [Your Company], protecting the environment is a high priority. We are pledged to eliminate or reduce, wherever possible: 1) our use of toxic substances; 2) our release of toxic pollutants; and 3) our generation of hazardous and other wastes. When wastes or releases cannot be avoided, we are committed to recycling, treatment, and disposal in ways that minimize any undesirable impacts on the air, water, and land.

4. [Your Company] and all its employees are committed to a sound environmental program directed to bring hazardous and all waste to the lowest level, using the best available technology.

5. [Your Company]'s policy is to reduce all hazardous and non-hazardous waste to the minimum levels economically and technically practical and to be in full compliance with all Federal and State waste regulations;

   As both a responsible citizen and [Company] employee, each individual is responsible for reducing waste during working hours, for complying fully with all waste reduction program goals established by the company, and for not violating any Federal or State waste regulations;

   Employees are urged to come forth with suggestions for further reducing waste in their own work area and in any other areas about which they may have ideas.

6. [Your Company] is committed to excellence and leadership in protecting the environment by striving to minimize adverse impact on the air, land, and water through pollution prevention and energy conservation. We are dedicated to identifying and implementing pollution prevention opportunities through training and awareness building programs for all associates.

   The attached policy outlines [Your Company]'s corporate policy with respect to environmental and safety issues. We pledge to eliminate or reduce our use of toxic substances and to minimize our use of energy and generation of all wastes, whenever possible. Prevention of pollution at the source is the preferred alternative. When waste cannot be avoided, we are committed to recycling, treatment, and disposal in ways that minimize undesirable effects on air, water, and land.

   ENVIRONMENTAL PROTECTION IS EVERYONE'S RESPONSIBILITY

____
, Plant Manager

YOUR TURN - Develop a "draft" written policy statement for your facility. Can you keep it to 25 words or less?

Management Practices and Procedures

Pollution prevention and environmental programs must provide more than just a policy statement if there is to be implementation. Management must be willing to give authority and responsibility to the pollution prevention team to implement the program much like they have with quality management system teams. The following paragraph is an example of how one plant set forth new management practices and procedures that showed the overall commitment to the pollution prevention plan, team, and program.

"The commitment of management to pollution prevention and waste reduction is incorporated in the company environmental policy. Economic incentives associated with this process are sufficient to force management to actively pursue alternatives to reducing costs associated with current usage and waste generation levels. In order to ensure on-going efforts in this area, a pollution prevention team will be implemented, consisting of all departments. This group will set goals and monitor progress in attaining these goals. Management will demonstrate personal commitment to the objectives and praise the commitment demonstrated by the pollution prevention team."

Once management signs and dates the policy statement, display it prominently and distribute it widely. How you first distribute the written policy to employees indicates company commitment. Posting it unexpectedly at work stations sends a negative message. Calling a special meeting to review Kentucky's voluntary pollution prevention program, explaining and distributing copies of your company's own policy, and asking for employee ideas sends a positive signal.

YOUR TURN - List some ideas here for promoting the policy statement at your own company.

Another example of a positive signal for management commitment of the overall pollution prevention program at a facility is a certification statement of understanding and support by the owner or senior management as a cover page for the plan. The following is an example certification used by one plant.

POLLUTION PREVENTION PLAN

Facility Identification and Information

Company Name:

Mailing Address:

Contact Person: Telephone:

Certification:

I certify that I have personally examined this pollution prevention plan, and that I am familiar with its contents and all attachments. Based upon my inquiry of those persons immediately responsible for obtaining the information, I believe the information presented in the plan is true, accurate, and complete.

Owner or Senior Management Official

Name (Please print or type) Title

Signature

Although a commitment to reducing waste should begin with management, employees often suggest improvements in day-to-day operations. Employees generate the waste and they can contribute to the overall success of the pollution prevention program. Inform and involve employees at each step in developing and implementing a program and solicit their cooperation. Employee involvement will be discussed further in section 3.

2) DEFINING THE SCOPE, OBJECTIVES, AND GOALS

The scope of the pollution prevention plan is to include all managers and employees in implementing the company's policy. Initially, review historical waste generation and the current technologies and procedures being used. Then, outline possible future technologies and procedures that will reduce generation of wastes. In addition, analyze existing training levels and future training needs. General project objectives developed by management and the assessment team can include:

- To comply with all environmental laws and regulations
- To achieve a significant reduction in the generation of hazardous wastes and toxic chemicals through avoidance and source reduction
- To work towards developing reliable means of measuring reductions
- To improve the health and safety aspects of the workplace
- To advise and train employees in environmental and pollution prevention matters, actions, and responsibilities
- To increase research and development activities with a focus on finding substitutes for hazardous raw materials used in production
- To maintain product quality
- To sustain the facility's growth for a five-year period
- To meet the corporation's economic requirements.

YOUR TURN - What are the scope and objectives for your organization?

Developing A Pollution Prevention Plan

Another important aspect to achieving commitment is to set pollution prevention performance goals for the smallest practical operating entity (a business unit, a production line, or an individual worker) and to provide incentives to the employees for achieving or surpassing those goals. The workers should participate in the setting of the goals and agree to them before they are brought to management for endorsement.

When you are setting the overall goals for the pollution prevention program, make them effective goals that are:

- Acceptable to those who will work to achieve them
- Flexible to adapt to changing requirements
- Measurable over time
- Suitable to the overall corporate goals
- Understandable
- Achievable with a practical level of effort

YOUR TURN - What are the goals for your organization?

3) ORGANIZE A TEAM

The keys to reducing waste generation , commitment, involvement, and teamwork , are basic to many work place successes. Owners and managers can determine priorities and set the tone of the company's waste management efforts, but it takes everyone to make it happen. Once everyone understands how reduction of toxic substances and hazardous waste fits into company policies and practices, opportunities for participation are unlimited. Everyone in the facility is involved in some way in changing how it operates.

A technically competent person with sufficient authority to do the job should select and lead the team. A company needs to identify a "Cause Champion" with the following attributes:

- Familiar with the facility, its production processes, and its waste management operations
- Familiar with the people
- Familiar with quality control requirements
- Good rapport with management
- Familiar with new production and waste management technology
- Familiar with pollution prevention and waste reduction principles and techniques and environmental regulations
- Aggressive managerial style

When planning for pollution prevention ask yourself these questions:

- **Who can help you understand your facility?**
- **Who can help you change how your facility operates?**
- **Who can help you maintain your waste reduction plan as old challenges are met and new opportunities arise?**

Although a commitment should begin with management, production operators and line employees can often suggest improvements in the operations. They possess first-hand knowledge and experience with production and operation processes. They can assist especially in assessing operational or procedural changes, or in equipment modifications affecting the way they work.

The team approach is best since it combines a wide range of experience, knowledge, and perception of the issues. Include representatives from:

Management	Engineering	Production
Environmental	Quality	Product Design
Operators	Purchasing	Accounting
Consultants	Vendors/ Suppliers	Shipping/Receiving

No pollution prevention program is successful without the full cooperation of all employees. **To obtain cooperation, the role of training is very important.** Secure employee commitment to pollution prevention by training them in waste reduction procedures, encouraging them to come forth with ideas, asking them to participate in the setting of waste reduction goals and procedures, and by providing them with incentives to achieve those goals.

Training the staff, especially the supervisors, in the importance of pollution prevention and the procedures employed allows everyone to understand the goal of the organization. Your plan should include a description of the:

- Types of awareness activities and training courses provided
- Schedule of awareness activities and training courses offered
- Methods of documenting the training

The pollution prevention training can be a part of the RCRA hazardous waste or Worker Right-to-Know training programs. In Appendix A, you will find an excerpt from 40 CFR 265 on required personnel training for RCRA and a handy RCRA personnel training checklist.

YOUR TURN - How can you incorporate pollution prevention training into your current RCRA hazardous waste training program?

To reduce waste successfully, management must recognize the value of employee involvement. If management initiates and encourages employees to develop and implement a program, pollution prevention changes will occur.

4) CONDUCT A WASTE ASSESSMENT

The likelihood of finding cost-effective options for reducing hazardous wastes is directly related to understanding the relationships between your operations, the toxic substances used, and the wastes generated. Enlarge your understanding of these relationships by reviewing plant operations and conducting a toxics use and hazardous waste pollution prevention assessment.

Consider a pollution prevention assessment in several stages:

- **Preview your plant's operations, chemical usage, business practices, and wastes generated**

- **Walk through your facility to verify your findings and identify reasons for your wastes**

- **Document your findings**

The size and type of your business will determine how much effort you put into an assessment. The owner of a very small business might conduct an assessment alone in four to six hours. Larger manufacturing or multiple- process firms benefit from a team assessment that may take several weeks. You'll need several people with diverse skills to evaluate complicated wastestreams, analyze multiple kinds of equipment, and contribute to economic analyses. This is where the team approach to pollution prevention is crucial.

To preview your organization, ask the following questions about your current operations:

- **What are this facility's current processes/operations?**
- **Why do we do each process/operation this way?**
- **What are the consequences of doing each process/operation this way?**
- **What are the wastestreams generated from each process, and how much?**
- **Which wastes are classified as hazardous and which are not? What makes them hazardous?**
- **What input materials do you use that generate wastestreams?**
- **How much input material from a particular process enters each wastestream?**
- **How much of a raw material can you account for through fugitive losses?**
- **How efficient is the process?**
- **Are unnecessary wastes generated by mixing otherwise recyclable hazardous wastes with other process wastes?**
- **What types of housekeeping practices do you use to limit wastes?**
- **What types of process controls do you use to improve process efficiency?**

Before the assessment walk-through, have the pollution prevention team answer these questions and prepare an agenda of points still needing clarification. The list can contain objectives, questions, and further concerns.

Pollution prevention assessments identify and profile wastestreams, how they are generated, and the amount of waste generated by each. A pollution prevention assessment helps you identify cost-effective approaches to reducing waste volume and toxicity. You can then better decide how to use resources for source reduction and recycling programs. A waste assessment alone will not reduce waste, but it's a good start.

Pollution prevention assessments are not one-time projects. Goals are re-evaluated as changes occur. Such changes might exist in available technology, raw material supplies, environmental regulations, and economic climate. **Effective facility pollution prevention planning requires an annual review and update of your plan and accomplishments.**

After the assessment team identifies wastestreams and creates a checklist, it's time to survey the plant site. Become as familiar with the site as possible. Although the information you collected is critical to understanding the processes involved, seeing the site in operation is also important. For example, a process unit may operate differently from the method originally described in the operating manual. Employees may have made undocumented changes in flow diagrams or to equipment. The site inspection resolves questions which might arise during your review.

The site inspection also provides information that supplements what you learned earlier. Throughout your tour, team members should use the inspection checklist, ask questions about the above items, and look for specific opportunities to reduce waste. They should verify information gathered prior to the site inspection.

Assessors should talk with employees who operate processes and equipment. The employees' experience and opinions concerning pollution prevention and waste reduction options can be quite valuable. The assessors should review the data during or just after the survey. This review can help you identify missing or inaccurate information. From it, you can make additions and corrections to the waste flow diagram. Examine each step in the manufacturing process from the delivery of the material to the storage and shipping of the final product.

Use something similar to the following worksheet for each wastestream at your facility. Appendix B also has examples of "Wastestream Data Sheets" being used at a plant.

WASTE ASSESSMENT

INSTRUCTIONS: Copy this form and use one copy for each process. Summarize each process selected for detailed review along with its associated toxic substances and wastes.

Date: **Process, Operation, or Activity:**

For each wastestream generated, determine:

- Point of origin ____
- Subsequent handling/treatment/disposal ______________________
- Physical and chemical characteristics _________________________
- Quantity ___________________________________
- Rate of generation (i.e., lbs/unit of product) __________________
- Variations in generation rate _________________________________
- Potential for contamination or upset __________________________
- Cost to manage or dispose ___________________________________

List all toxic substances used in this process:

List reduction options for this process:

Which option is economically most feasible? Explain:

Which option is technically most feasible? Explain:

How much reduction is achieved? Develop a performance standard for this wastestream based on this information.

List the positive or negative cross-media impacts on the environment or employee health and safety.

Toxic substances affected:

Other wastestreams affected:

Products affected:

Option proposed on (date):
Option approved for implementation:

YES NO Date:

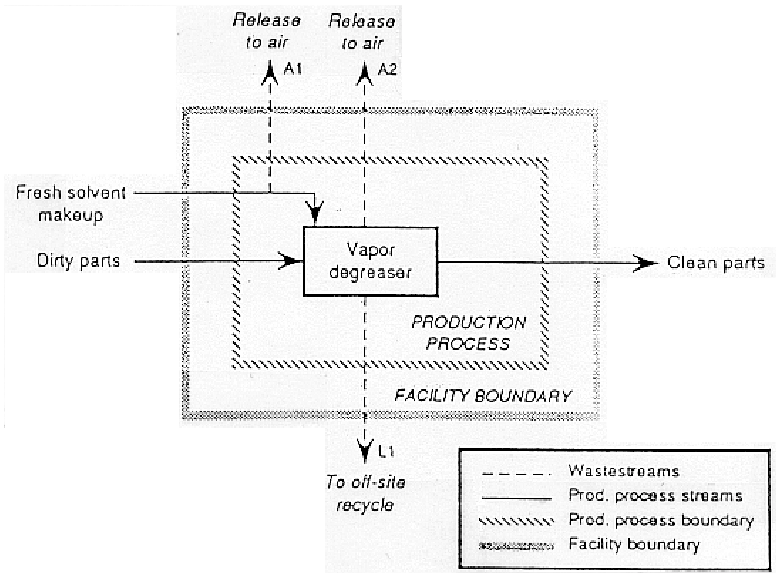
Reason for acceptance or rejection:

If you have many wastestreams that are generated at your facility, you probably will want to prioritize them before you start the assessment. Some typical considerations for prioritizing wastestreams to assess include:

- Compliance with current and future regulations
- Costs of waste management (treatment and disposal)
- Potential environmental and safety liability
- Quantity of waste
- Hazardous properties of the waste (including toxicity, flammability, corrosivity, and reactivity)
- Other safety hazards to employees
- Potential for (or ease of) reduction
- Potential for removing bottlenecks in production or waste treatment
- Potential recovery of valuable by-products
- Available budget for the pollution prevention assessment program and projects

Based on the collected information, you can develop a flow diagram and material balance for each process step. The diagram should clearly identify the source, type, quantity, and concentration of each wastestream. Use the background information to identify data gaps, sampling points, problem areas, and data conflicts.

Example Flow Diagram


Release to air
Release to air
A1
A2
Fresh solvent makeup
Dirty parts
Vapor degreaser
Clean parts
PRODUCTION PROCESS
FACILITY BOUNDARY
L1
To off-site recycle
Wastestreams
Prod. process streams
Prod. process boundary
Facility boundary

The waste assessment tracks all waste produced at a business to find out where it was generated. Break it down into these elements:

- **Alternative procedure and process decisions for the following:**

  √ Identify housekeeping and operating procedures which will reduce waste and include a description of these procedures in the plan

  √ Survey production equipment and facility technologies to ensure no excessive waste is generated

  √ Waste separation by compatible groups to enhance reuse

  √ Preventive Maintenance Programs: Maintaining equipment history cards on equipment location, characteristics, and maintenance

  √ Operation of equipment to minimize energy use and material waste

  √ Review employee training programs to include pollution prevention goals and to encourage employee participation in the program

- **Inventory of raw material supplies and waste sources to include:**

  √ Material and waste balances

  √ Sources of chemical use and waste generation

  √ Points of waste discharge

  √ Chemical profile of wastes (why they are hazardous)

  √ Waste disposal costs

- **Priority framework to include:**

  √ Analyze and review chemical hazards for acceptance

  √ Assess risk and require prior approval of all chemicals before being received on-site

  √ Estimate cost of pollution prevention and waste reduction

  √ Estimate liability costs, especially long-term

  √ Identify management criteria for importance

  √ Prioritize wastes for the pollution prevention program

Once you identify your wastes, quantify and determine their costs as accurately as possible. Reports which you've submitted to regulatory authorities can help you estimate waste quantity and disposal costs. A record of the frequency of waste pulls and tipping fees is often on file at your facility. Develop further details by having team members measure individual wastestreams over a period of time to establish a verified generation rate. The difference between the amount of material purchased and the quantity shipped as product components is your estimated waste.

5) TRACK TRUE COSTS OF WASTES

An accounting system should be in place to routinely track the quantity, disposal method, and disposal costs for every wastestream produced. This information is very useful in identifying waste reduction opportunities, prioritizing efforts, and tracking the overall success of the program. The costs of waste management includes more than just the fee paid to the removal contractor. True costs of waste management include:

- **Calculating costs of wastestream materials, based on the purchase price of those materials. The value of the waste material is the initial cost less any scrap credits**.

- **Calculating the cost of managing wastes, including costs for personnel, recordkeeping, monitoring, training, inspections, manifesting, and labeling. Also include costs for transportation, laboratory fees, penalties and fines, liability insurance, pollution control equipment, treatment and disposal and others.**

- **Estimating the cost of waste reduction (include initial costs, amortization, depreciation, tax rebates, pay back potential, labor costs)**

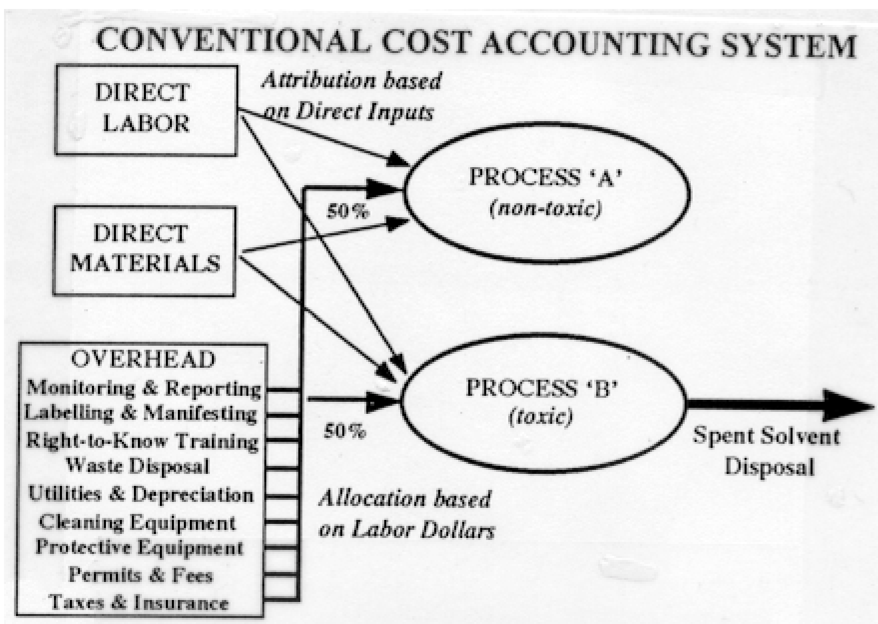
- **Estimating liability costs, especially long-term**

These costs should be charged to the product or the process that generates the waste. Department managers can be motivated to reduce waste when they realize the costs. A tool that is gaining a lot of popularity in pollution prevention payback is Activity-Based Costing or ABC. When a company initially benchmarks its departments and operations, it is for cost reduction.

The benchmarking process to determine the true cost of waste management forces us to begin assigning costs to all activities associated with the process including handling, training, storage, oversight costs and the value of the lost raw material in the wastestream. The process of assessing pollution prevention projects, particularly the financial analysis component, fits within the framework of the standard capital budgeting model yet expands on and broadens the way traditional capital budgeting is often practiced.

The ABC financial approach attempts to rectify the tendency in financial analyses to omit environmentally-related costs, which typically are lumped into overhead accounts, arbitrarily allocated to products, and overlooked in the cost identification process. Several limitations of a traditional accounting system are cost allocations are NOT appropriate or relevant because they are managed by accounts without process knowledge and the information is static or even after-the-fact which is too late for strategic planning.

Look at the allocation of costs in a traditional or conventional cost accounting system in the diagram below. Notice that Process A is non-toxic and generates no hazardous waste while Process B uses a solvent in cleaning and generates a spent solvent for disposal. In a traditional cost system, 50% of all overhead costs are assigned to each process based on labor in dollars.



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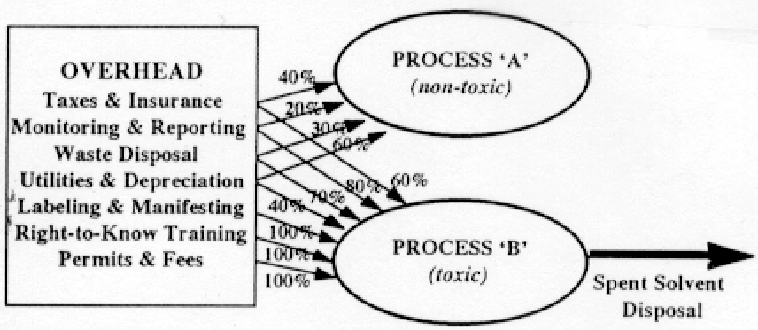
The Massachusetts Office of Technical Assistance, 1994

In an ABC system, or full cost system, 100% of the labeling and manifesting costs, permits and fees, and Right-to-Know training costs are assigned to Process B because of the spent solvent. Also, Process A has reduced insurance, monitoring, and reporting costs because it is non-toxic.

The following diagrams visually show you what to think about during an assessment to assign costs and determine pay back for pollution prevention opportunities which will help the project compete for funding. These hidden costs can make the difference in funding market-driven, pollution prevention options.

OVERHEAD ALLOCATION USING FULL COST SYSTEM



OVERHEAD COSTS FOR PROCESS B

	Annual Cost	Conventional System*	Actual Consumption	Full Cost System
Monitoring & Reporting	$1000	$500	80%	$800
Labeling and Manifesting	500	250	100%	500
Right-to-Know Training	500	300	100%	500
Waste Disposal	3000	1500	70%	2100
Utilities	1000	500	40%	400
Depreciation	800	400	40%	320
Permits and Fees	1200	600	100%	1200
Taxes & Insurance	2000	1000	60%	1200
Total Overhead Costs	$10,000			
Overhead Costs of B		$5000		$7,000

* The total of all the costs included in overhead is multiplied by the cost driver, in this case direct labor @ 50%.

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Developing A Pollution Prevention Plan

As your company incorporates pollution prevention approaches in its strategic planning, capital investment priorities need more management attention and coordination. Qualitative dimensions of assessing pollution prevention projects needs better management review. The following list of "Potential Operating Costs" is adapted from material published by the Tellus Institute. The italicized items are those most likely not to be included in the financial analysis of a pollution prevention project either because they are hidden in overhead or because their allocation is insufficiently specific.

POTENTIAL OPERATING COSTS

Materials	**Regulatory Compliance**
direct product materials	*monitoring*
catalysts and solvents	*manifesting*
wasted raw materials	*reporting*
transport	*notification*
storage	*recordkeeping*
	training (right-to-know, safety etc.)
Waste Management (Materials & Labor)	*training materials*
pre-treatment	*inspections*
on-site handling	*protective equipment*
storage	*labeling*
hauling	*penalties/fines*
insurance	*lab fees.*
disposal	*insurance*
	R&D to comply with regulations
Utilities	*handling (raw materials and waste)*
electricity	closure & post-closure care
steam	
cooling & process water	**Revenues**
refrigeration	sale of product
fuel (gas or oil)	*marketable by-product*
plant air & inert gas	manufacturing through-put change
sewerage	*change in sales from:*
	increased market share
Direct Labor	*improved corporate image*
operating labor & supervision	
manufacturing clerical labor	**Future Liability**
inspection (QA & QC)	*fines & penalties*
worker productivity changes	*personal injury*
Indirect Labor	
maintenance (materials & labor)	
miscellaneous (housekeeping)	
medical surveillance	

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Pollution prevention projects often have impacts on a broad range of issues, such as market share, materials usage patterns, and process modifications, that are difficult to quantify but that may be of strategic importance. To provide a comprehensive and accurate assessment of the potential benefits of a pollution prevention project, it is crucial that all costs and less tangible items are identified and evaluated in a project proposal.

The following table provides examples of various environmental cost activities (**Activity**), the way those activities might be defined for determining frequency or volume (**Cost Driver**), the information needed to calculate the costs of the activities (**Measurement**), and the sources of information about the activities (**Source**).

ACTIVITY	COST DRIVER	MEASUREMENT	SOURCE
Spill/Leak Incident Reporting	Number of Spills Number of Incidents	Labor Hours \$/week	Engineer Interview
Monitoring	Number of Toxics Number of Processes using Toxics	Labor Hours \$/week	Engineer Interview
Manifesting	Number of Shipments	Labor Hours - \$/week \$/shipment or \$/drum	Engineer Interview Manifesting Records
Right-to-Know Training (in-house)	Number of Sessions	Labor Hours \$/week	Engineer Interview Engineering Records
Labeling	Number of Drums Shipped Off-Site	Labor Hours \$/week \$/drum	Engineer Interview
Permitting & Fees	Number of Toxics Number of Gallons or Lbs., Discharged	Labor Hours \$/week fees(\$/chemical or/gl)	Engineer Interview Accounting Records Regulatory Documnt
Maintenance & Repair (Old Equipmt)	Number of Machines	Labor Hours \$/week spare parts/equipment \$/item	Machine Manufcturer Vendor Outside Repair Shop
Maintenance (new equipment)	Number of Machines	Labor Hours \$/week spare parts/equipment \$/item	Machine Manufcturer Vendor Engineer Interview
Solvent Disposal	Number of Drums	\$/drum or /lb	Accounting Records Engineering Records
TURA Fees	Number of Reportable Chemicals	\$/chemical/category	TURA Reprting Form Engineering Records
Training Supplies	Number of Employees Trained Number of Sessions	\$/employee \$/session	Engineering Records Accounting Records
Protective Equipment	Number of Employees Sq ft protected	\$/employee \$/Sq Ft.	Engineering Records Accounting Records

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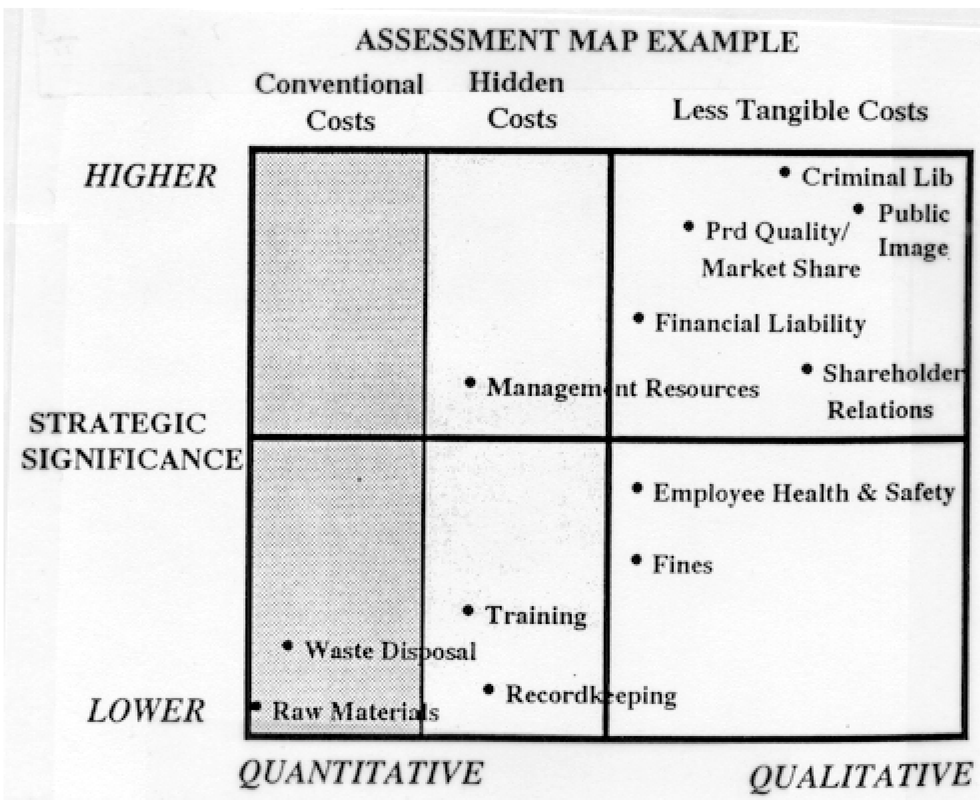
Activity-Based Costing (ABC) is a two step process — first, you determine the costs of significant activities and second, you assign the costs of activities to cost objects such as products, customers or services. When assigning costs, you have to remember that some facility-level costs do NOT go away such as the CEO's pay, environment, health, and safety, research and development and even the cost of accounting. We have to assign those costs to activities so that quality, delivery, costs, and time are evaluated simultaneously. The following diagram offers one example of how issues and costs might be mapped for a particular pollution prevention project.



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Environmental costs are broken out in the following table and you can see that they are not just based on labor hours to perform tasks but rather, reflect labor, materials, equipment and other costs such as insurance and regulatory fees. These are the common cost items often associated with pollution prevention projects.

ENVIRONMENTAL COSTS

LABOR	MATERIALS	EQUIPMENT	OTHER
production work	raw materials	**production equipment**	**depreciation**
material handling	**solvents**	cleaning/degreasing	**waste disposal**
inspection	process water	material handling machinery	insurance
recordkeeping	cleaning water	waste treatment	**utilities**
manifesting	office supplies	wastewater treatment	**regulatory fees**
labeling	training materials	air pollution control	taxes
stocking	safety materials	painting equipment	maintenance
training	parts	protective equipment	lab fees
permitting		storage equipment	

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YOUR TURN - What records and personnel will you need to establish an activity-based accounting system for multi-media wastes, energy and time?

6) EVALUATE POLLUTION PREVENTION (P2) OPTIONS

When the causes of waste are understood, the pollution prevention assessment process enters the creative phase. Your objective at this step is to generate a comprehensive set of pollution prevention options. Consider every wastestream as a reduction opportunity until proven otherwise. Most of the time, an opportunity exists if a wastestream exists.

Following the collection of data and site inspections, the members of the team will have begun to identify possible ways to reduce waste in the assessed areas. Identifying potential options relies both on the expertise and creativity of the team members. Much of the information you need can come from their education and on-the-job experience.

Don't forget to utilize available pollution prevention information resources such as the Kentucky Pollution Prevention Center (KPPC), the Waste Reduction Resource Center for the Southeast, EPA's telephone hotlines and the Enviroene electronic bulletin board, or the Kentucky Department of Environmental Protection (addresses and phone numbers are at the end of this handbook in Appendix C). Also, associations, vendors/suppliers, and consultants are valuable resources. These and many other sources contain information on what other companies have done to source reduce waste generation.

Rank your options using the following waste management hierarchy:

1) **Source reduction options**:
- Improved operating practices
- Employee training and awareness programs
- Scheduling to eliminate frequent equipment cleaning
- Process improvements
- Input changes
- Changes in the composition or design of a product
- Separation of wastes

2) Reuse/ Recycling options:

- Return a waste into the originating process as a substitute for a raw material
- Use a waste as a raw material in another process
- Reclaim a waste for sale or use as a fuel
- Utilize waste exchange services

3) Treatment options:

- Process a waste, hazardous or not, to reduce disposal cost and to minimize environmental damage. Consider treatment options only after identifying all acceptable pollution prevention techniques.

Your pollution prevention team should list all the possible opportunities to reduce waste within the facility. The list may include several options for each wastestream or process. At this stage in the assessment process, assessors should not consider in detail the technical or economic usefulness of any particular option. Develop the list based on a broad range of general opportunities identified by asking questions about each phase of your process:

- Product design: Does product design require use of hazardous materials in later stages of production? Could negotiation with the customer produce desirable changes in product formulation or design?

- Raw material substitutions: Would different materials result in a less-hazardous or less-toxic product? Do raw materials require use of hazardous materials in later stages of production?

- Materials handling: Is the form in which raw materials are received constraining design or processing? Are materials delivered in just-enough, just-in-time fashion?

- Changes in processes, equipment, or operations: Would upgrading machinery result in less use or release of hazardous materials? Do production runs and schedules optimize the use of material?

- Housekeeping procedures: What housekeeping or operations procedures cause problems later on?

- Maintenance procedures: Is maintenance adequate, regularly scheduled, and implemented?

- Training procedures: Are operators trained in (and using) the most efficient production processes?

- In-process recycling/reuse: Are there ways to recycle materials within the production process for later reuse?

- Reclaiming, recycling, and reusing of wastestreams: Are there ways to recycle materials outside the process, at the facility, in a way that minimizes the risk of worker exposure or release to the environment?

WHAT HAVE YOU FOUND?

Now you're ready to discuss your results with plant personnel and company management. The screening activity should promote the best options for technical and economic feasibility analyses. You need a detailed analysis from both the technical and economic viewpoints in order to choose the best waste reduction options.

Technical evaluation

Determine whether a proposed option will work, and whether there are any facility constraints or product requirements which make it technically unwise to install and operate. The completed technical evaluation is reviewed by ALL affected groups. If a project appears impractical, or is found unacceptable through unsatisfactory answers to any of the questions on the next page, drop it until more promising options have been investigated.

Economic evaluation

If capital expenditures are necessary, generate as accurate an estimate as possible of the total cost of implementation. Companies with sizable engineering departments probably have pre-set methods of estimating capital projects. If you are a smaller company, be sure that the capital cost estimate includes ALL costs incurred in getting the new process or equipment to the site, installed and ready to operate.

There may be increased costs you must consider in operating cost estimates: energy, material handling, maintenance, training, etc., for the new process or equipment. Use the capital and operating cost estimates as the basis for arriving at a final recommendation by whatever method the company normally uses for profitability analysis (i.e. return on investment, pay back period, net present value).

During the screening procedure, assessors should consider:

- Does it have a good track record? If not, is there convincing evidence that the option will work as required?
- What other benefits will occur?
- Does the option have a good chance of success? (A successful start for a P2 program will gain wider acceptance as the program progresses.)
- Can you implement it within a reasonable amount of time without disrupting production?
- Does the necessary technology exist to develop it?
- What is the main benefit gained by implementing this option (e.g., economics, compliance, liability, workplace safety, etc.)?
- How much does it cost? Is it cost effective?

These technical and economic calculations should lead to the final ranking of the most reasonable options. The waste assessment tracks all wastes produced at a business to find out where it was generated. When the tasks outlined above are completed, you can write into the plan a description of options and a schedule for implementation. You will find some options (such as procedural changes) are inexpensive and quick to implement. The screening procedure should account for ease of implementation. If an option is clearly desirable and inexpensive, promote it.

7) IMPLEMENTATION

Implement operational, procedural, or materials changes (without changing equipment) as soon as you determine potential cost savings. In plans that call for equipment changes, it's essentially no different from any other capital improvement project. The phases of the project include planning, design, procurement, and construction or installation.

Once the reduction techniques are identified, develop an implementation plan for each wastestream. This plan should include the implementation schedule, equipment needs, conceptual design, implementation requirements, management requirements, and cost estimates.

The implementation schedule and goals for the plan should include:

- Selecting alternatives for implementation (prioritize and list conditions for adoption)
- Identifying measurable, performance goals for each hazardous wastestream
- Establishing outcome objectives and ranges of acceptability
- Identifying steps or phases and timing for implementation
- Identifying tasks and personnel assignments
- Training and involving all personnel in the business
- Setting target dates for completion of goals

Several attitudes can prevent successful implementation of pollution prevention options, which is frustrating to the assessment team. The important factor at this point is that the pollution prevention task force MUST NOT consider the job complete until the recommended measures are implemented, or at least until the project is funded and scheduled.

Some barriers you can expect include:

- Other corporate priorities for use of capital resources
- Skepticism , "it won't work," or "we've tried that before"
- The Status Quo , "if it ain't broke, don't fix it."

This pollution prevention program is designed and organized to overcome such attitudinal barriers early by:

- Obtaining high-level commitment
- Representing all groups in the plant on the task force
- Carefully analyzing and evaluating all options

BUT, the assessment team must keep selling the package until it's a success.

YOUR TURN - What barriers do you expect to implementing your pollution prevention plan?

8) MEASURING P2 RESULTS

In order to measure the success of the pollution prevention plan, specific waste reduction performance goals must be established and expressed in numeric terms. This does not mean percent reduction, but actual reductions in pounds, tons, or kilograms of waste generated per standard unit of production, as defined by the generator. If the establishment of numeric performance goals is not practical, include a clearly stated list of actions designed to lead to the establishment of numeric goals as soon as possible in your pollution prevention plan.

Demonstrating that your plan's objectives and goals have been achieved is essential. The following are some useful measurements:

- Ratio of waste generated to production unit or rate, before and after implementation of the option
- Savings in raw materials costs and waste disposal costs
- Changes in the composition and/or toxicity of wastes
- Insurance and liability savings for environmental, health and safety improvements
- Changes in utilities and maintenance costs
- Changes in production capacity and product quality
- Ratio of raw materials consumed to production rate, before and after implementation (an indirect measure of waste reduction)
- Reduced health and safety exposure of workers and the community
- The program's actual costs and savings compared with the initial program estimates

In general, waste generation depends directly on the production rate. Measuring pollution prevention by comparing quantity of waste or input materials to production rate is generally more useful if applied to a single production unit rather than to an entire plant. This is especially true of plants where dissimilar processes and operations are included in one facility. Consider wastes generated on a periodic basis, such as waste from maintenance or construction, separately from production wastes, unless the evaluation includes at least one repetition of the periodic cycle.

One measure of effectiveness for a waste reduction project is the project's effect on the organization's cash flow. The project should pay for itself through reduced waste management costs and reduced raw materials costs. However, measuring the actual reduction of waste is also important. The easiest way to measure waste reduction is by recording the quantities of waste generated before and after a waste reduction project was implemented. The difference, divided by the original rate of waste generation, represents the percentage of waste reduced. However, this simple measurement ignores other factors also affecting the quantity of waste generated.

The ratio of waste generation rate to production rate is a convenient way to measure waste reduction. However, this ratio is not accurate for large quantities of waste that is generated infrequently. To assure accuracy, distinguish between production-related wastes, maintenance-related wastes, and clean-up wastes.

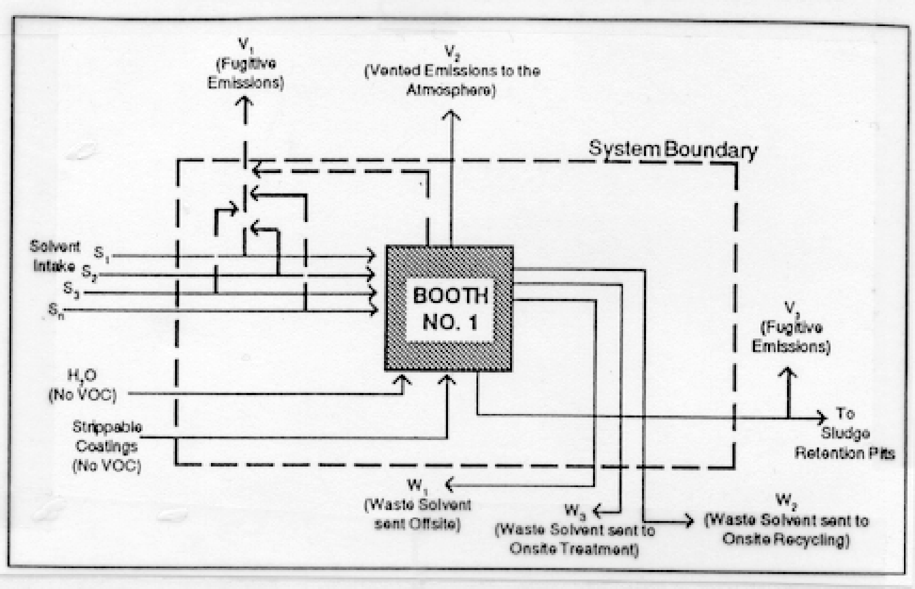
Also, a few wastestreams may be inversely proportional to production rate. For example, waste from old materials will increase if the production rate decreases. This is because the old materials in inventory are more likely to expire when its production use decreases.

In measuring waste reduction, businesses should measure the total quantity of an individual wastestream as well as the individual waste components. Often, good housekeeping and concentrating a dilute aqueous waste cause much of the reduction. Although concentration, as such, does not fall within the definition of waste reduction, practical benefits result from concentrating water wastestreams, including decreased disposal costs. Concentrating a wastestream makes it easier to recycle and may reduce the load on a facility's wastewater treatment system .

Obtaining good quality data for wastestream quantities, flows, and composition can be costly and time consuming. For this reason, in some instances, expressing waste reduction indirectly in terms of the ratio of input materials consumption to production rate may be practical. These data are easier to obtain although the measure is not direct.

Measuring waste reduction with a ratio of waste quantity to material throughput or product output is generally more meaningful for specific operations rather than for an entire facility. Therefore, preserving the focus of the project when measuring and reporting progress is important. For those operations without chemical reactions, measuring progress with the ratio of input material quantity to material throughput or production rate may be helpful.

Schematic of a spray booth cleaning unit operation system.



9) A LONG-TERM COMMITMENT

To insure continued reductions, a business must monitor and evaluate techniques once they are in place. Your plan should address updating procedures as well as combining the program into the management structure. In addition, the program should allow for production changes and development of new reduction techniques.

Pollution prevention planning (and assessing) offers ways to improve management of a source reduction program and introduce new technologies and practices.

Much of the planning for a pollution prevention program requires:

- **Increased awareness and attention to toxic chemicals**
- **Increased awareness and training to change old work patterns**
- **Knowledge of options for change**
- **Willingness to experiment and to change**
- **Management's willingness to provide resources for change**
- **Willingness to follow through, evaluate, and learn from changes**

Management's commitment to change makes the difference between simply preparing a plan, and preparing and **implementing** a plan. Implementation is the key. Since changes seldom occur as planned, and facilities change over time, you need to monitor your pollution prevention plan to ensure its usefulness. This means long-term management support and, in many cases, a champion within the organization whose job includes staying abreast of the pollution prevention program and making needed updates.

By following these nine steps and using the information resources listed in the back of this handbook, you'll make a great

Pollution Prevention Champion!

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Waste Minimization: Environmental Quality with Economic Benefits. EPA/530-SW-87-026. Washington, DC: US EPA Office of Solid Waste and Emergency Response, 1987. 800-369-5888.

POLLUTION PREVENTION INFORMATION

The Kentucky Pollution Prevention Center (KPPC)
The University of Louisville
Room 420, Academic Building
Louisville, KY 40292
Phone: 502-852-0965 Fax: 502-852-0964
WWW - http://www.louisville.edu/org/kppc

KPPC provides information on techniques designed to reduce all wastes to all media — land, air, and water. This is accomplished through confidential, non-regulatory, on-site assessments, an information clearinghouse, and training seminars and activities.

Cam Metcalf, Executive Director
Keith Ridley, Assistant Director, Assessment
Melinda Latham, Administrative Assistant
Allan Handmaker, Technical Coordinator
Patricia Longfellow, Program Assistant III
and retired waste reduction engineers throughout Kentucky and EPA Region IV.

Waste Reduction Resource Center for the Southeast
PO Box 27687
3824 Barrett Drive
Raleigh, NC 27611-7687
(800) 476-8686

WRRC is staffed by five engineers who provide confidential waste reduction technical assistance on a variety of industry specific techniques. The Center houses an extensive collection of information concerned with waste reduction options.

US EPA
Pollution Prevention Office
401 M Street, SW
Washington, DC 20460
(202) 245-3557
Provides information on reducing industrial pollutants.

US EPA
Pollution Prevention Information Clearinghouse Technical Support
Science Applications International Corporation
7600-A Leesburg Pike
Falls Church, VA 22102
(703) 821-4800
Technology transfer of methods to reduce industrial pollution including information packets and the PIES on-line data base.

US EPA - Office of Research and Development
Pollution Prevention Research Branch
26 West Martin Luther King Drive
Cincinnati, OH 45268
(513) 569-7215
Publishes information for industry based on Pollution Prevention research.

US EPA - Region IV
Pollution Prevention Office
345 Courtland Street, NE
Atlanta, GA 30365
(404) 347-3555
Regional office that provides Pollution Prevention information.

US EPA Asbestos and Small Business Ombudsman
401 M Street, SW A-149 C
Washington, DC 20460
(800) 368-5888
Distributes information to businesses on a variety of health and environment issues.

APPENDIX A:

RCRA PERSONNEL TRAINING CHECKLIST

EXCERPT FROM 40 CFR 265

§ 265.16 Personnel training.

(a) (1) Facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with the requirements of this part. The owner or operator must ensure that this program includes all the elements described in the document required under paragraph (d)(3) of this section.

(2) This program must be directed by a person trained in hazardous waste management procedures, and must include instruction which teaches facility personnel hazardous waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed.

(3) At a minimum, the training program must be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems, including where applicable:

(i) Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment,

(ii) Key parameters for automatic waste feed cut-off systems;

(iii) Communications or alarm systems;

(iv) Response to fires or explosions,

(v) Response to ground-water contamination incidents; and

(vi) Shutdown of operations.

(b) Facility personnel must successfully complete the program required in paragraph (a) of this section within six months after the effective date of these regulations or six months after the date of their employment or assignment to a facility, or to a new position at a facility, whichever is later. Employees hired after the effective date of these regulations must not work in unsupervised positions until they have completed the training requirements of paragraph (a) of this section.

(c) Facility personnel must take part in an annual review of the initial training required in paragraph (a) of this section.

(d) The owner or operator must maintain the following documents and records at the facility:

(1) The job title for each position at the facility related to hazardous waste management, and the name of the employee filling each job,

(2) A written job description for each position listed under paragraph (d)(1) of this Section. This description may be consistent in its degree of specificity with descriptions for other similar positions in the same company location or bargaining unit, but must include the requisite skill, education, or other qualifications, and duties of facility personnel assigned to each position;

(3) A written description of the type and amount of both introductory and continuing training that will be given to each person filling a position listed under paragraph (d)(1) of this section;

(4) Records that document that the training or job experience required under paragraphs (a), (b), and (c) of this section has been given to, and completed by, facility personnel

(e) Training records on current personnel must be kept until closure of the facility. Training records on former employees must be kept for at least three years from the date the employee last worked at the facility. Personnel training records may accompany personnel transferred within the same company.

RCRA Personnel Training Checklist

1 Do you generate RCRA hazardous waste?

If "NO," no training is required or needed

2. Are you a "CESQG" (never as much as 100kg of hazardous waste in any one month)?

If "YES," no training is required by law. It may, however, be advisable.
If "NO", continue to next question.

3. Are you an "SQG" (never as much 1000 kg of hazardous waste in any one month)?

If "NO," skip to Question 6.

4. If "YES," do you accumulate hazardous waste on site before shipping to a TSDF?

If “NO," no training is required by law. It may, however, be advisable.

5. If "YES," have you made sure that "all employees are thoroughly familiar with the proper waste handling and emergency procedures relevant to their responsibilities during normal operations and emergencies?"

6. If you are a “LQG” (1000 kg or more of hazardous waste in any one month), do you accumulate hazardous waste on site before shipping to a TSDF?

If "NO," no training is required by law. It may, however, be advisable.
If "YES," continue with the remaining questions.

7. Have you trained facility personnel in:

\>> Procedures for proper use, repair and maintenance of emergency and monitoring equipment?
\>> How to stop flow of waste in case of an emergency?
\>> Communications and alarm systems in the facility?
\>> Emergency response to fires and/or explosions?
\>> Emergency response to spills which threaten surface or ground water?
\>> How to shut down operations in those emergencies?

8. Have you ensured that new employees, or those newly assigned to this position, have completed this training within their first six months on the job?

9. Do all affected personnel take part in an annual review of this training?

10. Do you maintain the following records and have documentation readily available at the facility:

>> The job title for each hazardous waste-related position, and the name of the person who fills that position? A written job description for each of those positions?

>> A written record of the types, amounts, and dates of training given to each of the hazardous waste workers?

>> Do you maintain detailed records of the content of this training to demonstrate that it conforms to 40 CFR Part 265.16?

11. Do you retain training records on current personnel permanently, and on former employees for at least three years?

APPENDIX B:

WASTESTREAM DATA SHEETS

WASTE STREAM DATA SHEET #3

Department All Waste Coordinator

Waste Name Light Bulbs (Crushed tubes)

Process Generating The Waste All departments

Waste Generation Rate (Gallons or Pounds Per Month) Varies

Current Disposal Procedures Shipped to Approved Vendors for Recycling

can be made. One Time Disposal? [N]

Have You Classified Your Waste?
Hazardous [X] D009 (If so list the EPA Waste Codes) Non Hazardous [ ]

How Have Your Made This Determination?
Testing [X] (If so attach results) Process Knowledge: (Consult CES) [X]

Waste Composition	Percent
1. Glass/Metal	>99
2. Mercury	<.2PPM
3.	
4.	
5.	
6.	
7.	
8.	
9.	

General Parameters: Flash Point N/A Degrees F pH N/A Specific Gravity N/A

Physical State at 70 DegreesF Solid [X] Liquid [ ] Semi Solid [ ] Gas [ ]

Identify Waste Packaging Type and Size: 17H 55 Gallon Drums

Waste Coordinator Signature Date

WASTE STREAM DATA SHEET #4

Department ______________ Waste Coordinator ______________

Waste Name Oily Rags

Process Generating The Waste Maintenance

Waste Generation Rate (Gallons or Pounds Per Month) 55 gallon drum every 3 months

Current Disposal Procedures Oily rags are packaged and shipped to Rineco.

One Time Disposal? [N]

Have You Classified Your Waste?

Hazardous [ ] ______________ (If so list the EPA Waste Codes) Non Hazardous [X]

How Have Your Made This Determination?

Testing [X] (If so attach results) Process Knowledge: [X]
(Consult CES)

Waste Composition	Percent
1. Miscellaneous Used Oils	20
2. Cloth Rags	80
3.	
4.	
5.	
6.	
7.	
8.	
9.	

General Parameters: Flash Point ______ Degrees F pH ______ Specific Gravity ______

Physical State at 70 DegreesF Solid [X] Liquid [ ] Semi Solid [ ] Gas [ ]

Identify Waste Packaging Type and Size: 55 Gallon Drum DOT 17E

Waste Coordinator Signature ______________ Date ______________

ANALYSIS OF WASTE STREAMS

Plantwide

Plant Waste Producing Activity	Waste Material Produced	Estimated Amount of Waste Produced Per Year	Current Waste Disposal Method	Goals

APPENDIX C:

CONTACTS FOR:

KY DEPARTMENT OF ENVIRONMENTAL PROTECTION FIELD OFFICES

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET

KENTUCKY DEPARTMENT OF ENVIRONMENTAL PROTECTION FIELD OFFICES

Ashland Office
3700 13th Street
Ashland, Kentucky 41105-1507
606/920-2071

Bowling Green Office
108 Westen Avenue
Bowling Green, Kentucky 42104-3356
502/843-5475

Columbia Office
PO Box 335
102 Burkesville Street
Columbia, Kentucky 42728-1408
502/384-4734

Florence Office
Suite #8
7964 Kentucky Drive
Florence, Kentucky 41042-2915
606/292-6411

Hazard Office
PO Box 2
233 Birch Street
Hazard, Kentucky 41701-2115
502/435-6022

London Office
238ARegional State Office Building
Room 345
85 State Police Road
London, Kentucky 40742-9008
606/878-0157

Louisville Office
312 Whittington Parkway, Suite 201
Louisville, Kentucky 40222-4925
502/595-4254

Madisonville Office
State Office Building
625 Hospital Drive
Madisonville, Kentucky 42431-1698
502/824-7529

Morehead Office
Mabry Building
200 Kentucky Highway 32 South
Morehead, Kentucky 40351-1346
606/784-6635

Owensboro Office
Suite #700
Alvery Park Drive West
Owensboro, Kentucky 42303
502/686-3304

Paducah Office
4500 Clarks River Road
Paducah, Kentucky 42003-0823

Maxey Flats
Highway 1895, Route 2, Box
Hillsboro, Kentucky 41049-9608
606/784-6612

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET

OFFICE OF THE SECRETARY 5th Floor, Capital Plaza Tower		Work*
Cabinet Secretary	Phillip J. Shepherd	4-3350
Deputy Secretary	Karen Armstrong-Cummings	4-3350
Principal Assistant	Mark York	4-3350
Ombudsman	Judith Petersen	4-3350
Ombudsman	Pamia Wood	4-3350
Ombudsman, Air	Rose Marie Wilmoth	4-3350
Budget Officer	Melanie Bailey	4-3368
Office of Adm. Hearings	Barbara Foster	4-7312
Office of Communications	Faun Fishback	4-5525
Director, OAS	Boyce Wells	4-7320
Assistant Director, OAS	Roger McCann	4-7320
Personnel Branch	Trinta Cox	4-7320
Finance Branch	Jim Reynolds	4-7364
Data Processing Branch	Belenda Holland	4-5174

OFFICE OF LEGAL SERVICES
5th Floor, Capital Plaza Tower

General Counsel	Jody Curry	4-5576
Surface Mining Division	Iris Skidmore	4-5576
Natural Resources	Kathy Hargraves	4-5576

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
14 Reilly Road

Commissioner	Robert Logan	4-3035
Deputy Commissioner	Russ Barnett	4-2150
Division of Water	Jack Wilson	4-3410
Division of Waste Management	Pat Haight	4-6716

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100 Sower Blvd., Ste. 104		
Div. of Environmental Services	William Davis	4-6120
803 Schenkel Lane		
Division for Air Quality/Director	John Hornback	3-3382

DEPARTMENT FOR NATURAL RESOURCES

107 Mero Street		
Commissioner	William Martin	4-2184
Executive Staff Advisor	Joe Dietz	4-2184
691 Teton Trail		
Division of Conservation	Steve Coleman	4-3080
Division of Energy	John Stapleton	4-7192
627 Comanche Trail		
Division of Forestry	Mark Matuszewski	4-4496

DEPARTMENT FOR SURFACE MINING RECLAMATION AND ENFORCEMENT

#2 Hudson Hollow		
Commissioner	Carl Campbell	4-6940
Division of Permits	Fred Kirchhoff	4-2320
Division of Field Services	Dave Nance (Acting)	4-2340
618 Teton Trail		
Division of Abandoned Lands	Steve Hohmann	4-2141

ENVIRONMENTAL QUALITY COMMISSION

14 Reilly Road		
Director	Leslie Cole	4-2150
Chair	Wm. Horace Brown	4-2150

NATURE PRESERVES COMMISSION

801 Schenkel Lane		
Director	Bob McCance	3-2886
Chair	Hugh Archer	

PETROLEUM STORAGE TANK ENVIRONMENTAL ASSURANCE FUND COMMISSION
911 Leawood Drive

Acting Director	Laurance McCabe	4-5981

Bob Ware 839-4696
Bill Berger-Emergency Response 4-341 0 or 4-2380

*Area Code/Prefix: 502-56

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APPENDIX D:

TWO SAMPLE POLLUTION PREVENTION (P2) PLANS

XYZ WIDGETS CORPORATION
2200 Widget Road
Anytown, Kentucky 40000

POLLUTION PREVENTION PLAN

September 1, 19___

POLLUTION PREVENTION PLAN

Facility Identification and Information

Company Name:

Mailing Address:

Contact Person: Telephone:

Certification:

I certify that I have personally examined this pollution prevention plan, and that I am familiar with its contents and all attachments. Based upon my inquiry of those persons immediately responsible for obtaining the information, I believe the information presented in the plan is true, accurate, and complete.

Owner or Senior Management Official

Name (Please print or type) Title

Signature

PREFACE

XYZ Widgets Corporation has always been concerned with protecting the environment and keenly aware of its role as a good neighbor in the community. It has long been a policy that we go well beyond what is legally required and strive for zero discharge of pollutants into the environment, whether on-site or off-site.

We recognized long ago that reduction of wastes has definite economic benefits as well as environmental ones. Consequently, a program called SWAP (Stop Waste, Add Profits) was begun in 1990 under which teams were formed to reduce our wastes to the lowest cost-effective level, beginning with the most "environmentally unfriendly." Under this team approach, the wastes were identified and arranged in order of environmental impact. The processes which caused them to be generated were analyzed to determine what source reduction measures were available for each. The analysis resulted in reduction priority being given to the two of the three largest hazardous waste streams generated at that time. As a result of our waste reduction measures, those two streams were reduced as follows between 1989 and the date of writing this Waste Reduction Plan:

			REDUCTION (1989-91)	
WASTE STREAM	1989 LBS.	1991 LBS.	LBS.	%
"TCA"	15,000	0	15,000	100
Varsol	39,000	12,130	26,870	69
"MEK"	1,050	1,200	-150	(14) gain
"PERC"	15,000	18,500	-3,500	(23) gain

The PERC waste stream was not reduced because of rigid contractual rules. Attempts to obtain contract revisions to remove this barrier have been under way for months, but have been unsuccessful so far. Although we would like to project reduction goals for the PERC waste stream, it is generated making a product under U.S. Department of Defense contracts specifying procedures which preclude source reduction of hazardous materials.

In both cases where our efforts have been successful, reductions have been accomplished by process changes and by training which increased employee awareness of how their actions can be directly responsible for generating unnecessary waste.

Our teams are currently working on all waste streams generated in the plant, hazardous or not. Cost estimates on which to base capital funding to implement further reduction are being made. The goals and schedule for accomplishing further hazardous waste reduction from the present to the end of 1995 are detailed later.

We are confident we can meet the goals set forth in this plan, especially with strong support from corporate management as stated in the *Pollution Prevention Policy Statement,* a key element of the plan.

POLLUTION PREVENTION POLICY STATEMENT

XYZ Widgets Corporation
September 1, 199__

This corporation is committed to excellence and leadership in protecting the environment from being adversely affected by any material emitted from our manufacturing operations.

It is further committed to the concept that wastes of any kind to any medium represent costs which must be reduced to the economically and technically achievable minimums.

We reaffirm here our Corporate goals to provide a safe and healthy environment for employees and to be a good neighbor to the community in which we reside.

Therefore, our policy is, and shall be, to constantly seek opportunities to:

+ Reduce wastes at the source, through employee training in waste awareness, through substitution of environmentally friendly raw materials wherever possible, and by ongoing analysis of processes and operations to identify causes of waste,
+ Replace existing waste-generating processes with those which generate fewer or less-hazardous wastes,
+ Revise processes so that wastes can be re-used or recycled within them,
+ Market new or re-designed products whose manufacture results in reduced wastes, or for which existing wastes become raw materials, and
+ Urge suppliers to develop products and procedures which will assist us to reduce wastes generated.

In order to ensure that this policy is carried out, we pledge that we will make available the necessary resources to our employees so that opportunities determined to be feasible will be implemented. To encourage such implementation, economic justification of projects resulting in waste reduction at the source will require a return on investment which is no more than three-fourths of that required for conventional projects.

Chairman & Chief Executive Officer	President & Chief Operating Officer
Vice President, Manufacturing	Vice President, Financial
Vice President, Marketing	Vice President, Procurement

XYZ WIDGETS CORPORATION
POLLUTION PREVENTION PLAN

STATEMENT OF SCOPE AND OBJECTIVES

SCOPE OF THE PLAN:

Although this plan is written to meet the voluntary planning responsibilities of the Kentucky Revised Statues 224.46-305etseq., the XYZ Widgets Corporation 's *Stop Waste, Add Profits* (SWAP) program applies to all hazardous and non-hazardous wastes generated by operations conducted at the Anytown, Kentucky facility. The plan, in future updates, will be amended to include all the following in addition to RCRA hazardous wastes and Section 313 toxic chemicals, which are being given first priority:

+ Point source and fugitive emissions to the air;
+ Liquid waste discharges to the municipal sewer;
+ Raw material and finished goods scrap; and
+ Non-hazardous solid wastes such as general plant trash, office and lunchroom waste,

The plan calls for positive commitment to its objectives by Corporate management, and for involvement of every person employed at the facility.

OBJECTIVES OF THE PLAN:

The plan has two objectives:

1. To reduce all waste streams (as defined in the statement of the Plan's scope) to the minimum quantity which is technically feasible and economically practical.

2. To continue in perpetual effect as an instrument which will:
   + Maintain Corporate waste awareness;
   + Ensure on-going analysis of factors influencing waste generation; and
   + Provide continuing employee training.

ESSENTIAL ELEMENTS OF THE PLAN:

1. A facility-wide waste assessment will be conducted to less frequently than annually. The assessment will be conducted by the Plan's administrative team. The plant-wide assessment will be scheduled so that its results will be available to Process Teams when they establish their annual goals.

2. All new processes and all major process changes will require a waste stream impact study.

3. Employee training on waste reduction will be embedded in the existing and on-going Safety and OSHA Employee Right-to-Know training program. For those employees who are required to have special hazardous materials training, a waste-reduction component will be incorporated in that training as well.

4. Each Process Team will be required to measure and track all wastes generated by the team's activities. A process team will be responsible for and bear the expense of its waste streams, which will be a part of the team's cost-budgeting structure. Tracking of wastes will be accomplished by a mass-balance technique which will ensure that all materials are truly accounted for.

5. Financial tools will be utilized so that the full cost impact of each waste stream generated is tracked.

6. Each Process Team will establish a pollution prevention goal and an implementation schedule at the beginning of each year. A progress report and the next year's goals and implementation schedule will be submitted by January 5 of each year.

DESCRIPTION of the PLAN

1. Administration

The Pollution Prevention Plan will be administered by a SWAP Team to be headed by the Vice President, Manufacturing.. The team will composed of the following:

+ Technical Coordinator;
+ Environmental & Safety Director;
+ Maintenance Superintendent;
+ Purchasing Agent;
+ Staff Accountant; and
+ One representative from each Process Team

The duties of the team will include:

+ Administer the plan;
+ Schedule and conduct the annual facility-wide assessment;
+ Appoint sub-teams to analyze assessment results, consider options and make recommendations for the entire team's consideration;
+ Meet regularly to review waste data, project progress and make new assignments;
+ Report findings, make final recommendations, and initiate project requests for implementation and corrective action; and
+ Prepare the annual progress report and update the Plan and the goals and implementation schedule as and if necessary.

2. Training and Worker Involvement

Pollution Prevention will be incorporated into the existing training curriculum wherein employees are trained on the general nature of chemical hazards, safe operating procedures and use of MSDS's. Employees in a process area will be required to evaluate their own area's waste streams and be provided with resource material which describes the technology available and currently used for reduction of waste streams of similar nature or in similar processes. Major emphasis will be on preventing waste generation by improved procedures, material substitution and process changes.

3. New Processes, New Products and Major Changes

New processes and products or major changes will be installed only after an analysis of the waste stream impact. New start-ups and major changes will require an estimate of the type and volume of the waste generated, its environmental impact and related costs. Product development groups will be required to assess waste impact early in their design considerations. Any significant additional waste generated will require a challenge to the design before work proceeds. Manufacturing teams will need to be apprised early in the development as to the nature of the required manufacturing process and asked for input on the anticipated waste streams' impact. Production teams will have a strong incentive to challenge changes and new products because they are ultimately responsible for managing and must budget the cost of their waste streams.

4. Waste Management Cost Accounting

A mass balance analysis technique (total pounds of all materials in = total pounds of all materials out) will be used to identify all input and output streams to each individual process. Once waste streams have been identified and quantified by this analysis, waste will be reported in weight per unit of production. For example, the process manufacturing Type A Widgets will report all waste streams in pounds per 1000 Type A Widgets made.

This information will be logged by operating personnel on a shift-by-shift basis and turned over to accounting for cost calculation. because of the differing nature and processing involved in the various wastes, waste costs will be established in dollars per pound on a case-by-case basis. In the case of product rejects, the process team will classify rejects in five categories, according to the value added by manufacturing at the point of rejection.

A. Waste Streams No.1: Perchloroethylene (PERC); EPA Waste Code F001

SOURCE

Type X Widget Department

OPERATION GENERATING WASTE

Vapor degreasing to remove machine coolant prior to in-process inspection

BARRIERS TO REDUCTION

Type X Widgets are produced under a DOD contract which specifies the process in great detail. PERC is used in this department in a vapor degreaser to remove chips and oils resulting from first-stage machining so that the parts can be individually inspected. Because of potential corrosion by hydrochloric acid resulting from solvent degradation, the DOD contract specifies replacement of the solvent charge every 100,000 widgets. The waste is generated when the degreaser is drained and solvent replaced. Given this lack of control, potential for reducing this waste is very poor.

POLLUTION PREVENTION MEASURES PREVIOUSLY IMPLEMENTED

Considerable reduction has been accomplished in the quantity of PERC lost at this location as drag-out and fugitive emissions by modifying operating procedures. However, no reduction in RCRA hazardous waste has been accomplished because of the requirement that the solvent be replaced on a regular schedule.

GENERATION HISTORY

1989: Produced 6,000,000 Widgets, Generated 15,000 pounds waste
Waste Generation Rate = 2.50 pounds per 1000 Type X widgets.

1990: Produced 6,500,000 Widgets, Generated 16,250 pounds waste
Waste Generation Rate = 2.52 pounds per 1000 Type X widgets.

1991: Produced 7,400,000 Widgets, Generated 18,500, pounds waste
Waste Generation Rate = 2.50 pounds per 1000 Type X widgets

POLLUTION PREVENTION MEASURES PLANNED

Technical liaison has been established with DOD with the objective of eliminating use of this solvent. Because of our success in totally eliminating solvent-cleaning in manufacturing Type Z Widgets, we expect to eventually negotiate contract revisions with DOD which will allow us to change to an aqueous cleaner. This technique is now in successful use making Type Z widgets. All plans to reduce hazardous waste in this operation are held in abeyance, pending definite action by DOD.. We would be able to implement the change about ten weeks after the contract revision.

POLLUTION PREVENTION GOAL

Technology already in use in this facility could eliminate this waste stream. XYZ Widgets has no control over when the decision to allow its use may come. Therefore, no reduction goal or implementation date has been set.

B: Waste Stream No.2: 1,1,1 Trichloroethane (TCA); EPA Waste Code F001

SOURCE

Type Z Widget Department

OPERATION GENERATING WASTE

Vapor degreasing of widgets prior to deburring and buffing.

POLLUTION PREVENTION MEASURES ALREADY IMPLEMENTED

Whereas this department used a vapor degreaser and TCA until late 1989, the process no longer uses vapor degreasing, but relies on a rinse of the parts in clear, ambient-temperature water to accomplish the same end. This was made possible by replacing oil-based cooling medium in the preceding machining operation with a water-based synthetic coolant.

GENERATION HISTORY

1989: Produced 6,120,000 widgets, generated 15,000 pounds waste
Waste Generation Rate = 2.50 pounds/1000 Type Z Widgets

1990: Produced 7,050,000 widgets, generated 800 pounds waste
Waste Generation Rate = 0.11 pounds/1000 Type Z Widgets

1991 and Future - No RCRA waste to be generated in this operation
Waste Generation Rate = 0.00 pounds/1000 Type Z Widgets

C. Waste Stream No. 3: Waste Varsol (Mineral Spirits); EPA Waste Code D001

SOURCES

Maintenance Shop; Tool and Die Shop

OPERATIONS GENERATING WASTE

Maintenance mechanics use Varsol-charged Safety-Sink cleaning stations to wash parts or anything they may have to clean up. A service removed dirty solvent and replaced it with clean on a regular three-week schedule. There were three sinks in the maintenance shop in 1989. In that year, these sinks were responsible for 7,500 pounds of waste manifested for off-site recovery.

The tool and die shop has two 250-gallon vats of Varsol into which stamping dies are immersed for cleaning. The solvent was replaced every nine weeks by the same company that serviced the parts sinks. They were responsible for generating 31,500 pounds of waste solvent in 1989.

POLLUTION PREVENTION MEASURES ALREADY IMPLEMENTED

During 1990 and 1991, the use of Varsol for cleaning was extensively studied, including study of work practices and evaluation of how well the existing operations were utilizing the solvent's oil-removal capacity. As a result of that study, the following measures were taken:

+ The replacement cycles for the sinks in maintenance were increased from three weeks to six weeks.
+ One of the die-cleaning vats was taken out of service.
+ The replacement cycle for the remaining die-cleaning vat was increased from nine weeks to twelve.
+ Drainboards were added to the die-cleaning vats to allow recovery of solvent dragged out on dies.

As a result of these measures, the total waste Varsol shipped off-site was reduced as indicated below:

GENERATION HISTORY

1. Maintenance Department:

1989: Processed 11,240 Maintenance Workorders, generated 7,500 pounds of waste.

Waste Generation Rate = 0.67 pounds per workorder

1990: Processed 12,100 Maintenance Workorders, generated 4,250 pounds of waste.

Waste Generation Rate = 0.35 pounds per workorder

1991: Processed 11,300 Maintenance Workorders, generated 3,800 pounds of waste.

Waste Generation Rate = 0.34 pounds per workorder.

2. Tool and Die Shop

1989: Produced 23,000,000 widgets, generated 31,500 pounds of waste.

Waste Generation Rate = 1.37 pounds per 1000 widgets.

1990: Produced 23,500,000 widgets, generated 21,900 pounds of waste.

Waste Generation Rate = 0.93 pounds per 1000 widgets.

1991: Produced 22,950,000 widgets, generated 8,330 pounds of waste.

Waste Generation Rate = 0.36 pounds per 1000 widgets.

POLLUTION PREVENTION MEASURES PLANNED

The following options are being evaluated from a technical and economic standpoint:

+ Replace all but one of the solvent type parts sinks in maintenance with a heated, agitated cleaning tank using a water/detergent solution as cleaning medium. This should allow us to reduce this department's solvent waste by another 50%.

+ Purchase and install a spray cleaner with air-drying capability for die cleaning. This should eliminate use of solvent cleaners in tool and die shop except for small hand-wipe operations.

POLLUTION PREVENTION

1. Maintenance Department

Evaluation Date	Target Waste Quantity, lbs.	Lbs. Waste/Workorder
06/30/93	2500	0.21
06/30/94	2500	0.21
06/30/95	1250	0.12

2. Tool and Die Shop

Evaluation Date	Target Quantity, lbs.	Pounds/1000 Widgets
06/30/93	8300	0.32
06/30/94	8500	0.32
06/30/95	115	0.05

D. Waste Stream No. 4: Methyl Ethyl Ketone (MEK): EPA Waste Code F005

SOURCE

Final Packaging and Inspection

OPERATION GENERATING WASTE

Type Y Widgets have a component made of highly polished stainless steel. To prevent marring of the polished surface, the stainless steel sheet is purchased with a protective paper attached by pressure-sensitive adhesive. Removal of traces of adhesive and bits of paper from the finished product is accomplished by wiping with a rag wet with MEK. The operator's supply of MEK is discarded when it becomes dirty enough to leave a dull film on the surface after it evaporates.

POLLUTION PREVENTION MEASURES ALREADY IMPLEMENTED

None - All alternative methods of cleaning tried thus far have failed.

GENERATION HISTORY

1989: Produced 10,400,00 Type Y widgets, generated 1, 050 pounds of waste.

Waste Generation Rate = 0.10 pounds/1000 Type Y widgets.

1990: Produced 9,950,000 Type Y widgets, generated 1,000 pounds of waste.

Waste Generation Rate = 0.10 pounds/1000 Type Y widgets.

1991: Produced 11,785,000 Type Y widgets, generated 1,200 pounds of waste.

Waste Generation Rate = 0.10 pounds/1000 Type Y widgets.

POLLUTION PREVENTION MEASURES PLANNED

At present there are no proven alternatives known to us. We will continue an intensive program of training and waste awareness, but reduction of any significant magnitude will be difficult to accomplish, given the present state of training.

It is planned to investigate the following potential source-reduction options. If one should be come available, it will be thoroughly evaluated from an economic standpoint, and implemented if it is not cost-prohibitive. It should be noted that the market for Type Y widgets is extremely competitive, and the profit margin is one of the lowest in our product line.

+ Obtain polished sheet from supplier with water-removable protective film; and
+ Continue search for suitable substitute cleaning material.

POLLUTION PREVENTION

It is our intention to eliminate this waste stream entirely, if an alternative method which is both effective and economically feasible can be found.

Our goal is that the Waste Generation Rate for this waste stream will be reduced 10% or to 0.09 pounds per 1000 Type Y widgets by September 30 1995.

Company ABC
Pollution Prevention Plan

September 1993
Revision: New

POLLUTION PREVENTION PLAN

Facility Identification and Information

Company Name:

Mailing Address:

Contact Person: Telephone:

Certification:

I certify that I have personally examined this pollution prevention plan, and that I am familiar with its contents and all attachments. Based upon my inquiry of those persons immediately responsible for obtaining the information, I believe the information presented in the plan is true, accurate, and complete.

Owner or Senior Management Official

Name (Please print or type) Title

Signature

PREFACE

Company ABC is committed to protecting the environment. Prior to enactment of the Kentucky Revised Statutes, Chapter 224 Environmental Protection Section 46.305 et seq., Company ABC implemented the following processes and procedures to reduce waste.

PARTS CLEANING

In 1993, Company ABC installed a Hotsy aqueous washer to replace a large solvent dip tank. The dip tank was used to clean parts that were too large for the parts cleaning tanks. The dip tank was removed a few years ago. The new Hotsy washer uses a non-hazardous detergent and hot water. No hazardous waste is anticipated to be generated from the new process.

The Hotsy cleans parts effectively and timely. Most parts can be cleaned within a 10-minute cycle. We have successfully cleaned engine blocks, engine parts, transmissions, and many other parts.

The Hotsy runs on a timer so that the washer is turned off on nights and weekends and automatically starts heating up prior to opening.

The washer also has an oil skimmer to remove oil from the water. We expect the water to last for approximately 6 months, at which time we will determine if it can be discharged to the sanitary sewer. The washer is topped off with fresh water and soap as needed.

PAINTING

In 1992, Company ABC switched from purchasing pre-mixed paints to a paint mixing process. Due to the many color and batch variations among autobody paints, we bought a large amount of paint. Paint was often wasted when we did small jobs that required little paint.

We now have a system that mixes any color or batch of paint to match the automobile paint. We mix paint in various amounts, thereby reducing excess waste.

In 1992, we also installed a gun cleaner that recirculates the solvent. Prior to installing this cleaner, our painters used a bucket of solvent and manually cleaned guns.

Company ABC
POLLUTION PREVENTION
POLICY STATEMENT

Company ABC is committed to a leadership role in protecting the environment. Whenever feasible, we will eliminate, reduce, or recycle our waste in full compliance with all Federal and State Regulations. Our employees are urged to participate in all types of pollution prevention.

________________________________ ___________________President, Company ABC Date

SCOPE AND OBJECTIVES

To comply with the voluntary planning responsibilities of KRS 224.46-305 et seq. and improve the environment, all employees of Company ABC will be involved in pollution prevention. RCRA hazardous waste and Section 313 toxic chemicals will be our first priority for waste reduction.

Our goal is to reduce hazardous waste streams to the technically feasible and economically practicable minimum by the timetable noted in the contents of the plan. We will achieve these reductions through waste reduction assessments, procedure improvements, equipment changes, material substitution, employee training and other reduction methods.

POLLUTION PREVENTION PLAN ADMINISTRATION

John Smith Foreman will act as the Pollution Prevention Coordinator for Company ABC. The Pollution Prevention Coordinator will administer the plan, prepare the annual progress report and update the plan as needed.

Pollution prevention options will be evaluated by the foreman, Service Director, Manager, and applicable employees.

Pollution prevention can only be achieved with the cooperation of employees generating the waste. Therefore, all employees will be made aware of the need for waste reduction. Training will be incorporated into the Hazard Communication training. Employees will also be trained on operator dependent pollution prevention techniques.

Waste costs are computed from the following costs:

* Cost of raw material lost to waste (if applicable)
* Labor;
* Waste transportation/treatment/disposal; and
* Laboratory fees (if applicable).

WASTE STREAM # 1: WASTE PAINT RELATED MATERIAL

Company ABC has an automated, enclosed paint booth for autobody repairs. The spray guns are manual High Volume Low Pressure (HVLP) guns. Waste is generated from leftover paint and gun cleaning. Waste is collected in 55-gallon drums and shipped off-site for fuels blending.

Waste Generation:

	WASTE GENERATED	BODYSHOP REPAIR ORDERS	WASTE (LB) PER REPAIR ORDER	COST OF WASTE
1989	1505	1342	1.12	N/A
1990	1441	840	1.72	N/A
1991	1161	1000	1.16	N/A
1992	1764	1432	1.23	$5200
1993*	1199	952	1.26	$3850

* As of July 31, 1993 N/A = Not available

Cost of waste includes transportation, disposal, and raw material loss.

Disposal/transp. $500/year
Average paint cost $35/gallon
Average thinner cost $20/gallon

In 1992, Company ABC implemented two waste reduction measures for waste contributing to the paint waste stream. A paint mixing station was installed which allowed us to mix our own paint colors. With the new paint system, we are able to mix the quantity of paint needed for the job. This reduced the excess paint, thereby reducing the waste. Weighing accuracy becomes critical. If operators do have leftover paint, it is saved in small paint containers for the next job of the same color.

We also installed a recirculating gun cleaning tank to replace manual dipping and cleaning. The gun cleaning tank holds 5 gallons of solvent. Guns and paint pots are rinsed with a small amount of solvent and then placed in the tank. The gun cleaning tank takes about 45 seconds to clean the parts. The solvent is changed monthly. Reclaimed solvent is purchased for refilling the tank.

BARRIERS TO REDUCTION

* SUBSTITUTE PAINT:
  We are currently unable to substitute a non-hazardous paint due to car manufacturers' paint types. Since we have to match GM and other car manufacturers' paint, we must use the same type. GM is currently evaluating substitute paint. If water-based paint is approved by GM, we will adopt this waste reduction strategy. Our waste generation would decrease, however the phase-out time of the solvent-based paint would be significant.
* REUSE GUN CLEANING SOLVENT TO THIN PAINT:
  This option is not feasible due to the various paint colors and types and the exact measurements of mixing. Contaminants in the thinner would ruin the paint.
* SOLVENT DISTILLING ON-SITE:
  Solvent distillation is economically unfeasible for our low generation rate.

POLLUTION PREVENTION OPTIONS

The following options are being assessed as possible pollution prevention:

* Substitute paint. This would follow auto manufacturers' lead. If implemented, we would be required to keep two systems for many years for older cars.
* Scrape paint cup with a spatula prior to placing in gun cleaner.
* Train operators to reduce overspray.
  - Ensure spray gun nozzles are clean and not damaged.
  - Maintain a gun distance of 6-8 inches from the workpiece.
  - Trigger gun at the end and the beginning of each stroke.
  - Ensure proper pressure is on gun stroke.
* Settle solids out of paint gun cleaning tank, remove and reuse the solvent.

Except for the substitute paint, the above pollution prevention measures can be implemented without a significant cost. The waste reduction would result in decreased disposal costs. Operators will be trained on above practices during 1993 and improvements will be ongoing.

Installing a water-based system will be very expensive but cost will not be a prohibiting factor. Costs at this time are unknown.

GOALS

	WASTE (LB)/REPAIR ORDER
1993	.55
1994	.50
1995	.45

WASTE STREAM #2: MINERAL SPIRITS PARTS CLEANING SOLVENT

Company ABC generates a mineral spirits parts cleaning solvent when parts cleaners are changed. We have seven parts cleaning tanks throughout the maintenance shop. Parts cleaning tank are changed as needed on a contract. The contract price includes solvent replacement, transportation, and permitted recycling.

Waste Generation:

	WASTE GENERATED (LB)	MECHANICAL REPAIR ORDERS	WASTE (LB) PER REPAIR ORDER	COST OF WASTE
1989	3868	11643	0.33	N/A
1990	2398	9469	0.32	N/A
1991	3555	10765	0.30	N/A
1992	4173	11095	0.30	$1922
1993*	2112	6592	0.28	$863

* As of July 31, 1993   N/A = Not available

In 1992, Company ABC installed an aqueous parts cleaner to replace a solvent dip tank removed a few years ago. This aqueous washer is used to clean large parts such as engine blocks, transmissions, etc. The Hotsy washer uses a detergent and hot water. We have successfully cleaned all types of parts. We anticipate changing the wash water every 6 to 12 months. We believe the wash water will be non-hazardous. The cost to purchase this size Hotsy was $6000.

POLLUTION PREVENTION

Solvent is used until its cleaning capacity is exhausted. All tanks are used regularly. At this time we will not consider on-site distillation because our intention is replacement of hazardous solvent with aqueous cleaners.

* Replace all solvent parts washers with aqueous washers. We estimate that 2 or 3 additional Hotsy's will be needed to replace our 7 solvent parts cleaners. These washers will be smaller than the one we have already installed. The cost will be approximately $3000 each. The estimated payback is 3.2 years for two washers.

* Inform operators to drain parts into tank rather than blow off with compressed air.

* Turn off parts washers when not in use. Currently, washers are turned off only during non-business hours.

The Hotsy parts washers will be purchased one per year starting in 1994. Other measures will be communicated in 1993.

GOALS

	WASTE (LB)/REPAIR ORDER
1993	.27
1994	.27
1995	.20
1996	.10
1997	0

If we are unable to purchase aqueous cleaners, we will consider solvent distillation.

Estimated Cost:

Investment of Still	$5000
Annual maintenance of waste streams:	
Replenishing solvent	$ 200
Utilities, Labor	UNKNOWN
Still bottom disposal	$ 500

Estimated Savings:

Cost of waste paint/thinner and parts cleaners	$1900

Estimated Payback: 3 years

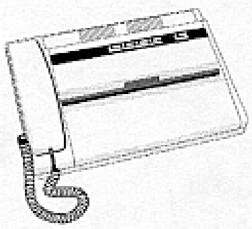
The still may also be used to distill gun cleaning solvent. The estimated payback period would not change significantly due to the low volume.

APPENDIX E:

KPPC Fax Request Form

FREE, FAST, CONFIDENTIAL INFORMATION

the RequestLine: Fax Us to Ask Us



FAX to 502-852-0964 or call (800) 334-8635 xt. 0965

☐ Please send me a listing form for the Kentucky Industrial Materials Exchange.

☐ Add me to your mailing list to receive *the Bottom Line* newsletter and notices of environmental workshops.

☐ I would like information about an on-site pollution prevention assessment.

☐ I have a difficult wastestream. I would like to work with you to reduce/ eliminate it. The wastestream/process is (briefly describe):

☐ I would like for KPPC to make a presentation at my company about pollution prevention.

Your name and title ____________________

Company Name ____________________

Address ____________________

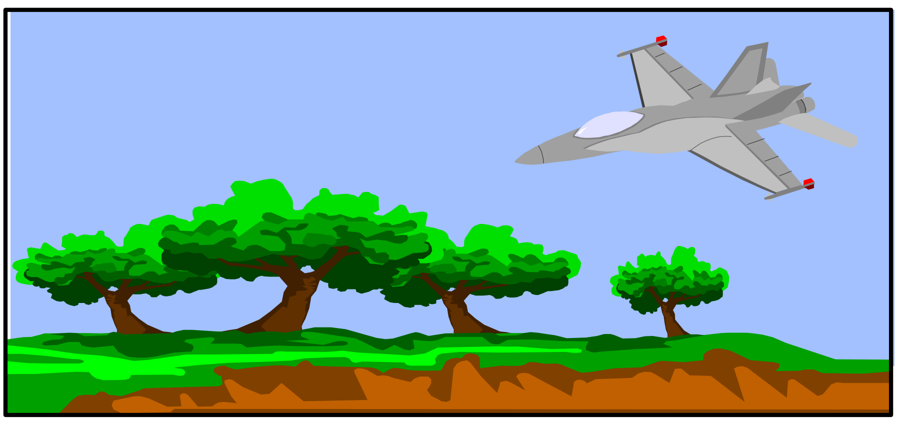
City, State, Zip ____________________

Date ____________________

U.S. AIR FORCE

INSTALLATION POLLUTION PREVENTION PROGRAM GUIDE

and
Sample Pollution Prevention Management Action Plan



July 1996

Compiled by
HQ AFCEE/EP
3207 North Road, Bldg 532
Brooks AFB TX 78235-5363

with the invaluable assistance of
a team from various MAJCOMs,
Installations, HQ AFCESA and
HQ USAF/CEVQ/SGPA

**INSTALLATION POLLUTION PREVENTION
PROGRAM GUIDE**

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CHAPTER 1
POLLUTION PREVENTION PROGRAM

1.1 Overview of Policy

The Air Force (AF) is committed to environmental leadership and preventing pollution by reducing usage of hazardous materials and releases of pollutants into the environment to as near zero as feasible. The pollution prevention concept is designed to prevent pollution by reducing or eliminating harmful discharges to the air, land, and water at the source. Pollution prevention provides every installation with the opportunity to become good stewards of the environment and to act on the 13 Mar 95 SECAF/CSAF *Environment, Safety and Occupational Health Initiatives* memorandum:

- **Sustain Readiness:** Pollution prevention is essential to maintaining and improving environmental quality. This strongly supports the initiative of "preserving the long-term environmental vitality of our training ranges and airspace."

- **Be a Good Neighbor:** Although the SECAF/CSAF memo emphasizes cooperation with local communities on restoration issues, the Emergency Planning and Community Right-to-Know Act (EPCRA - see Section 3.9) also offers pollution prevention program managers the opportunity to cooperate with local agencies. Reductions in pollutant discharges will certainly be welcomed by all communities which have AF installations as neighbors.

- **Leverage our Resources:** We "must do more today than ever before, and do it with increased cost-effectiveness." Pollution prevention reduces the costs associated with hazardous material purchases and management, hazardous waste management and disposal, compliance efforts, personal protective equipment and the health impacts resulting from exposure to hazardous substances. Pollution prevention is an opportunity to change our work processes for greater safety and efficiency, using the latest environmental technologies.

The AF pollution prevention policy is solidly in step with the national policy of the United States as stated in the Pollution Prevention Act of 1990:

> "...pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner."

The AF pollution prevention program involves efforts to reduce the use of wastes through a hierarchy of actions. The actions range from the most preferred choice of source reduction, to recycling, treatment, and finally disposal as a last resort. This hierarchy of actions must be fully integrated into day to day AF operations. By considering how **all** operations - not just those producing hazardous wastes - contribute to the pollution of air, land, and water resources, the Air Force can better identify and control pollution sources.

In keeping with the requirement for full integration, the Air Force pollution prevention program applies to all AF installations within the United States, its territories, and foreign countries. Additionally, it applies to the Air Force Reserves, the Air National Guard, and Air Force Government Owned Contractor Operated (GOCO) facilities. Each installation, including those outside the U.S., will develop and execute a Pollution Prevention Management Action Plan (PP MAP) that addresses source reduction, recycling, treatment opportunities and disposal for major pollutant sources.

For more details on Air Force pollution prevention policy, consult Air Force Policy Directive (AFPD) 32-70, Environmental Quality, and Air Force Instruction (AFI) 32-7080, Pollution Prevention Programs.

1.2 Program Goals

The *Air Force Pollution Prevention Strategy,* released by the Air Force Chief of Staff and the Secretary of the Air Force on 24 July 1995, provides the vision, objectives and goals for execution of the Air Force's Pollution Prevention program. The Vision Statement reads:

> "Effectively promote pollution prevention by minimizing or eliminating the use of hazardous materials and the release of pollution into the environment. Meet or exceed regulatory requirements through the use of education, training and awareness programs, health-based risk assessments, acquisition practices, contract management, facilities management, energy conservation, and innovative pollution prevention technologies."

This is to be accomplished through four primary objectives:

- Permeate all mission areas with the pollution prevention ethic through comprehensive education, training and awareness.
- Institutionalize pollution prevention into all phases of the weapon system life cycle.
- Incorporate pollution prevention in all aspects of installation operations.
- Develop and transition innovative pollution prevention technologies to the field.

Reduction efforts apply equally to all aspects of the AF mission: from concept through production, deployment, and ultimate disposal of new weapon systems; to finding less hazardous materials and processes and integrating them into technical orders, military specifications, and military standards for existing (deployed) systems; to reducing hazardous materials use and waste generation of installation activities. This *Installation Pollution Prevention Program Guide* will focus mainly on the third objective, achieving pollution prevention in installation operations.

In the *AF Strategy*, specific goals have been established for selected pollution prevention program components: Environmental Protection Agency 17 Industrial Toxic Pollutants (EPA-17), Hazardous Waste, Municipal Solid Waste, Affirmative Procurement, Energy/Water Conservation, Toxic Release Inventory (TRI) Chemicals, and Pesticide Management. These program components will be continuously monitored and measured against their respective baselines to ensure goals are achieved.

TABLE 1-1
AIR FORCE POLLUTION PREVENTION GOALS

PROGRAM COMPONENT:	*BASELINE YEAR:*	*GOAL:*
Environmental Protection Agency 17 Industrial Toxic Pollutants (EPA-17)	1992	50% Reduction of purchases by 31 Dec 96
Hazardous Waste Minimization	1992	25% reduction in disposal by 31 Dec 96 50% reduction in disposal by 31 Dec 99
Municipal Solid Waste	1992	10% reduction in disposal by 31 Dec 93 30% reduction in disposal by 31 Dec 96 50% reduction in disposal by 31 Dec 97
Environmentally Preferable Products (Affirmative Procurement)	None	100% of all products purchased each year in each of EPA's "Guideline Item" categories shall contain recycled materials meeting EPA's Guideline Criteria
Energy Conservation	1985	10% reduction in BTU/sq ft by 1995 20% reduction in BTU/sq ft by 2000 30% reduction in BTU/sq ft by 2005
TRI Chemical Releases	1994	50% reduction of total releases and off-site transfers by 1999
Pesticide Management	1993	50% reduction in pounds of active ingredient by 2000

Another component of the *AF Strategy* is the reduction or elimination of the use of Ozone Depleting Substances (ODS). Although there is no numeric reduction goal currently associated with purchases of ODS, their purchase requires SAF/AQ approval through the waiver process. This will be discussed further in Chapter 3.

1.3 Purpose and Organization of Guide

The purpose of this guide is to give AF personnel a comprehensive document describing how to implement AF pollution prevention policy and maintain effective programs at their installations. Pollution prevention is an evolving program; this edition of the guide is the second update to the initial edition published in July 94, and additional revisions will follow in future years. Personnel are encouraged to expand this document as required and to send suggested changes to HQ AFCEE/EP.

Chapter 1 provides the policy background, mandate, and context for the pollution prevention program. Chapter 2 describes the pollution prevention process and the MAP as an execution tool. Chapter 3 details the program components including ozone depleting substances; EPA-17 target chemicals; hazardous materials/waste; municipal solid waste; affirmative procurement; energy and water conservation; EPCRA, including the Toxic Release Inventory; and pesticide management. Chapters 4 through 7 focus on other aspects of an effective program, to include team building, programming and budgeting, technology needs, and sources of information.

CHAPTER 2
POLLUTION PREVENTION AS A PROCESS

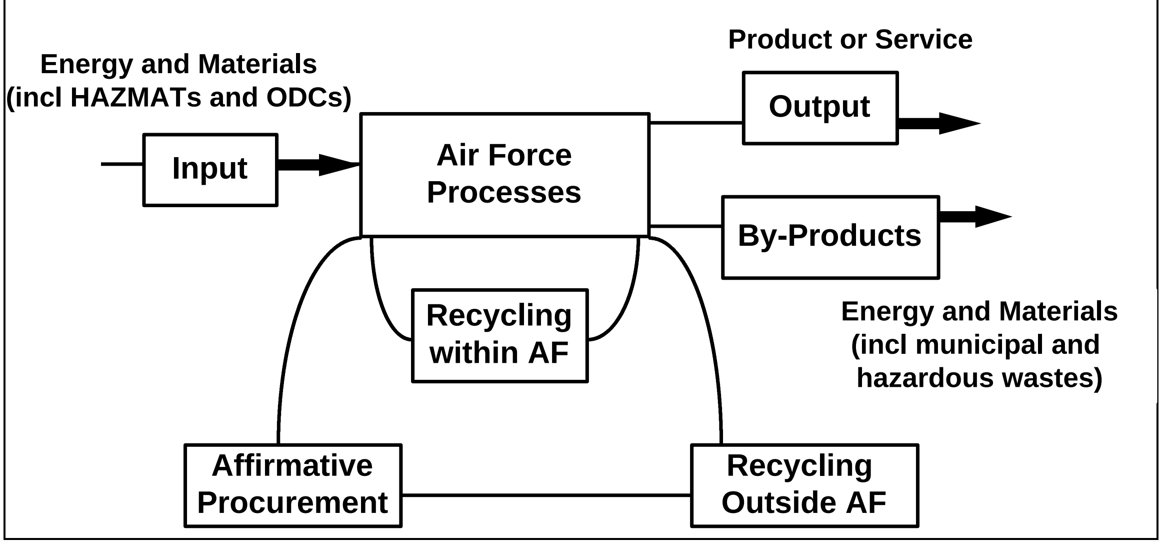
2.1 Overview

This chapter reviews the pollution prevention process and the methodology for developing a Management Action Plan (MAP), and then explains how to reevaluate the MAP to keep the program on target. It does not address organizational structure or the detailed goals of specific pollution prevention program components, which are covered in other chapters.

A well prepared MAP is the key to a successful pollution prevention program. All AF installations were required to have MAPs completed by December 1995. The program's focus now switches from developing a plan, to maintaining the plan and measuring the program's success.

2.1.1 Pollution Prevention Conceptual Model. AF activities may be modeled as processes (e.g. base industrial activities, administrative activities, support activities and family housing), each relying on a steady stream of material and energy. Waste is generated as a by-product of these processes. Specific goals and objectives for pollution prevention program components target subsets of these input (material) and output (waste) streams. The relationships in these processes are shown in Figure 2-1.

FIGURE 2-1
POLLUTION PREVENTION CONCEPTUAL MODEL



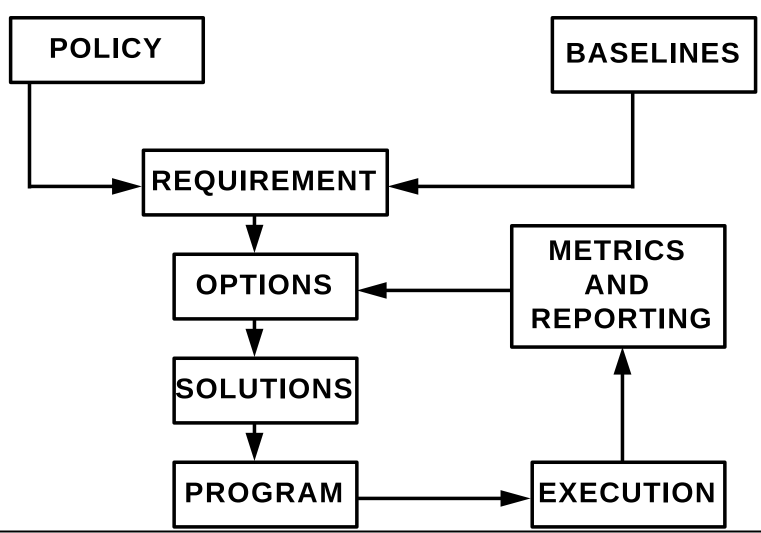
AF processes are fueled by energy and materials. Some of the materials purchased are hazardous to human health or to the environment. Hazardous wastes are by-products that can pose a substantial or potential hazard to human health or the environment when improperly managed. They possess at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or are listed in 40 CFR 261.30 or applicable state or local waste management regulations. Municipal solid waste (trash) is non-hazardous waste generated by domestic and industrial processes. Hazardous material use often produces hazardous emissions into the air or water, increasing environmental and occupational safety and health requirements for these media. Hazardous material can even become hazardous waste through non-use (i.e., through expiration of shelf-life).

2.1.2 Pollution Prevention Hierarchy. Changing processes to eliminate purchases of undesirable "targeted" materials and generation of wastes is known as "source reduction." Where source reduction is not feasible or cannot eliminate waste, materials may be reused or recycled to reduce waste and purchase requirements. Goals to purchase environmentally preferable products through affirmative procurement programs help "close the recycling loop" by creating demand for recycled products. Treatment of wastes and emissions control to reduce environmental impacts prior to disposal is a last resort.

2.2 Pollution Prevention Process

Figure 2-2 represents the process of developing and executing a pollution prevention program. The following subparagraphs describe each portion of the process.

FIGURE 2-2
THE POLLUTION PREVENTION PROCESS



Pollution Prevention MAPs are the documentation of this process. They are based on recurring opportunity assessments designed to continually evaluate an installation's success in achieving pollution prevention at the highest level in the hierarchy of actions. A sample MAP is included as Appendix C to this guide.

2.2.1 Policy. Refer to Chapter 1 for a discussion of policy.

2.2.2 Baselines. A baseline is a measurement of the amount of targeted substance purchased or generated during a specified time period. The baseline is the beginning status relative to a goal, and is the basis for calculating future progress toward the goal. Your installation has established baselines for all program components except affirmative procurement (see Table 1-1). They are individually listed in the installation MAP in Section 1.2, and summarized in the Program Summary table in Section 2.

2.2.3 Requirement. The requirement for minimization for each program component equals the difference between the goal and the baseline. For affirmative procurement, the requirement will equal the difference between the goal and the current measurement. The requirement identifies what the program needs to do. For example, the first Energy goal is to reduce energy use 10% by the end of CY 1994 from a 1985 baseline. If the 1985 consumption was 0.149 MBTU, a 10% reduction amounts to 0.0149 MBTU; this is the requirement. If energy consumption efforts after 1985 have already yielded a reduction of 0.004 MBTU, this can be subtracted, and the remaining requirement is 0.0109 MBTU, or the amount of reduction still needed to attain the goal. This process is repeated to obtain the requirements for the second and third phase energy reduction goals (20% by 2000 and 30% by 2005 respectively). Requirements are individually listed in the MAP in Section 1.3, and summarized in the Program Summary table in Section 2.

2.2.4 Options and Solutions. Options include all possible ways to achieve the goals. They may involve procedural changes, material substitutions, equipment purchases, facility modifications or construction, technology needs, or any combination of these. A list of options is generated for each program component, they are evaluated against criteria established by the base (cost, feasibility, environmental benefit, mission effectiveness, etc.) and then ranked in priority order. Solutions are chosen from the prioritized lists of options, developing a cumulative total of expected reductions for each component (pounds of hazardous waste, tons of MSW, etc.) until the total reductions meet the previously identified requirements. Finally, the selected solutions for each program component are listed and described in Chapter 2 of the MAP.

For program components with phased requirements (sequential goals in various fiscal years), plan to meet the requirements with groups of actions which will provide sufficient reductions to meet each phase. Once the initial requirement is met, determine the next solution set by continuing down the list until the benefits exceed the next phase's requirement, and so on. Projects selected to satisfy a second phase requirement should generally be programmed after the deadline imposed by the first requirement. For example, projects supporting between 25% and 50% hazardous waste reduction by the end of 1999 should be programmed after the end of 1997, when hazardous waste is to be reduced by 25%.

Some solutions may require MAJCOM approval or assistance, while others may require Air Force Materiel Command (AFMC) assistance for technology solutions. MAJCOMs are responsible for identifying technology needs (see Chapter 6).

The base should choose criteria to decide what shops, processes or activities to evaluate for pollution prevention reductions. These criteria may include:

- Waste generation rates - largest or most toxic waste streams
- Hazardous material usage rates
- Possibility of using pollution prevention to eliminate current industrial health concerns, environmental compliance problems, or reporting requirements

To fully exploit all pollution prevention options, consider all activities. Don't overlook the base exchange, commissary, snack bars, hobby shops, service stations, golf course, and hospitals. Construction projects are a large source of solid waste; a pollution prevention review during project design may yield huge benefits.

2.2.5 Program Execution. The MAP is the installation's single reference to manage the development and execution of the pollution prevention program. A well prepared plan will document an installation's previous, current and future pollution prevention actions. It will also support Toxic Release Inventory (TRI) reporting by including reduction efforts associated with the installation's releases as reported on the Form R.

The MAP has three sections: process, program, and execution. Each section lists required management actions, who is responsible for doing them, and when they will be completed.
The execution plan for the program is contained in the MAP in Chapter 3, including the chosen solutions satisfying the goals of each program component; required actions; schedules; and OPRs. The level of detail is up to each environmental manager. Subdivisions in this section will generally be each program component, then each chosen option. For example, in the municipal solid waste area, there may be a project to purchase two cardboard baling machines. Examples of actions associated with executing this project might be identifying where the machines will be located, who will operate them, how operators will receive training, how procedures will be modified to use the machines (e.g., asking customers to segregate cardboard waste, how cardboard bales will be transported, etc.), and other details determined by the installation to be important enough to formally manage.

To get necessary funding, the cost of these solutions needs to be included in budget and Program Objective Memorandum (POM) submittals as appropriate. See Chapter 5 of this guide and AFI 32-7001, Environmental Budgeting, for programming and budgeting information. Execute pollution prevention projects as soon as they are funded. Early execution of pollution prevention projects will result in early return on investment.

2.2.6 Metrics and Reporting. Installations must measure the actual benefit of implemented ideas and compare them with the projected benefits. The program should then be adjusted accordingly, adding or deleting ideas to the program if benefits are disappointing. This will "close the feedback loop" to ensure the pollution prevention program will ultimately meet its goals. Progress toward goals will be measured and reported to MAJCOMs, where it is summarized and reported using metrics provided in HQ USAF/CEV's 16 Oct 95 letter, *Quarterly Reporting of Pollution Prevention Metric Data.* Although Civil Engineering is tasked with reporting, the data will come from many functional organizations including Supply and Bioenvironmental Engineering.

The numerous changes taking place on AF installations have caused confusion in establishing baselines and reporting metric data. HQ USAF/CEV's 16 Oct 95 memo transmitted the latest *Metric Reporting Guidance,* summarized below .

As installations transfer between MAJCOMs, coordinated baseline data adjustments will be made such that the Air Force totals will remain constant. No adjustments will be allowed to compensate for mission changes, personnel increases or decreases, or Base Realignment and Closure Commission actions. When an installation closes, the MAJCOM does not remove their data from the baseline and previously reported numbers. The rationale for this guidance is that when an installation closes, the missions on that installation typically transfer to other installations within the same MAJCOM.

The adjusted baseline data will be used to measure all progress toward the AF pollution prevention goals. MAJCOMs report data to HQ USAF/CEV for the following target areas:

<u>Hazardous Waste Disposal (reported quarterly)</u>: Report quantity of pounds disposed, regardless of disposal avenue (on-site in permitted facilities, or off-site through DRMO or installation contracts). Include small spills and normal installation operation wastes, but exclude wastes from major spills such as train derailments; wastes from contaminated fuel or oil removed as part of the Underground Storage Tank Program; or any wastes resulting from Installation Restoration Program cleanup.

<u>Municipal Solid Waste (MSW) (reported quarterly)</u>: Report the number of tons generated for each of four categories: disposed, recycled, composted, and waste-to-energy consumption. Exclude construction and demolition debris. Note this metric data is separate from the annual HQ AFCESA/CESM solid waste survey, which requires a response from all MAJCOMs on their solid waste stream in order to identify reduction opportunities.

<u>Number of Units Utilizing Class I ODS (reported quarterly)</u>: Each occurrence of the following is a "unit". Report the total number of units using Class I ODS at the installations.

- Refrigeration system greater than 5 tons
- Facility halon flooding system
- Facility portable extinguisher
- Flight line extinguisher
- Any other miscellaneous halon system that has been identified in the equipment inventory for the installation's halon management plan.

Quantity of Class I ODS (reported quarterly): Report the number of pounds of ODS installed in the units above and in bench stock. Data will be reported by type of ODS (Halon 1301, R-12, etc.)

EPA-17 Chemicals Usage (reported annually): Report the quantity used, in pounds.

Affirmative procurement metrics are still being defined. They will be structured differently from the program components previously discussed. Instead of developing a baseline and reducing our totals to some percentage of that baseline, we work to maximize the purchase of EPA-designated products ("Guideline Items") containing recycled materials. Affirmative procurement is discussed further in section 3.6 of this Guide. The base MAP should include listings of all Guideline Items the base purchases (MAP Chapter 2) and the actions required to ensure all of these purchases contain sufficient recycled materials to meet EPA recommendations (MAP Chapter 3).

2.3 Maintaining the MAP

The Management Action Plan should be viewed as a living document reflecting changes in missions, pollution prevention technology and regulatory requirements. Progress toward pollution prevention goals needs to be measured and tracked. If small corrective actions are not taken when they are needed, large ones will be needed later.

As the MAP is reviewed and revised, be sure to pay equal attention to new operations and activities. New facility construction, new industrial processes, and even projects to repair buildings and equipment, all offer opportunities to plan pollution prevention into the project. Remember to consider pollution prevention as a part of the environmental impact analysis process for all new projects and activities coming to the installation.

2.3.1 Reviewing the Current Plan. Depending on how complete and recent the MAP is, the base team will need to decide whether it is adequate, needs only updates and minor additions, or needs to be completely redone starting with a basewide OA. The following audit questions can be used to determine the health of the current OA and MAP:

1. How recently were the OA and MAP published? Are all AF pollution prevention program components addressed?
2. Are the schedules in the current MAP being met? Which actions were implemented? Which were not?
3. What missions have changed since the OA was performed?
4. Did the OA cover all base activities that create health, safety, or environmental issues?
5. Did the OA and MAP address the biggest waste generators and the biggest users of hazardous materials?
6. How have base shops changed: processes, equipment, people, missions?

7. Is a cultural change evident? Has training and awareness brought positive attitude changes towards Pollution Prevention?
8. Are waivers or authorized substitutes for hazardous chemicals in use?
9. Did the actions implemented so far significantly reduce waste disposal and hazardous material usage rates?
10. How much further to meet reduction goals?
11. Are base personnel adequately trained to perform OAs?
12. Are the above changes significant enough to warrant a new basewide OA?

To answer these questions, it's absolutely necessary to know the program status. If the current OA and MAP are inadequate - grossly outdated or incomplete, or (at the other extreme) if all actions have been completed - redo the OA and MAP following the steps outlined in Appendix B. If the plan is basically sound and is yielding results, but needs a little tinkering to bring it up to date, consider "spot" OAs and improvements to the MAP.

2.3.2 Updating the OA and MAP. The basewide OA will be easier to update if it consists of individual process OAs on loose-leaf paper in a binder. New assessments can be added as missions, processes and goals change.

The first step is to define targets. Where do you want or need new OAs? Know your strengths and weaknesses. Look at the current plan to see what worked and what didn't. Focus on lacking areas. The 1995 *AF Pollution Prevention Strategy* added new reduction goals; ensure there are OAs and MAP actions to support all of the latest goals.

Next, consider all possible types of reduction opportunities. Here are some ideas:

- Conduct an education campaign to create cultural changes
- Reward suggestions to foster individual involvement
- Look beyond shop walls
- Improve housekeeping and segregation of wastes and materials
- Conserve - Turn off the tap and the lights
- Reexamine processes: improve handling, storage, timing, materials usage
- Research more equipment, newer technologies
- Include more on-base organizations and activities, expand targets
- Research pesticide and herbicide use
- Review Model Shop Reports
- Consider how the MAP actions interact with Base Comprehensive Plans, Stormwater Plans, Natural Resources, Water/Energy Conservation, Spill Prevention, Pest & Grounds Management, Toxics Management Plans, HW and SW Plans, etc.

The third step is to define your capabilities. Can the effort be handled in-house; will there be internal team support? Consider taking on "easy" areas and focusing a contractor on more complicated issues that require more research. Form a team including the BEE, CEV or EM, LG, the Pharmacy, process owners and shop personnel. Borrowing personnel from other shops for OAs often helps to crossfeed ideas and solutions.

Fourth, do the OAs. Familiarize the team with any previous OAs for the shop, then use the checklists in Appendix B to conduct new or supplemental OAs. When visiting the shop think about all aspects of pollution prevention, trying to stay as high on the hierarchy as possible (source reduction first, then recycle or reuse). Remember to look for affirmative procurement opportunities. Look at other shops having similar problems, processes, or materials for ideas. Develop a list of new opportunities; evaluate them and select the most promising. Remember, at this stage not all the options will be easy. Break the “Convenience Paradigm”; don’t just say it “takes too much time”, measure the time and effort that’s required and do a cost benefit analysis. Look beyond territorial boundaries; if three shops use the same solvent, consider buying one solvent still for all three to use to recycle their waste. Or better yet, consider consolidating the workload into one area.

Next, supplement the old basewide OA with the new opportunities. Document the shops visited, the options identified, and the options selected. Consider keeping a “shop by shop list” so that the next team updating the OA will see what has already been considered, accepted and rejected. Develop one-sheet descriptions for the selected options, including cost-benefit analysis, and add them to the basewide OA binder.

The final step is to revise the MAP and request any necessary funding. Quantify expected pollution prevention gains; prioritize the new actions along with the other opportunities in the MAP that have not yet been accomplished; and define and assign action items. Update Chapter 1 of the MAP to show new management actions, or to add completion dates for previously defined actions. In Chapter 2, revise the Program Summary and all of the individual sections (ODS, HW, EPA-17, etc.) for which new options were added. Add all new projects to the execution plan in Chapter 3. Add requirements to the A-106 and budget submittals as needed to obtain funding.

2.4 Hazardous Material Inventory Control as a Pollution Prevention Tool

The Hazardous Material Pharmacy (or HazMart) and the Air Force - Environmental Management Information System (AF-EMIS) software are powerful tools for reducing hazardous material use and collecting data for MAPs and metrics.

HQ USAF/LG’s 31 May 1995 *Hazardous Material Pharmacy (HMP) Organizational Change Package* formally establishes the HMP as a part of the Air Force’s Objective Wing structure. The pharmacy offers single-point accountability over the requisitioning, receipt, repackaging, and issue of hazardous material and is analogous to the control over prescription drugs. Control of hazardous material can eliminate unnecessary purchases, diminish handling hazards, and reduce hazardous waste disposal costs for unused, expired material. A pharmacy is composed of three activities:

- Authorizing the request: Each request for hazardous material should be given a health and environmental impact review. Each request should also be reviewed by logistics for quantity, unit of issue, alternative sources of supply (currently available on installation, smaller quantity vendor) and current supply position.

- Distributing or dispensing the material: Each receipt of material should be provided to the pharmacy user organization in a reasonable quantity and within a reasonable time. ("Reasonable" shall be defined in a memorandum or agreement/understanding between the pharmacy and the using organization). This activity may require a new facility.

- Tracking and reporting: All material requested, received, issued, used, returned, and stocked on the installation needs to be recorded. To comply with EO 12856, toxic chemical data must be gathered, processed and reported on the Form R (when required).

The *Commander's Guide to the Implementation of the Hazardous Materials Pharmacy* and the *PRO-ACT Information Packet - HAZMAT Pharmacy* are useful references for installations establishing a pharmacy. These documents are available from PRO-ACT; see Chapter 7 for contact information.

The AF-EMIS is a Windows-based environmental, occupational health and safety focused hazardous material management tool. It is entirely Air Force owned and developed. The primary environmental objective of the AF-EMIS is pollution prevention. Prior to ordering hazardous materials, the user must submit a request that provides detailed material, industrial process, workplace training and waste disposal information. The request must pass a rigorous review by environmental, bioenvironmental, supply and hazardous material pharmacy personnel. Once approved, the AF-EMIS maintains an authorized users list for each material, material safety data sheet information, including constituent data, waste profile information, as well as all the information from the original request. As the day-to-day hazardous material supply transactions are completed, the AF-EMIS builds quantity and usage data for material compounds and for the individual constituents. The AF-EMIS can supply data for many reports. Among them are EPCRA, bioenvironmental engineering workplace inventory, ozone depleting substance (ODS) information, waste manifests, DD Forms 1348, complete usage data by authorized user, by chemical constituent and by hazardous material.

The AF-EMIS features barricading, an automated link to the standard base supply system (SBSS), to the quality shelf-life listing (QSL) and to the Hazardous Material Information System (HMIS). The system is available to all Air Force installations. The AF-EMIS is a key source of hazardous materials data.

CHAPTER 3
PROGRAM COMPONENTS

3.1 Overview

Pollution prevention addresses the reduction and recycling of ozone depleting substances, hazardous waste/industrial waste and municipal solid waste; reduction of EPA-17 target chemicals, Toxic Release Inventory (TRI) chemicals and pesticides; and programs for affirmative procurement, energy conservation, and water conservation. The purpose of this chapter is to discuss in detail each of these program components.

MAJCOMs are to establish a pollution prevention program that crosses functional areas to meet these AF goals and objectives. The following discussion addresses, as appropriate, the unique aspects of each of these program areas, typical uses, and typical opportunities for reduction in use or recycling.

3.2 Ozone Depleting Substances (ODS)

3.2.1 Goals. Air Force Pollution Prevention Goals concerning ODS:

- Cease purchases of halon (Class I ODS) by 1 Jun 93
- Cease purchasing air conditioners, Aerospace Ground Equipment (AGE) and other refrigeration and support equipment containing Class I chlorofluorocarbons (CFCs) after 1 Jan 93
- Cease purchasing commercial vehicles with ODS air conditioning equipment after 1 Jun 93
- Cease purchasing newly produced Class I CFC refrigerants by 1 Jun 93
- Cease awarding contracts requiring use of ODS by 1 Jun 93
- Reclaim and recycle ODS in accordance with current AF procedures

3.2.2 Overview. ODS are substances that deplete the earth's stratospheric ozone layer, and contribute significantly to greenhouse warming. Some examples include CFCs and hydrochlorofluorocarbons (HCFCs) which are used in ground air conditioning and refrigerant systems, automobile air conditioning systems, cleaning solvents and aerosol sprays. Another category of ODS is halon. Halons are primarily used in fire suppression systems and for vector control in some missile systems. Other controlled substances include carbon tetrachloride and methyl chloroform, which are used primarily as cleaning solvents and methyl bromide, which is used as a pesticide and fumigant. Table A-1 (Appendix A) identifies the Class I and Class II ODS.

3.2.3 Directives. The Department of Defense (DoD) has established policies for CFCs and halons in DoD Directive (DoDD) 6050.9. It outlines steps required to comply with the Montreal

Protocol (Sep 87), the Copenhagen-amended Montreal Protocol (1992), the Clean Air Act (CAA) of 1990, and the National Defense Authorization Act for FY 1993. These laws/acts restrict the production, purchase and use of Class I ODS listed in Appendix A, Table A-1. See Section 3.2.11 for suggested reading materials for these specific acts and regulations.

Additionally, the *AF Pollution Prevention Strategy* calls for SAF/AQ and HQ USAF/LG (with the assistance of SAF/MI and all MAJCOMs) to establish an aggressive program to identify, and reduce or eliminate, the use of ODS. Technical Orders and MILSPECS are being changed. This effort is proceeding separately from the PP MAP effort, and will be essential to the AF's ability to reduce or eliminate the use of ODS.

3.2.4 Refrigerants. The purchase of facility air conditioning systems, aerospace ground equipment (AGE), other refrigeration and support equipment, and commercial vehicles that use Class I ODS, without an approved waiver, is prohibited as of 1 Jan 93. Existing equipment presently being used will be phased out through normal attrition or conversion at scheduled overhaul. The determination of conversion or replacement is one of economics and should be based on life cycle costs. There is no requirement for change out or conversion for the sake of becoming "CFC free". All weapons systems (pre Acquisition Milestone III as of 1 Jan 93) shall be designed to use non-Class I ODS refrigerants. The purchase of newly produced ODS refrigerants without an approved waiver is prohibited as of 1 Jun 93.

The pollution prevention program will support the following projects with funding:

- ODS recycling/reclaiming equipment
- Chiller modifications for leak detection
- Efficient purge hardware

The base Refrigerant Manager, located in the Base Civil Engineering organization, manages facility air conditioning/refrigerant (AC/R) equipment and regulated refrigerants through the use of a Refrigerant Management Plan (RMP). The *AF Strategy* set a goal for all installations to have this plan in place by December 1995.

AFCESA/EN's *Refrigerant Management Handbook* focuses on conservation measures and the development of the RMP. Conservation measures include improved servicing techniques, training and certifying technicians, and recording equipment maintenance and refrigerant usage. The RMP provides a plan to ensure adequate refrigerant supplies will be available to meet mission needs until the last of the units using CFC refrigerants have achieved their full economic life. The RMP provides a refrigerant inventory timeline that shows refrigerant consumption rates, equipment retirements, and other activities which affect the inventory of refrigerant. An implementation schedule is part of the RMP. A simple comparison of a plan's projected refrigerant inventory quantity versus what is actually on-hand will determine whether the base is in danger of a negative mission impact.

EPA's final rules for facility AC/R technician training and motor vehicle air conditioning (MVAC) equipment have five main elements:

- Established required practices for technicians servicing and disposing of air conditioning and refrigeration equipment;
- Established a certification program for technicians servicing air conditioning and refrigeration equipment;
- Established a certification program for recovery and recycling equipment;
- Established a requirement to repair equipment with substantial leaks;
- Established requirements for removing ozone-depleting refrigerants from appliances, machines, and other goods prior to disposal.

There were two effective dates and regulatory references for technician training and certification. 40 CFR 82.40 addresses the MVAC service requirements which became effective on 1 January 1993. 40 CFR 82.161 covers facility AC/R equipment, and became effective 14 November 1994.

3.2.5 Halons. The purchase of newly produced halons or obtaining halon through the Defense Reserve (Defense Logistics Agency [DLA] Bank), without an approved waiver, is prohibited (see Section 3.2.8 on waivers). MAJCOMs may request waivers for mission critical halon applications. "Mission critical" is defined as those halons used on board aircraft to meet flight safety, flight survivability, or flight certification requirements.

Like the refrigerant management program described in Section 3.2.4, the halon management program has a requirement for preparation of a management plan. The *AF Strategy* calls for each installation to have this plan in place by December 1995. Engineering Technical Letter (ETL) 95-1, *Halon 1301 Management Planning Guidance*, describes Air Force goals and requirements for managing Halon 1301 to ensure its availability for mission critical requirements while minimizing halon dependency and releases into the environment. A sample management plan outline is included in the ETL.

3.2.6 Solvents. The purchase of ODS solvents and equipment/systems/products requiring ODS solvents for maintenance or operation must be approved by SAF/AQ. Some solvent use has been identified as mission critical for which an acceptable substitute has not been found. Such solvents are now being purchased for the DLA bank.

3.2.7 Procurement Contracts. Contracts awarded on or after 1 Jun 93 must not include specifications or standards that require the use or that only can be met by the use of Class I ODS, unless an exception is approved. SAF/AQ, HQ USAF/LG and HQ USAF/CE are the approval authorities for their respective areas.

3.2.8 Waivers. In the National Defense Authorization Act for FY 1993 (P. L. 102-484) waivers are permitted for the purpose of extending time to develop and implement ODS alternatives. The new waiver procedures require a “use” waiver for all uses of ODS, whether purchasing new ODS, obtaining ODS from the DLA bank, or using recycled materials. “Use” is defined as dispensing and employing Class I ODS in the operation of any system or in support of any system. For refrigerants and halons, this refers to the amount required to recharge a system during maintenance, not the quantities already in the system.   Waiver approvals are required:

- prior to award of any contract that requires the use of a Class I ODS;
- prior to purchase of any Class I ODS;
- prior to obtaining Class I ODS from the Defense Reserve DLA ODS bank for mission critical applications;
- for the use of Class I ODS, including recycled materials.

3.2.9 Tracking and Reporting. ODS are tracked in quantities of pounds used/quarter or pounds purchased/quarter.   Installations report ODS quantities to their MAJCOMs in accordance with HQ USAF/CEV's *Metric Reporting Guidance*. See section 2.2.6 of this Guide for details.

3.2.10 Alternative Chemicals. Substitute chemicals to replace ODS must be chosen with care. Consult with the Bioenvironmental Engineering (BEE) flight to identify potential hazards associated with alternative chemicals. Alternatives which are hazardous or are Class II ODS may be used only as a last resort after all other environmentally preferable alternatives have been evaluated and rejected for technical or economic reasons. EPA has the authority to identify and restrict the use of substitutes for Class I and II ODS where other alternatives exist that reduce overall risk to human health and the environment. The program that provides these determinations is the Significant New Alternatives Policy (SNAP) Program.

Final rules for the SNAP Program were issued in the March 18, 1994 Federal Register. Under SNAP, EPA can approve or disapprove the use of chemicals, product substitutes, or alternative manufacturing processes, whether existing or new. The rule includes listings of acceptable substitutes, unacceptable substitutes, and pending decisions for ODS "use sectors". EPA publishes quarterly updates to the SNAP lists in the Federal Register. Contact PRO-ACT (see Chapter 7) for the latest SNAP program information and other EPA rulings.

3.2.11 Additional Resources. Additional information and details concerning ODS may be obtained by consulting the following documents:

- AFI 32-7080
- *Air Force Ban on Purchases of ODCs - ACTION MEMORANDUM*, 7 Jan 93
- *Air Force ODC Interim Waiver Application, Approval Procedures, and Reporting Requirements*, 14 Jul 93
- Air Force *Pollution Prevention Strategy*, 24 July 1995
- EO 12843, *Procurement Requirements and Policies for Federal Agencies for Ozone Depleting Substances*, 21 Apr 93, Office of the Press Secretary
- Guidance for Eliminating the Use of Class I ODS in Military Procurement Contracts, 20 May 93, Department of Defense
- Final Air Force Contracting Policy for Elimination of Class I ODS, SAF/AQC, 14 Oct 94
- *Refrigerant Management Handbook*, AFCESA Systems Engineering

- 40 CFR 82.40, technician training and certification requirements for motor vehicle air conditioning (last updated 2 May 1995)
- 40 CFR 82.161, technician certification requirements for facility air conditioning and refrigeration equipment (last updated 9 Nov 1994)
- Procedures for Turning In Ozone Depleting Substances (ODS) to the Defense Reserve, DLA, 8 July 94
- Engineering Technical Letter (ETL) 95-1, *Halon 1301 Management Planning Guidance*, 12 May 95 ***(note:*** this ETL also includes attachments detailing AF procedures for requisition and turn-in of ODS to/from the Defense Reserve)
- Significant New Alternatives Policy (SNAP), EPA (59 FR 13044, originally published March 18, 1994 and updated quarterly in the Federal Register)
- PRO-ACT *Information Packet - Refrigerant Recovery Equipment*

3.3 EPA-17 Target Chemicals

3.3.1 Goal. By the end of 1996, the AF goal is to reduce purchase of EPA-17 Industrial Toxic Pollutants by 50% from a 1992 baseline. Progress will be assessed by measuring the weight in pounds of substance purchased compared to the CY92 baseline. The new *AF Pollution Prevention Strategy* calls for SAF/AQ and HQ USAF/LG (with the assistance of SAF/MI and all MAJCOMs) to establish an aggressive program to identify, and reduce or eliminate, the use of EPA-17 toxics. Technical Orders and MILSPECS will be changed. This effort is proceeding separately from the PP MAP effort, and will be essential to the AF's ability to meet its EPA-17 reduction goals.

3.3.2 Background. EPA has selected seventeen target chemicals for reduction or elimination of their use based on the volume of use, toxicity, persistence, and mobility. These chemicals were drawn from the Toxic Release Inventory (TRI) List in the Superfund Amendments and Reauthorization Act (SARA) Title III.

3.3.3 EPA-17 Target Chemicals and Typical Uses. Appendix A, Table A-2 identifies the EPA-17 chemicals and typical processes and/or uses for these chemicals at AF installations.

3.3.4 Typical Opportunities. Potential reduction/recycle methods are described briefly in Appendix B. This discussion provides some of the more common methods available to reduce the use of EPA-17 chemicals or recycle those that are being used. Additional suggestions may be found in *Air Force Model Shop Reports*, available from PRO-ACT (see Chapter 7 for contact information). Remember that prior to making any substitution for chemicals used in a process, you must obtain concurrence of the engineering authority with management responsibility for any applicable Technical Orders (TOs).

3.3.5 Tracking and Reporting. The EPA-17 chemicals are tracked in quantities of pounds used, as described in HQ USAF/CEV's *Metric Reporting Guidance*. See section 2.2.6 of this Guide for details.

3.4 Hazardous Waste/Industrial Waste

3.4.1 Goal. The objective is to reduce hazardous waste disposal 25% by the end of 1996 and 50% by the end of 1999 from the CY 92 baseline.

3.4.2 Tracking and Reporting. AFI 32-7042, Solid and Hazardous Waste Compliance, requires automated reporting of hazardous waste from accumulation to disposal through the WIMS-ES Hazardous Waste Module. Reporting requirements are given in HQ USAF/CEV's *Metric Reporting Guidance*. See section 2.2.6 of this Guide for details.

Hazardous waste disposal quantities are reported in pounds and include all hazardous waste disposal through the installation (via contract, Defense Reutilization and Marketing Office (DRMO), etc.). Hazardous waste accepted from offsite facilities should not be included in the installation's figures. If an installation's state regulates used oil as a hazardous waste, disposal figures should be considered a reportable quantity. Wastes removed or treated under the Defense Environmental Restoration Account (DERA) program do not count toward total hazardous waste quantities included in baselines.

Disposal information can be obtained from the documents listed below. Currently there is no standardized automated tracking program for compiling the HW disposal quantities.

- Hazardous Waste Disposal Manifests - include all disposal contracts, e.g., Safety Kleen, DRMO, installation contracts. (Note: if certificate of destruction or treatment codes on HW manifest indicate recycling or fuels reblending, the item should not be reported as disposed.)

- Annual Federal and state hazardous waste disposal summaries generated at the installation.

3.4.3 Processes Generating Hazardous Waste. Hazardous waste is generated through many processes typical to most Air Force installations. However, identification of new hazardous waste streams is ongoing and requires constant attention. The WIMS-ES Waste Stream Program is a tool developed to record individual waste stream data and allows for electronic transfer of the information to MAJCOM and Air Staff. This provides a crossfeed mechanism, as the waste stream may not have been identified at other bases.

Processes with associated hazardous waste streams typical to all installations are listed in Appendix B. Installations should also cross check these processes with their opportunity assessments to ensure all waste streams have been identified.

3.4.4 Typical Hazardous Waste Reduction Opportunities. Opportunities exist in almost all processes to reduce and/or eliminate hazardous waste generation. Each installation should conduct opportunity assessments to define current waste management practices, characterize existing waste streams and assess actions needed to reduce and/or eliminate waste. Assessments should be done at all facilities on base as appropriate toward reaching the pollution prevention goals.

Waste Segregation is a simple opportunity that should be practiced at all installations. Physical segregation of hazardous and non-hazardous waste streams increases waste minimization effort capabilities, such as recycling, and it also decreases the costs associated with waste disposal. It is easily achieved by recurring hazardous waste management and awareness training and the use of good waste handling techniques. Waste streams must be properly classified in order for them to be properly segregated. Consult your installation hazardous waste management plan and hazardous waste program manager for more information.

Waste minimization opportunities focus on source reduction or recycling activities that reduce either (or both) the volume or the toxicity of hazardous waste generated. Waste treatment is another option that may be considered, however, it is the least favored alternative. Treatment is typically performed downstream of the source on a waste stream generated by various facilities. Additionally, it normally requires regulatory notification and/or permitting.

A list of some hazardous waste minimization opportunities is presented in Appendix B. Additional opportunities may be found in *Air Force Model Shop Reports*, available from PRO-ACT (see Chapter 7 for contact information). <u>Recycling</u> refers to the use or reuse of a waste as an effective substitute for a commercial product, or as an ingredient or feed stock in an industrial process. Federal and local regulatory requirements dictate how reuse of waste materials must be used in order to qualify as recycling; see section 3.4.5. <u>Source reduction</u> refers to the reduction or elimination of waste generation at the source, usually within a process. The Hazardous Material Pharmacy concept, discussed in more detail in section 2.4, provides a mechanism for hazardous material source reduction through purchasing controls and inventory management of hazardous materials. This in turn results in less hazardous material becoming hazardous waste.

3.4.5 On-Site Recycling/Reuse of Hazardous Waste. The regulatory requirements of recycling hazardous waste onsite must be considered. Recycling decreases the volume of waste that may be considered hazardous and it may exempt the waste from consideration under RCRA. However, institution of onsite recycling activities involves many site-specific and waste-specific factors including the type, rate, and frequency of waste generation; the concentration of contaminants in the waste; and the value of the recycled material. There are also many off-site factors that may affect the implementation of an onsite recycling program. Off-site factors include: regulatory limitations; base location; markets for recycled materials; and waste acceptance criteria by recycling facility (where recycled products are segregated on base and shipped to off-base recycling facility).

Several recycling practices may be implemented at a base to reduce the volumes of hazardous waste generated. These methods include:

- Establishing an internal clearinghouse for excess inventory, expired or near expired shelf life hazardous materials, and recoverable wastes (through the Hazardous Material Pharmacy or other means)

- Identifying recoverable used materials
- Installing closed loop systems where hazardous wastes generated in a given process are reused in that same process

3.4.6 Additional Resources. Each AF base is faced with the need to develop a list of specific HW minimization techniques to achieve the HW disposal reduction goal. The first source is in-house input from personnel including operations and maintenance workers, supervisors, engineers, and others with first hand knowledge of the base operations. Other references that document source reduction methods are listed below.

- PRO-ACT Environmental Information Clearinghouse (DSN 240-4214)
- "Commander's Guide to the Implementation of the Hazardous Materials Pharmacy", 1994 (available from PRO-ACT)
- Opportunity Assessments
- The “Pollution Prevention Technical Library”, a database found in the DENIX environmental information system (see Chapter 7 for DENIX information)
- EPA publications and databases (“Enviro$ense” - see Chapter 7)
- State and local environmental agency publications
- Published literature, journals, technical papers
- Consultants, equipment vendors and suppliers
- AF Waste Minimization Program Reports
- Other installations with existing waste minimization programs
- MAJCOM Crossfeeds
- Technology Transfer publications

Other references providing guidance and execution for the overall hazardous waste program are listed below.

- AFI 32-7042, Solid and Hazardous Waste Compliance
- Base Hazardous Waste Management Plan

3.5 Municipal Solid Waste

3.5.1 Goals and Objectives. Solid waste reduction, pollution prevention and conservation of natural resources are the goals of the Air Force Resource Recovery and Recycling Program (RRRP).

Established goals for this program component call for reducing solid waste disposal 50% by 1997 based on a 1992 baseline. Interim objectives call for a 10% reduction by 1993 and a 30% reduction by 1996. In keeping with the Air Force RRRP, the following objectives are outlined as a means of accomplishing these goals:

- Minimize the amount of waste discarded in landfills

- Increase the percentage of waste that is recycled
- Stimulate market demand for environmentally preferable products by increasing the type and amount of products purchased
- Expand education to increase public awareness and support of recycling and composting programs
- Maximize proceeds both now and in the future
- Comply with Federal, State and local mandates

3.5.2 Program. Elements of the RRRP include recycling, composting, and advocacy. Each installation should select a RRRP Manager (or Qualified Recycling Program Manager) to establish and run the recycling and composting programs, and to advocate for the resources needed for a successful program. Supporting the RRRP Manager is a RRRP Subcommittee which reports to the installation Environmental Protection Committee. At a minimum, the following organizations should participate in the RRRP Subcommittee:

- Aircraft Maintenance
- Army and Air Force Exchange Service (AAFES)
- Comptroller
- Civil Engineering Operations
- Contracting
- Defense Commissary Agency (DeCA)
- Defense Reutilization and Marketing Office (DRMO)
- Environmental Management
- Legal
- Public Affairs
- Services
- Supply
- Vehicle Maintenance

Specific detailed guidance for implementing recycling and composting programs that will successfully reduce the amount of solid waste generated on Air Force installations, and meet the legal requirements of Federal, DoD, and Air Force can be found in the *Air Force Resource Recovery and Recycling Program (RRRP) Guide*, dated May 95, available through PRO-ACT or HQ AFCEE/EP.

3.5.3 Program Measurement. Measuring program effectiveness is an important part of the overall process. The following three metrics, in combination, provide the best complete picture of program operations.

- Solid Waste Disposal: This metric measures solid wastes disposed of in landfills and through incineration (not waste-to-energy) in tons. The annual numbers are compared to previous years and the baseline year (calendar year 1992 for the Air Force) to measure progress toward meeting the Air Force reduction goals.

- Solid Waste Generation: This metric measures the total waste generated on the installation in tons. The total waste is the sum of the disposed amount and the recycled/reused amount (sum of recycled, composted, and waste-to-energy amounts). This metric allows an installation to determine the effect of their source reduction efforts, the first level in the pollution prevention hierarchy.

- Recycling Percentage: This performance indicator measures recycled/reused amounts as a percentage of total waste generation. The recycled/reused amount is divided by the total waste generated. This indicator judges the effectiveness of the recycling efforts, the second level of the pollution prevention hierarchy.

3.6 Affirmative Procurement

3.6.1 Goals. "Environmentally preferable" is a broad term for products or services having a lesser or reduced effect on human health and the environment, when compared with competing products or services serving the same purpose. Non-hazardous substitutes for products containing ODS, EPA-17 and TRI chemicals would be considered environmentally preferable. Another "environmentally preferable" approach is to buy products which are manufactured using recycled and reclaimed materials. Affirmative Procurement is the program focusing specifically on recycled-content product purchases.

One of the problems facing recycling is creating a market for products made from recycled materials. Today, these products rival virgin products in quality and cost, yet their market remains largely untapped. The stimulus of government procurement can help close the recycling loop by encouraging market demand for recovered materials.

Air Force policy as expressed in AFI 32-7080 requires MAJCOMs to establish affirmative procurement programs. The *AF Pollution Prevention Strategy* calls for emphasis on purchase of recycled materials to the maximum extent practical; and for encouraging purchasing activities to use environmental preference of vendors and products as selection criteria for awarding contracts.   More detailed implementation guidance will be presented in *A Guide to Buying Recycled: The Air Force Affirmative Procurement Program*, still in development but anticipated complete in Fall 1996. Contact PRO-ACT (see Chapter 7) to receive a copy when available.

The U.S. EPA designates specific "guideline items" that shall contain recycled materials for Federal procurement. EPA's original list of guideline items included paper and paper products, lubricating oil, retread tires, building insulation products, and cement and concrete containing fly ash.

On 1 May 1995, EPA issued a Final Rule adding 21 new guideline items in six product categories. The rule became effective on 1 May 1996. The new guideline items and their product categories are listed in Appendix A, Table A-3. All EPA Guideline requirements formerly found in 40 CFR 247-253 are now consolidated in 40 CFR 247.

When purchasing items in any of these categories, installations are required to buy products containing recycled materials unless a written determination is made that such items meet one of the following exceptions:

- Are not available within a reasonable period of time
- Fail to meet the performance standards set forth in applicable specifications or fail to meet reasonable performance standards of the procuring agency
- Are not available from a sufficient number of sources to maintain a satisfactory level of competition (i.e., available from two or more sources)
- Are only available at an unreasonable price. If the cost of the recycled content product exceeds comparable product costs by 10% or more, the cost is considered unreasonable.

The recommended recycled material content for each product is established in EPA's Guidelines. Executive Order (EO) 12873 made these recommended content levels mandatory for Executive agencies, including DoD, unless an exception is met. The *Guide to Buying Recycled* will provide more detailed information on content requirements.

The *Pollution Prevention Strategy* also calls for the Air Force to "promote the use of environmentally friendly materials in the construction and maintenance of facilities", and to "promote efficient material/energy use practices in the construction and maintenance of facilities." Pollution prevention program managers should remember to consider the construction and maintenance of facilities as potential processes for opportunity assessment, and work with project designers to identify and specify building products containing recycled/recovered material. Many such products are now available and Engineering Technical Letter (ETL) 94-7 requires their use in AF construction projects. HQ ACC has undertaken a demonstration project in their FY 97 MILCON program; the project is currently in design. Information from this and other sources will be developed into a separate Guide for Environmentally Responsible Facilities, due to be completed in December 1996.

3.6.2 Tracking and Reporting. Metric development for the Affirmative Procurement program has been very difficult. Federal agencies are required to have procedures for monitoring and annually reviewing the effectiveness of their affirmative procurement program by tracking purchases and maintaining records of products containing recycled materials. The difficulty lies in balancing the effort of data collection with the potential management benefits. A healthy program will include metrics that yield useful information to help the program grow.

DoD policy requires reporting to the Federal Environmental Executive for large purchases (over $100,000). Installations will not have to report on stock-listed purchases because these are reported directly by GSA and DLA. Separate guidance on metrics and reporting will be issued at a later date. Reporting is expected to be required on an annual basis.

Monitoring Guideline Item purchases (whether from GSA or local purchase) and sharing the results through a cross-functional team or EPC subcommittee will enable the base to measure and crossfeed its affirmative procurement successes. Even though GSA item purchases do not need to be reported to headquarters, the base needs to gather enough information to complete its MAP and evaluate its overall success in meeting the goal of 100% recycled-content purchases for each Guideline Item.

Typical Processes/Opportunities. Installations must establish an aggressive program to meet Air Force goals for purchase of environmentally preferable products. A list of actions intended to help installations establish an effective procurement program consistent with the goals is included in Appendix B.

Many issues such as recycled products tracking, reviewing performance standards of recycled products, and revising procurement procedures require a coordinated effort among personnel outside the typical pollution prevention arena. Close coordination with procurement personnel is essential to successful implementation. As a result, installations should consider establishing a team through the Pollution Prevention Subcommittee or Working Group to address these unique issues.

3.6.4 Product Sources. For help in locating products meeting EPA's requirements, refer to the General Services Administration (GSA) *Environmental Products Guide*. All Guideline products listed in this catalog have been researched and purchased to meet EPA's recycled content recommendations. Contact the GSA Centralized Mailing List Service in Fort Worth, TX, commercial (817) 334-5215 or DSN 739-7369.

Additional sources for recycled product information will be listed in the *Guide to Buying Recycled.*

3.6.5 References

- Air Force *Pollution Prevention Strategy*, 24 July 1995
- *A Guide to Buying Recycled: The Air Force Affirmative Procurement Program*, still in development (estimated completion Fall 1996)
- Resource Conservation and Recovery Act, Section 6002
- 40 CFR Part 247
- Engineering Technical Letter (ETL) 94-7, *EPA Guideline Items in Construction and Other Civil Engineering Specifications*
- Comptroller General Decision No. B-238290
- Office of Federal Procurement Policy Ltr 92-4
- HQ USAF/CC and SAF letter, 25 Sep 92
- DASD (Production and Logistics) Memorandum, 3 Feb 93
- EO 12873, Federal Acquisition, Recycling, and Waste Prevention, 20 Oct 93.

3.7 Energy Conservation

3.7.1 Goals. The AF goal to reduce facility energy (natural gas, coal, electricity, fuel oil, etc.) is 10% by 1995, 20% by 2000, and 30% by 2005 on a BTU/sq ft basis, with 1985 consumption as the baseline; and a 20% increase in industrial facilities energy use efficiency from a 1990 baseline. It also requires the Air Force to identify and accomplish all energy conservation actions which pay back in ten years or less, by the year 2005.

Data input by MAJCOMs and bases into the Defense Utility Energy Reporting System (DUERS) is used to track progress toward the goals. These goals apply to the energy consumed within the facility (computers, appliances, equipment, etc.) not just the energy used to operate the facility (heating, air conditioning, lights, hot water, etc.) These goals mirror EO 12902, Energy Efficiency and Water Conservation at Federal Facilities, and the Energy Policy Act of 1992 (EPACT), which extends the energy conservation goals of the Federal Energy Management Improvement Act (FEMIA) of 1988. Reduced energy consumption equates directly to pollution avoidance.

3.7.2 Background. Energy conservation reduces pollution through the reduction of greenhouse gas emissions, protection of the stratospheric ozone, and prevention of acid precipitation. As electricity is generated by burning fossil fuel or operating nuclear reactors, it produces emissions of trace metals such as beryllium, cadmium, chromium, copper, manganese, mercury, nickel, and silver. Reducing energy generation decreases boiler ash, and scrubber and spent nuclear waste. It also lessens the need to mine and transport virgin fuels, and dispose of powerplant wastes.

3.7.3 Energy Program. Each base should have a designated Facility Energy Program Manager. This person is typically located in the Maintenance Engineering Flight of the Base Civil Engineer organization. The Air Force has provided information to help this person develop and manage an Energy Conservation Program. The *DoD Energy Management Handbook* was provided to all MAJCOMs and base Energy Managers. An Energy Management Training course has also been offered to all base and MAJCOM Energy Managers. The Air Force Institute of Technology (AFIT) is also offering an Energy Management course.

The Construction Criteria Base (CCB) is provided on CD-ROM disks, and is sent to each AF installation every quarter. Current energy information including policy and guidance from OSD, DOE and AF are on this system.

The Energy program should have two main thrusts - Energy Awareness and Energy Project Investment. Energy Awareness simply means not using energy when it is not needed (i.e. turn off lights/equipment when not needed; buy energy efficient equipment when buying new or replacement products; don't leave windows and doors propped open when heating or cooling is needed). This thrust should not cause discomfort or inconvenience to the occupants of the facility, just use common sense on how and when energy is used. Be good stewards of energy and use it like you were paying the bill.

Energy Project Investment is divided into three areas: government funds, utility company funds and private sector funds. Two special DoD programs, Energy Conservation Investment Program (ECIP) and Federal Energy Management Program (FEMP), have been provided by Congress to fund energy projects. Also, utility companies are offering rebates for installing energy efficient equipment and have Demand Side Management (DSM) programs to fund energy efficient equipment installation on their customers' facilities. Within the private sector many companies offer Energy Savings Performance Contracting (ESPC), that pays for installation of energy efficient equipment on a customer's facilities up front and they get paid out of the savings realized by the customer. Congress has provided special legislation to encourage government participation in these private sector programs.

3.7.4 Typical Opportunities. Conserving energy can be as easy as turning off a light or turning down the heat. Examples of conservation measures (from simple to more technical in nature) are included in Appendix B.

Lighting accounts for over 20 % of the total U.S. electricity consumption. Available technology can reduce the electricity used for lighting by 50 to 70 percent. These efficient technologies also provide excellent investment opportunities. A typical lighting upgrade yields an internal rate of return of 20 to 30 percent, a payback of about 3 to 4 years. The U.S. EPA's Green Lights Program and DOE's Federal Relighting Program encourage investment in energy-efficient lighting. Information on energy efficient fixtures, lamps, and bulbs which are stock-listed is available from the Defense Supply Center Richmond (DSCR), (800) DLA-BULB.

Office equipment and creature comfort are the fastest-growing electricity load. Computer systems account for 5% of total commercial electricity consumption. The Energy Policy Act and EO 12902 require the purchase of energy efficient equipment, such as EPA's Energy Star computers. Computer energy efficiency is addressed in EO 12845.

3.7.5 References

- Energy Policy Act of 1992 (EPACT)
- EO 12902, Energy Efficiency and Water Conservation at Federal Facilities
- EO 12845, Requiring Agencies to Purchase Energy-Efficient Computer Equipment
- *DoD Energy Management Handbook*, new version anticipated Sept 96
- Defense Energy Program Procedural Memorandum (DEPPM) 94-1
- AFPD 23-3, *Energy Management*, Sept. 1993
- DoDI 4170.10, *Energy Management Policy*
- AFI 32-1023, *Design and Construction Standards and Execution of Facility Construction Projects*

3.8 Water Conservation

3.8.1 Goals. The *Air Force Pollution Prevention Strategy* does not include a numeric goal for water conservation. Instead, it requires Air Force installations to identify and accomplish all water conservation actions which pay back in ten years or less. This is to be accomplished by 2005. Energy and water conservation are both mandated by Executive Order 12902 and the Energy Policy Act. The Defense Energy Program Procedural Memorandum (DEPPM) 94-1 incorporates water conservation into the Energy program. Air Force Energy Program Procedural Memorandum (AFEPPM) 96-2 addresses the Air Force Water Management Program.

3.8.2 Background. Water conservation is related to energy conservation and pollution prevention in two ways. First, approximately 80% of the cost of water production (on a nationwide basis) results from the energy required to provide water. Second, reductions in water use will create corresponding reductions in wastewater treatment - which in turn reduces energy requirements, chemical usage, and the potential for environmental compliance issues associated with effluent discharge.

3.8.3 Execution. Water conservation should be executed as part of the Energy program. Specific requirements and responsibilities are detailed in AFEPPM 96-2. Efforts are focused on three main areas:

- Performing Prioritization Surveys: In 1995, computer models were run to determine the order in which Air Force bases should receive their comprehensive energy and water conservation audits. MAJCOMs will be required to accomplish audits on 10% of their bases each year.

- Performing Comprehensive Facility Audits: The main purpose of an audit is to detect inefficient water systems, determine how much water and money is lost through leakage or waste, and determine a feasible method to implement conservation recommendations. Installations are encouraged to seek out suppliers that will provide free audits. GSA will provide a list of all utilities that offer no-cost water conservation audits and demand-side management services and incentives. AF facility managers can contact GSA at (202) 501-1763. Audits can be accomplished through Energy Savings Performance Contracting (ESPC) and Demand Side Management (DSM). The *DoD Energy Manager's Handbook* and the FEMP handbook *Financing Federal Energy Efficiency Projects* are both in the process of being updated to include water conservation.

- Promoting Effective Project Management: The success of a water conservation plan depends largely on personnel commitment. Before a conservation program is implemented, notify facility occupants of the program and new procedures. Consider posting notices near water equipment with information about correct usage; setting up a hotline for questions or leak reporting; distributing flyers with program information; or setting up a system to recognize exceptional efforts by individuals.

Including water conservation projects in the installation PP MAP along with the energy conservation projects will provide visibility for these projects, help ensure their funding, and provide a mechanism to track their implementation. Projects should be prioritized according to their cost-effectiveness. Economic evaluation of water projects will include the direct cost of water; the cost of heating hot water saved; O&M costs of wells, pumps, treatment facilities, etc.; reduced wastewater disposal costs; O&M savings realized by process changes, new equipment, etc.; and the availability of grant money for the project. Funding to execute water conservation projects comes from the same sources used to fund Energy projects (see Section 3.7.3).

3.8.4 Typical Opportunities. Typically, water conservation projects with the most economical paybacks include the following:

- Plumbing retrofit (shower heads, toilets, etc.)
- Leak detection and repair
- Xeriscaping, wastewater reuse, and other cost-effective landscaping techniques
- Modifications to cooling towers, boilers and process equipment
- Projects funded in whole or in part with grant money

3.8.5 References

- Energy Policy Act (EPACT) of 1992
- Executive Order 12902, Energy Efficiency and Water Conservation at Federal Facilities
- *Air Force Pollution Prevention Strategy*, 24 July 1995
- AFEPPM 96-2, *Air Force Water Management Program*
- GSA list of utilities offering no-cost audits (call 202-501-1763)
- American Water Works Association (AWWA) "M36" manual, a reference for audit implementation (call DOE Pacific Northwest Laboratory at 509-372-4368 or AWWA at 303-794-7711)
- Enviro-Management & Research, Inc. (EMR) document, *Water Management: A Comprehensive Approach for Facility Managers* (call 703-875-2800)
- Rocky Mountain Institute's *Water-Efficient Technologies* manual for evaluating appropriate uses of water-efficient equipment (call 303-927-3851)
- Installation Water Resources Analysis and Planning System (IWRAPS) computer software; models the winter and summer water requirements for military installations, prepares water sustainability plans, compares water reduction measures for implemented programs, and assesses cost effectiveness. Contact HQ AFCESA/CESC at DSN 523-6338
- *Passive Solar Handbook*, HQ AFCESA
- *DoD Energy Manager's Handbook*, currently being revised to include water conservation information
- FEMP handbook, *Financing Federal Energy Efficiency Projects*, currently being revised to include water conservation information

3.9 EPCRA and the Toxic Release Inventory (TRI)

3.9.1 Background. On 3 August 1993, President Clinton signed Executive Order 12856 requiring all Federal agencies to comply with the Emergency Planning and Community Right-To-Know Act (EPCRA) and to commit Federal agency planning, management, and acquisition resources to fulfill the intentions of the Pollution Prevention Act.   Among its provisions, this act requires industry to notify state and local emergency planning entities of the presence and quantities of hazardous materials at their facilities and to notify Federal, state, and local authorities of inventories and releases of those substances. The EPCRA is a stand alone amendment to the Superfund Amendments and Reauthorization Act (SARA).

Section 313 of EPCRA is of significant importance to Air Force installations. This section requires Federal facilities to submit annual U.S. EPA Toxic Release Inventory (TRI) reports by 1 July each year for the previous calendar year's data. The first report covered calendar year 1994, the baseline year. Progress toward the Air Force goal of 50% reduction in TRI chemical releases will be measured against the 1994 baseline.

The EO is not applicable to Federal agency facilities outside the customs territory of the United States. The EO applies to GOCOs, whether or not they are within Standard Industrial Classification (SIC) codes 20-39. However, the EO cannot create new legal obligations for private parties, although overall agency reports shall take into account such activities. Future contract revisions will require GOCOs to provide their agencies with the information necessary for TRI reporting.

3.9.2 Reporting. EPCRA is composed of 5 basic parts: Emergency Notification and Planning (Sections 301 to 303), Emergency Release Notification (Section 304), Community Right-to-Know or List of Material Safety Data Sheets (Section 311), Annual Chemical Inventory (Section 312) and Annual Toxic Chemical Release (Section 313). Sections 301 through 312 are intended to provide neighboring communities with all the information they need about hazardous chemicals on the Federal facility for proper emergency response and planning. Section 313 requires the only report that is submitted to the EPA.

EPCRA Sections 301 to 303 require Federal facilities to notify Local Emergency Planning Committees (LEPCs) and State Emergency Response Commissions (SERCs) of any extremely hazardous substances (EHSs) produced, used or stored on-site in amounts above the threshold planning quantities (TPQs). Basically, this is to assist LEPCs in developing emergency response plans.

EPCRA Section 304 requires Federal facilities to immediately notify SERCs and LEPCs of any release (above the reportable quantity - RQ) of an EHS or CERCLA section 102(a) hazardous substance. Immediate notification is by a phone call, followed by written details of the release. The intent is to notify surrounding communities of any potential hazards.

EPCRA Section 311 requires Federal facilities to provide copies of all Material Safety Data Sheets (MSDSs), or a list of MSDSs, to the SERCs, LEPCs and fire departments with jurisdiction over the facility. (If the facility has its own fire department, then providing the MSDSs to community fire departments is not necessary, but could be considered part of good community relations.) The MSDSs are for all "hazardous chemicals" over a certain threshold: any chemical considered as physical or health hazards under OSHA hazard communication standards. This Section of EPCRA *does not* have a definitive list of chemicals, but this definition is very broad. Updated lists, or MSDSs, are required within 3 months of new materials exceeding thresholds or if new MSDS information is received from the manufacturer. The first Federal facility reports were due in Aug 94, but can - and should - be continually updated.

EPCRA Section 312 requires a formal Tier I or Tier II report to be submitted to the LEPCs, SERCs and fire departments with jurisdiction for the same chemicals covered in Section 311.

This report contains all the local and state agencies need to know about the amounts, locations and storage conditions of hazardous chemicals and mixtures present at the Federal facility during the reporting period. This report is due on 1 Mar, to cover the chemicals present on-site during the previous year. Like Section 311, certain exemptions apply to reduce the burden of reporting.

The EPCRA Section 313 report provides a nationwide view of total annual releases to the environment, and off-site transfers, of certain toxic chemicals. The TRI report or Form R was initially intended to inform the public and government officials of routine releases to the environment of toxic chemicals. With passage of the Pollution Prevention Act of 1990, the Form R was expanded to include pollution prevention and waste minimization progress as well. Completion of a Form R will require detailed transaction records, utilization and release data. The chemicals eligible for inclusion in the 1994 reports are those listed on the TRI List (40 CFR 372.65 - only 313 chemicals) current as of 1 Dec 93. For 1995 and beyond, an additional 286 chemicals are reportable. This list is subject to change; the latest information can be obtained from PRO-ACT (see Chapter 7).

Air Force Guidance for TRI reporting was released on 10 Apr 95. This guidance is intended to implement EO 12856/EPCRA Section 313 AF-wide with consistency in interpretation. A significant number of exemptions are available under EPCRA, but the intent is to provide baseline data indicating pollution prevention success. All TRI reports must be the best-effort of each facility and must be defensible.

The chemical monitoring required under EO 12856 tracks substance use (as calculated above threshold quantities) throughout all departments at a facility (including what is vented, evaporated, and spilled). This provides a "blueprint" of the aggregate chemical handling at the site. For EPCRA 313, all Federal facilities exceeding toxic chemical thresholds for: manufacture or import - 25,000 lbs/yr; process - 25,000 lbs/yr; otherwise use - 10,000 lbs/yr; must report on the Form R, as amended by the Pollution Prevention Act. Reporting applies even if facilities do not fall within SIC codes 20-39.

Most AF installations will not break the thresholds required to submit a Form R to EPA. However, the process of inventorying toxic chemicals, hazardous substances and extremely hazardous substances is very important to maintain safe and economical operations at each base.

Form R data is published annually by the EPA in the Annual Toxics Release Inventory Public Data Release. Totals of releases are given by state, facility and chemical. This public knowledge can help or hinder the installation mission, depending on how well the installation has worked with local communities prior to the annual publication release.

3.9.3 Goals. The EO mandates agencies set voluntary goals to achieve a 50% reduction in total releases and off-site transfers of TRI toxic chemicals by 1999, based on a calendar year 1994 TRI baseline. In addition, the EO directs each agency to establish voluntary goals for the reduction in use of toxic chemicals at facilities and in products purchased or manufactured by Federal agencies. Each facility is expected to identify its own reduction goals and prepare a written plan outlining how it will contribute to the 50% DoD-wide reduction goal. The PP MAP meets this requirement.

3.9.4 Tracking. The Hazardous Materials Pharmacy and the AF-EMIS tracking system provide excellent sources of information for compiling the installation TRI report (see Sections 2.3.5 and 2.3.6 respectively).

3.9.5 References.

- Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements
- 40 CFR 372.65, Toxic Release Inventory list
- Air Force Guidance for TRI Reporting, 10 Apr 95

3.10 Pesticide Management

3.10.1 Goals and Measures of Merit. DoD Instruction 4150.7 dated 22 Apr 96, *DoD Pest Management Program*, establishes three goals and metrics for DoD pest management operations. The DUSD(ES) Measures of Merit include:

- Measure of Merit 1, Installation Pest Management Plan: By the end of FY 97, 100% of all DoD installations will have pest management plans prepared, reviewed, and updated annually by pest management professionals. DoDI 4150.7 specifies requirements for installation pest management plans.

- Measure of Merit 2, Annual Amount of Pesticide Applied: By the end of FY 2000, the amount of pesticide applied annually on DoD installations will be reduced by 50% from the FY 93 baseline in pounds of active ingredient. This requirement is reflected as an Air Force pollution prevention goal in the *Pollution Prevention Strategy*.

- Measure of Merit 3, Installation Pesticide Applicator Certification: By the end of FY 98, 100% of all DoD installation pesticide applicators will be properly certified within two years of employment. Also, all contractor employees performing pest management work on DoD installations shall be certified under an EPA or State Plan accepted in the state in which the work is conducted.

3.10.2 Integrated Pest Management (IPM). IPM is an approach to pest control that utilizes regular monitoring to determine if and when treatments are needed, and employs physical, mechanical, cultural, biological, and educational tactics to keep pest numbers low enough to prevent intolerable damage or annoyance. Least-toxic chemical controls are used as a last resort. Treatments are not made according to a predetermined schedule, but rather are chosen and timed to be the most effective and least disruptive to natural pest controls. Program execution includes seven steps that are routine procedures for each pest problem:

1. Identify pest;
2. Develop plan/strategy;
3. Establish action thresholds;
4. Monitor pest population;
5. Control pest (optional);
6. Document results;
7. Evaluate/redesign plan.

In contrast to the past practice of widespread pesticide application, IPM focuses on trapping, sanitation and exclusion for rodent control; exclusion for bird control; and good fertilizer, mowing, aeration practices and use of native plants for weed control. Least-toxic pesticides are to be used only when these measures are inadequate.

3.10.3 References.

- DoD Instruction (DoDI) 4150.7, 22 Apr 96.
- HQ AFCESA/CC letter, 15 May 95, subject: *Integrated Pest Management Pollution Prevention Initiative* (with attachments providing a sample IPM Plan outline and explaining IPM implementation strategy)

CHAPTER 4
TEAM BUILDING AND IMPLEMENTATION

4.1 Introduction

Assembling and organizing installation resources is a critical aspect of building a successful pollution prevention program. The following sections provide guidance for developing and maintaining your pollution prevention team, including information on key organizational responsibilities, training, and recognition programs.

4.2 The Pollution Prevention Team

Effective pollution prevention program implementation at AF installations requires a coordinated and focused effort on the part of all AF personnel involved in the generation or handling of solid wastes and hazardous materials/wastes. While pollution prevention is everyone's responsibility, key players and organizations must plan, organize, initiate, and evaluate pollution prevention actions at each base. Well run programs are led by an active Environmental Protection Committee (EPC) with a strong Pollution Prevention Subcommittee.

TABLE 4-1
RESPONSIBILITIES OF THE POLLUTION PREVENTION SUBCOMMITTEE

- Recommend overall installation program goals (supplement to AF goals)
- Implement hazardous material identification and tracking system
- Recommend/implement a waste tracking system
- Prioritize the waste streams, processes, or facility areas for assessment
- Select pollution prevention and opportunity assessment teams
- Provide training for assessment teams
- Establish criteria for selecting options for implementation
- Conduct (or supervise) assessments
- Conduct (or monitor) technical/economic feasibility analyses of favorable options
- Select options for implementation
- Consolidate “Program” data for MAP (Project Narrative, Cost, ROI, Benefit, OPRs)
- Consolidate “Execution” data for MAP (Implementation steps, Schedule, OPRs)
- Advocate funding
- Monitor (and/or direct) implementation progress
- Monitor performance of new options, once operational
- Monitor overall progress toward achieving installation pollution prevention goals and objectives

4.2.1 Pollution Prevention Subcommittee (Working Group). The Pollution Prevention Subcommittee of the EPC typically proposes policy and recommends action to the EPC. This group may undertake some of the actions normally executed by the Assessment Team, outlined below, but in most cases will direct and review the Assessment Team's activity. Subcommittee membership should include those groups or departments that have significant operational or administrative interest in development of the program. Typical functions represented on the subcommittee include civil engineering, maintenance, supply, bioenvironmental engineering, operational contracting, public affairs, and legal. Table 4-1 summarizes the responsibilities of the Pollution Prevention Subcommittee.

TABLE 4-2
RESPONSIBILITIES OF THE POLLUTION PREVENTION TEAMS

- Recommend implementation of policy
- Ensure accurate baseline calculations
- Identify pollution prevention goal requirements
- Generate recommended solutions
- Classify options generated by assessments
- Select options for implementation
- Establish "Program" data for MAP (Project Narrative, Cost, ROI, Benefit, OPR) for each requirement
- Establish "Execution" data for MAP (Identify Implementation Steps, Schedule, OPRs) for each requirement
- Identify funding mechanisms
- Document (and/or direct) implementation progress
- Document performance of new options, once operational
- Document overall performance toward achieving the program area's pollution prevention goals and objectives

4.2.2 Pollution Prevention Teams. Pollution Prevention Teams are typically components of the Pollution Prevention Subcommittee which focus on achieving a specific goal, such as the hazardous waste reduction or affirmative procurement goal. Teams should be made up of five to seven shop chiefs and mid-level managers normally representing the CE/SG/LG communities. Team responsibilities are outlined in Table 4-2. They report to the Pollution Prevention Subcommittee on progress, initiatives, problems encountered, and other requirements. This step is crucial to the program's success as the overall working group cannot efficiently discuss, track and implement initiatives to meet all of the Air Force pollution prevention goals. Subcommittee personnel should stress the need for base personnel to be constantly looking for opportunities to reduce waste in their areas of expertise.

4.3 Training

As with most environmental programs, training must be conducted routinely. Every individual at an installation requires some level of environmental awareness and pollution prevention training on a frequency needed to maintain proficiency. Information on training and funding of training can be obtained by contacting the education office personnel. The following are recommended courses and materials for base personnel.

4.3.1 AF Institute of Technology (AFIT) ENV 220, Pollution Prevention Course. This five day in-residence course provides an introduction to pollution prevention for key personnel involved in program management. The course focuses on management and roles and responsibilities. Attendees are typically program managers from the CE/SG/LG communities. AFIT funds attendance at courses through course allocations to MAJCOMs.

4.3.2 USAF School of Aerospace Medicine Pollution Prevention Technologies Course. This five day in-residence course provides an introduction to pollution prevention for key personnel involved in program management. It places more emphasis on computer aided instruction and software resources than the AFIT course. Attendees are typically program managers and team members from the CE/SG/LG communities. Attendance at the USAFSAM course is funded through course allocations to MAJCOMs.

4.3.3 AFCEE Opportunity Assessment Training Workshops. The Air Force Center for Environmental Excellence conducts three-day opportunity assessment training courses at Air Force installations throughout the world. These workshops are designed for installation shop personnel and are typically attended by mid-level and senior NCOs, LG/SG/CE program managers, and installation leadership, such as EPC members. The course includes actual shop assessments done by the trainees. Workshops are typically funded through MAJCOMs with installations paying individual TDY costs. Individual installations have also funded the full course in order to provide training to base personnel.

4.3.4 Other Training Opportunities. Additional environmental training is available through a variety of sources:

- AFIT offers courses in Environmental Compliance Assessment and Management Program (ECAMP), Installation Restoration Program (IRP), AF/EPA Team Approach to Environmental Cleanup, Introduction to Environmental Management, Environmental Management Applications, Environmental Contracting, and Hazardous Waste Management. Call the Environmental Education Center at DSN 785-0381/2.
- EPA training opportunities for Federal personnel are listed on the Enviroene electronic information system; see Chapter 7 for Enviroene information.
- The Army offers a broad range of courses which AF employees may attend. Contact the Army’s Center for Environmental Initiatives and Hands-On Training (CEIHOT), Fort Sill OK, at DSN 639-2111 or (405) 442-2111.
- MAJCOMs provide many training courses via contractors. See Chapter 7 for a list of MAJCOM P2 contacts.

- The DENIX environmental electronic information system contains a listing of training resources, in addition to information on pollution prevention and all other aspects of environmental management; see Chapter 7 for DENIX information.
- Training videos are available from city, state and Federal agencies on many topics.

4.4 Recognition of Personnel

Good daily operating practices include paying attention to the human resources that are involved in program management and program execution. This includes recognizing individual and command achievements by implementing a recognition or reward program. On a monthly and an annual basis, awards may be given for ideas or suggestions that result in pollution prevention successes. Publicizing these awards by including them in the base paper will increase awareness. Contact your installation awards point of contact to establish program criteria.

CHAPTER 5
PROGRAMMING AND BUDGETING

5.1 Overview

Now that the MAP is developed and actions have been identified to meet the base's pollution prevention (P2) goals, it is critical to ensure all requirements are included in the base and MAJCOM program and budget. Installation level personnel initiate the programming and budgeting process for these requirements, and support them during reviews by higher headquarters. This chapter describes the process and criteria for programming and budgeting for P2 requirements.

5.1.1 Appropriations. Several different Congressional appropriations may be used to fund P2 needs, depending on the type of requirement and the activity being supported. These appropriations include Military Construction (3300); Operations and Maintenance (O&M) (3400); Research, Development, Test & Evaluation (RDT&E) (3600), Aircraft Procurement (3010), Weapons Procurement (3020), Other Procurement (3080), AF Reserve O&M (3740), and Air National Guard O&M (3840). Military Construction funds are used for new construction projects over $300,000; for example, a Hazardous Materials Pharmacy. O&M funds are used for many of the smaller projects and operational activities. See your resource advisor for details.

5.1.2 Program Element Code (PEC). Within the appropriations, funds are further broken down into different program elements which identify the mission areas being supported. PECs are five digit numbers representing specific missions and activity groups. The first three numbers vary, but for P2 the PEC will always end with "54F", where the letter F represents the Air Force. For example: PEC 11854F describes Air Force P2 projects for Operating Forces in the Air Operations activity group. All funding requirements must be identified in the appropriate PEC. Refer to AFI 32-7001, Environmental Budgeting; AFI 32-7080, Pollution Prevention Program; and your resource advisor for further information.

5.1.3 Pollution Prevention Requirements. Because P2 requirements span all functional areas in the Air Force, it is the responsibility of each functional area to identify pollution prevention opportunities. However, each functional area does not program and budget separately for pollution prevention funding. The installation environmental management function (CEV or EM) typically takes the lead in consolidating P2 requirements, and works with programmers and resource advisors (usually in CE) to develop the P2 program and budget. The P2 requirements identified in the installation programs are consolidated at the MAJCOM level and included in the MAJCOM budget submittal to Air Staff.

Remember, it all begins at installation level. Only a program which covers all requirements and is thoroughly documented and justified, will result in the installation getting the funds it needs to meet its P2 goals.

5.2 Pollution Prevention Program Budget and Priorities

Pollution prevention projects are divided into annually recurring (Operations and Services) and non-recurring (Level I, II, or III) requirements. The MAP needs to identify all requirements necessary to support the installation's P2 program and meet AF goals. The plan should include the program funding requirements for each year (see Appendix C, Sample MAP, Tables 2-2 through 2-8). All requirements for pollution prevention funding must be entered into the Work Information Management System - Environmental Subsystem (WIMS-ES) A-106 module in order to be eligible for funding. Projects not entered into the A-106 module, validated by the MAJCOM, and released to the Air Staff can not be supported during budget exercises. See Sections 5.5 and 5.6 for further discussion.

5.2.1 Recurring Requirements - Operations and Services (O&S). Annual recurring "must do" projects associated with "keeping the gates open" include manpower (only authorized positions on the unit manning document [UMD] coded against a PP PEC); periodic updates of plans; opportunity assessments; baseline survey updates, recurring operating costs associated with composting and municipal solid waste recycling programs, training; and travel.

5.2.2 Non-recurring Requirements. Non-recurring requirements are categorized into three funding levels as follows:

- Level I - ODS and Legal Requirements: This category includes projects required to reduce or eliminate the use of ODS and projects to comply with a current state, Federal or local law or meet an Executive Order or AF mandate.

- Level II - Meet Future Goals/Policies and Legal Requirements: Includes items required to meet goals, policies, and legal requirements at a date beyond the program fiscal year. These projects represent situations in which existing operations, programs, and facilities meet current standards, but require action to meet future legal requirements and P2 goals, objectives, and sub-objectives. Items essential to meeting a goal become Level I in the fiscal year prior to the fiscal year for goal attainment. For example, essential efforts to meet a 1999 reduction goal become Level I in fiscal year (FY) 98. Efforts not essential to goal attainment fall into the Level III category.

- Level III - Beyond Goals and Legal Requirements: Level III projects augment the base's P2 activities, but go beyond AF goals and legal requirements. Current AF policy is not to fund or program for Level III requirements.

5.3 Pollution Prevention Program Exclusions

When determining whether or not an item is eligible for P2 funding, evaluate how the project specifically supports AF goals. While a project may contribute to reduced "pollution," if it is not essential for meeting an AF goal, eliminating/reducing the use of ODS, or meeting a legal requirement, it cannot be supported as a valid P2 requirement. AFI 32-7080 describes requirements which are not eligible for pollution prevention funds.

5.4 Eligible Projects

Installations must evaluate each potential pollution prevention requirement when determining the project's eligibility for P2 funding. For example, installing a jet washer to replace a solvent cleaning process as a hazardous waste minimization project toward meeting the hazardous waste minimization goal would only be a valid Level II project if essential to AF goal attainment. If installing the jet washer reduces hazardous waste disposal beyond the goal, it would be a Level III item.

When evaluating items for funding, give priority to the items with low initial costs, high dollar savings, and significant P2 contributions. Items with a high cost but minimal contribution to the program should only be supported if absolutely essential to program accomplishment or goal attainment. While there is no set list of items that will "automatically be funded," following are some examples of projects that previously have been supported. Installations must still evaluate each item to determine its validity and category (O&S, Level I, Level II, or Level III) for funding.

- **Operating/Managing the PP Program:** TDY, travel, training, manpower (only for authorized positions on the Unit Manning Document). Only reasonable amounts for these items, based on installation size and number of P2 personnel, will be supported.

- **Pollution Prevention Plans and Opportunity Assessments:** Initial accomplishment and updates. Periodic reviews and updates to these plans should be accomplished "in-house" unless there have been significant changes that warrant the cost to accomplish this work via contract.

- **Recycling Programs to Reduce Municipal Solid Waste:** Facilities, supplies, equipment, contracts. P2 funding should only be used to the extent necessary to cover any shortfall between program revenues and expenses. Revenues from these programs must first be used to cover actual or anticipated program expenses before declaring a "profit" and using the revenues for other approved purposes.

- **Composting Programs:** Facilities, supplies, equipment, contracts. When evaluating projects for these programs, pay particular attention to the cost of the project and the associated reduction in solid waste disposal.

- **Jet Washers, Aqueous Parts Washers, Ultrasonic Cleaners, and Alternative Media Blasting Systems to Replace Solvent Processes:** Initial purchase only, not operating, maintenance/repair, or replacement costs.

- **Solvent Recycling/Filtration Units:** Initial purchase only, not operating, maintenance and repair, or replacement costs. Valid <u>only</u> if a viable source reduction alternative is not available. Recurring expenses associated with a solvent recycling contract are not eligible for P2 funding. The P2 program funds efforts to move higher on the pollution prevention hierarchy, but not to just transfer the waste stream from the installation to a contractor.

- **Antifreeze Recyclers:** Equipment initial purchase only, not operating, maintenance and repair, or replacement costs.

- **Refrigerant Recycling/Recovery/Reclamation Units:** Initial purchase only, not operating, maintenance and repair, or replacement costs.

- **Reviewing/Revising Standardization Documents (Mil Specs/Standards, Technical Orders, etc.) to eliminate/reduce the use of hazardous materials:** For specific weapon systems, P2 only funds the document review; the Single Manager for the weapon system is responsible for revising the documents.

- **Hazardous Material Pharmacy Startup Costs:** Only the initial costs (equipment, facilities, etc.) to establish the hazardous material pharmacy are valid for P2 funding. Recurring operating costs for the pharmacy are not valid for P2 funding.

- **Alternative Fueled Vehicle (AFV) Conversions and Infrastructure:** Initial purchase only, not operating, maintenance/repair, or replacement costs. Projects to convert petroleum fueled vehicles to operate on an alternative fuel and infrastructure to support AFVs (for example compressed natural gas fueling stations) are only valid for P2 funding if the special DOE/DoD funding for these efforts is insufficient to meet the Energy Policy Act (EPACT) and Executive Order requirements as determined by the LG community.

- **Oil Filter and Fluorescent Bulb Crushers To Reduce Hazardous Waste Disposal:** Initial purchase only; recurring contract efforts to accomplish these actions are not valid for P2 funding.

- **Polychlorinated Biphenyl (PCB) Elimination:** Removal and replacement of PCB equipment not otherwise eligible for real property maintenance or environmental compliance funds, in accordance with HQ USAF/CEV's *PCB Elimination Technical Guidance,* dated 27 Feb 1996.

5.5 Validating the P2 Program Submittal

All line items included in the installation P2 budget are validated by MAJCOM/CEVs, who must submit a line item listing to HQ USAF/CEV to support all funding submittals. HQ USAF/CEV in turn selects a percentage of these items to review for data accuracy. Items on the list, but not in the A-106 will not be supported. Information contained in the A-106 is used for validation. Therefore, it is very important for the A-106 record to be complete, especially the narrative, and contain information such as the quantified contribution to the P2 program and payback period, in order for the reviewer to have sufficient information to determine item validity with policy and law.

5.6 WIMS-ES

The WIMS-ES A-106 module is a computerized management information system for programming, budgeting and tracking environmental projects (see AFI 32-7002, Environmental Information Management System). It is a subsystem of Civil Engineering's WIMS computer system. WIMS-ES allows daily transfer of data between bases, MAJCOMs, and Air Staff, and is intended to be updated on a continuous basis. Each environmental funding requirement, whether part of compliance, conservation, or pollution prevention, must have a record in the A-106 module. No new pollution prevention requirements can be submitted to HQ USAF/CEV during budget exercises unless entered into the A-106 module, validated by the MAJCOM, and released to the Air Staff. Before an environmental project can be funded, it must be submitted and validated through the A-106 process.

When entering the project into the A-106, use the correct PEC and Element of Expense Investment Code (EEIC) and sub-shred for the project. Also, ensure the narrative entered for the project is complete and sufficiently detailed to provide anyone reviewing the project with enough information to determine the project's contribution to the pollution prevention program as well as the validity of the project.

A-106 records will reflect the current status of each project or requirement. When HQ USAF processes an A-106 report, a copy of the record is placed in the History File. As the project status changes, the A-106 record must be updated. Every item must eventually be updated to show a progress code of "complete" or "discontinued."

CHAPTER 6
TECHNOLOGY NEEDS

6.1 Overview

The Air Force (AF) uses the AFMC Technology Master Process (TMP) to assist with research, development and acquisition (RD&A) planning. The TMP identifies and documents needs for technologies that guide (or will guide) RD&A by AF laboratories. This program also ensures that RD&A programs address only validated technology needs. Technical Planning Integrated Product Teams (TPIPTs) are a key part of the TMP. These teams are comprised of users, system program directorates, product and group managers, development planners, laboratory technologists/planners, system engineers, test engineers and logisticians. A TPIPT examines users' mission needs; prepares roadmaps for solutions at a systems level; divides, using system methodology, those solutions into appropriate steps; and identifies the needed technologies for the projected steps or solutions. TPIPTs aid in planning and developing technical solutions for users' long- and short-term operational needs.

The Environment, Safety and Occupational Health (ESOH) planning process and TPIPT was implemented because of the AF's commitment to minimize the environmental impacts of current operations on community and global environments, while providing Air Force personnel with a safe and healthy workplace. The Human Systems Center Directorate of Plans, Requirements and Engineering (HSC/XR) function has been designated as the lead in the ESOH planning process and TPIPT as outlined in AFI 63-118. This process produces two major documents: the AF Technology Needs Survey and the ESOH RD&A Strategic Plan.

6.2 Technology Needs Survey (TNS)

The TNS process was created to facilitate ESOH RD&A to solve the AF's highest priority ESOH needs. The TNS documents needs from multiple user communities to include:

- Users responsible for AF infrastructure;
- Users from MAJCOMs that develop and manage weapon systems;
- MAJCOMs that use these weapon systems and;
- Agencies responsible for collecting ESOH needs

The ESOH Planning Process produces a validated and prioritized list of technology needs. Needs identified are ranked based on established criteria: mission impairment, pervasiveness, environmental hazard severity, human hazard severity, regulatory risk, cost of not fixing the problem, and AF goals and political sensitivity. The latest results are published in FY96 USAF ESOH Needs Survey, dated December 1995. This report included 366 ESOH needs of which 135 were related to pollution prevention. 37 of the pollution prevention needs, over 10 percent of the total ESOH needs identified, were identified as high priority needs.

The FY97 needs collection process will start in the summer of 1996. This survey will also be collecting requirements for the Air Force Material Command Hazardous Material Reduction Prioritization Process (HMRPP), a new initiative to improve weapon system pollution prevention. This initiative ties the identification of hazardous material use for existing weapon systems to issues such as the Environmental Protection Agency Toxic Releases Inventory reporting process, ESOH installation concerns and installation pollution prevention management plans. It will re-emphasize the important connection between the single manager and the installation where weapon systems are used.

6.3 Technology Assessment

In the ESOH Planning process needs identified are analyzed through the Technology Assessment (TA) Process. This process identifies the technologies available to satisfy those needs and presents both the most feasible methods for implementing the solutions and the risks associated with the solutions. The TA Process includes three parts: (1) the Requirements Analysis (RA); the Technology Evaluation (TE) and the Systems Implementation Review (SIR). The RA and TE help find the most effective technology solution.

The RA provides the preliminary information that can be used to select one of the following options: (1) to pursue commercial off-the-shelf (COTS) technologies, if appropriate and readily available; (2) to pursue RD activities that can lead to potential solutions for the technology needs; (3) to maintain the status quo and the ongoing course of action; or (4) to formulate policy or administrative changes. The TE provides more detailed information regarding the solution, and is performed only if the cognizant MAJCOM decides to pursue an option outlined in the RA and desires assistance in doing so. The SIR is conducted to evaluate the utility of the technology solution(s) actually implemented. The TA process also aids in the development of the Strategic Plan.

6.4 ESOH RD&A Strategic Plan

The Strategic Plan links the ESOH needs identified (or requirements) to programs and/or solutions. This plan consists of four volumes. Volume I summaries the ESOH planning process, and presents an overview of the ESOH technology needs and the programs by AF laboratories that address them. The other volumes provide the detailed information about laboratory programs in support of the Cleanup, Compliance and Pollution Prevention Pillars. The plan advocates the customer’s position, the need identifier, to influence the principal investigator, laboratory directors, and science and technology managers to satisfy specific requirements.

6.5 Base Level Responsibilities

Environmental, safety, public health and logistics managers can play a key role in the identification of technology needs. They should work with the users of ODS and hazardous materials (maintenance, logistics, civil engineering, etc.) to identify opportunities where new or existing technologies could help reduce their dependence on these materials.

Other bases or MAJCOMs may have already identified your problem to HSC/XRE or PRO-ACT. There may be an off-the-shelf solution, or an emerging lab technology that may meet your needs. You can call HSC/XRE at DSN 240-2129/3455 or commercial (210) 536-2129/3455, (email: whitfield@emgate.brooks.af.mil). See Chapter 7 for PRO-ACT contact information.

CHAPTER 7
SUPPORTING ORGANIZATIONS

There are numerous sources of information that can be helpful to installation personnel in conducting pollution prevention activities. Table 7-1 lists supporting organizations which can be utilized as a source for answers to a wide range of environmental questions.

TABLE 7-1
SUPPORTING ORGANIZATIONS

ORGANIZATION	TELEPHONE NUMBER
PRO-ACT (AF Environmental Information Clearinghouse)	DSN 240-4214 (210) 536-4214 or (800) 233-4356 **Web Page:** http://www.afcee.brooks.af.mil/PRO-ACT
Defense Envr. Network & Information eXchange (DENIX) (DoD Environmental Bulletin Board and Web page - includes PRO-ACT products, P2 Technical Library and other resources)	**BBS Access:** call (217) 373-6790 to request a password **Web Page**: http://denix.cecer.army.mil/denix/denix.html (request passwords using on-line form)
AF POL Technical Assistance Team	DSN 945-4617
HQ AFCESA Library	DSN 523-6285
Energy Program (Technical Advisors)	DSN 523-6361
Water Program (Technical Advisors)	DSN 523-6338
Integrated Pest Management (Technical Advisors)	DSN 523-6465
Wright-Patterson AFB “Tech Connect”	DSN 785-5940
Management and Equipment Evaluation Program (MEEP), Vehicle Maint & CE	DSN 872-4217
Fuels Laboratory	DSN 576-5051/5457
Navy CFC/Halon Information Clearinghouse (CHIC)	(703) 769-1883
DOT Military Traffic Management (Hazardous Material Transportation)	DSN 761-6951 (703) 756-6951

TABLE 7-1 (continued)

SUPPORTING ORGANIZATIONS

ORGANIZATION	TELEPHONE NUMBER
GSA National Customer Service Center	DSN 465-1416 or (800) 488-3111 **Web Page:** http://www.gsa.com
Defense General Supply Center (DGSC) Envr. Preferred Products Catalog	(800) 352-2852
EPA Publications	(202) 260-7751
Enviroene (EPA Bulletin Board and Web page - includes former PIES and FFLEX systems)	**BBS Modem**: (703) 908-2092 **Web Page**: http://es.inel.gov/index.html
EPCRA/SARA Hotline	(800) 535-0202
TSCA Hotline	(202) 554-1404
RCRA/Superfund Hotline	(800) 424-9346
Asbestos Hotline	(800) 368-5888
Lead Hotline	(800) 532-3394
Pesticides Hotline	(800) 858-7378
Stormwater Hotline	(202) 260-7786
Stratospheric Ozone Protection Hotline	(800) 296-1996
Air Hotline	(919) 541-0800
Radon Hotline	(800) 767-7236
OSHA	(800) 321-6742
NRC Spill Report	(800) 424-8802
Emission Measurement Technical Center	(919) 541-1060
Acid Rain Hotline	(202) 233-9620
Pollution Prevention Information Clearinghouse (PPIC)	(202) 260-1023
Solid Waste Information Clearinghouse	(800) 677-9424
Wetlands	(800) 832-7828

TABLE 7-1 (continued)
SUPPORTING ORGANIZATIONS

HQ USAF/CEVQ (P2 Policy)	DSN 225-2797/2550
HQ AFMOA/SGPA	DSN 297-1731 ext. 360
HQ USAF/LGMM	DSN 225-0844
HQ AFCEE/EP (P2 implementation resources; contract support, workshops, Pharmacy, EMIS, DENIX data management)	DSN 240-3371 **Web Page:** http://www.afcee.brooks.af.mil
MAJCOM Pollution Prevention Offices	
HQ ACC CES/ESC	DSN 574-4430 / Fax DSN 574-5339
HQ AETC/CEVP	DSN 487-3422 / Fax DSN 487-3597
HQ AFMC/CEVV	DSN 787-7414 / Fax DSN 787-5875
HQ AFRES/CEVV	DSN 497-1073 / Fax DSN 497-0108
HQ AFSPC/CEVV	DSN 692-5028 / Fax DSN 692-3533
HQ AMC/CEVC	DSN 576-8332 / Fax DSN 576-8376
ANGRC/CEVC	DSN 278-8197 / Fax DSN 278-8151
HQ PACAF/CEV	DSN 449-6536 / Fax DSN 449-0427
HQ USAFA/CEVV	DSN 259-2289 / Fax DSN 259-3753
HQ USAFE/CEV	DSN 480-6382 / Fax DSN 480-7306

Appendix A

Glossary

and

Reference Tables

APPENDIX A

GLOSSARY OF TERMS

Affirmative Procurement - The purchase of environmentally preferable products, required of Federal agencies by RCRA Section 6002 and EO 12783. Affirmative procurement programs must establish preference for products containing recycled material, must include a promotion plan to place emphasis on buying recycled, and must have procedures for obtaining and verifying estimates and certifications of recycled content.

Alternatives - Ways of reducing adverse effects of hazardous materials. Alternatives, as applied to hazardous material decision-making, include, but are not limited to, such possibilities as substituting less hazardous or nonhazardous material; redesigning a component such that hazardous material is not needed in its manufacture, use, or maintenance; modifying processes or procedures; restricting users; consumptive use; on-demand supply; direct ordering; extending shelf life; regenerating spent material; downgrading and reuse of spent material; use of waste as raw material in other manufacturing and combinations of those factors.

Baseline - Quantified starting points from which progress is measured. Baselines are quantities of material purchased or generated over a specified period of time.

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

Closed-loop Recycling - Utilization of byproducts from a production process in the original process, without significant alteration or reprocessing. There are three key requirements: The byproduct must be returned to the process without first being reclaimed (i.e. distilled, dewatered, or treated); the production process to which the byproduct is returned must be a primary production process (a process that uses raw materials as the majority of its feedstock); and the byproduct must be returned as feedstock to an operation within the original process from which it was generated.

Compost - A mixture of garbage and degradable trash with soil in which certain bacteria in the soil break down the garbage and trash into organic fertilizer.

Composting - A waste management option involving the controlled biological decomposition of organic material in the presence of air to form a humus-like material. Controlled methods of composting include mechanical mixing and aerating, ventilating the materials by dropping them through a vertical series of aerated chambers, or placing the compost in piles out in the open air and mixing it or turning it periodically.

EPA-17 Targeted Chemicals - Seventeen chemicals (or compounds) selected for reduction or elimination based on their volume of use, toxicity, persistence, and mobility. Also known as EPA Industrial Toxic Pollutant (ITP) chemicals.

EPCRA - Emergency Planning and Community Right-to-Know Act

Fluorocarbons (FCs) - Any of a number of organic compounds analogous to hydrocarbons in which one or more hydrogen atoms are replaced by fluorine. Once used in the US as a propellant in aerosols, they are now primarily used in coolants and some industrial processes. FCs containing chlorine are called chlorofluorocarbons (CFCs). They are believed to be modifying the ozone layer in the stratosphere, thereby allowing more harmful radiation to reach the Earth's surface.

Functional Areas - The operations or areas of responsibility that affect or are affected by the use of hazardous material. These areas include, but are not limited to, budget and fiscal planning, legal support, research and development, weapons systems acquisition and maintenance, material and performance specifications and standards, design handbooks, and technical manuals; maintenance and repair procedures, industrial processes, procurement policy, contracting provisions, new material identification, public works operations, construction, management of munitions, chemical agents, propellants, medical and other personnel support, safety and occupational health, transportation, and logistics analysis; supply; warehousing; distribution; recycling; disposal; spill prevention, control, and cleanup; contaminated site remediation; staffing, education, and training; information exchange; public affairs; general administration; and oversight.

Halon - Bromine-containing compounds with long atmospheric lifetimes whose breakdown in the stratosphere cause depletion of ozone. Halons are used in fire-fighting.

Hazardous Material Pharmacy - Single point of control for hazardous material.

Hazardous Material - Any material that poses a threat to human health and/or the environment typically due to their toxic, corrosive, ignitable, explosive, or chemically reactive nature.

Hazardous Substance - 1. Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive. 2. Any substance named by U.S. EPA to be reported if a designated quantity of the substance is spilled in the waters of the US or if otherwise emitted into the environment.

Hazardous Waste - By-products of society that can pose a substantial or potential hazard to human health or the environment when improperly managed. Possesses at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or are listed in 40 CFR 261.30 or applicable state or local waste management regulations.

Industrial Solid Waste - Includes wastewater treatment sludges, solids from air pollution control devices, trim or scrap materials that are not recycled, fuel combustion residues (such as the ash generated by burning wood or coal), and mineral extraction residues.

Life Cycle Economic Analysis - An evaluation of the cost associated with the use of hazardous material and potential alternatives over the life of the investment or hazardous material. The analysis is not a specific, step-by-step procedure that can be applied by rote to all cases. Analysis shall be guided by basic principles of economics and informed judgment.

Management Action Plan - Within the AF, a single reference to manage the actions needed to develop and execute an installation's pollution prevention program.

Metrics - Measurement used to measure progress.

Municipal Solid Waste (MSW) - Wastes generated by administrative and domestic activities. Includes wastes such as durable goods, nondurable goods, containers and packaging, food wastes, yard wastes, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. MSW does not include wastes from other sources, such as municipal sludges, combustion ash, and industrial nonhazardous process wastes that might also be disposed of in municipal waste landfills or incinerators.

Open-loop Recycling - A recycling system in which a product made from one type of material is recycled into a different type of product. The product receiving recycled material itself may or may not be recycled.

Opportunity Assessment - Systematic procedures to identify and assess ways to prevent pollution by reducing or eliminating wastes.

OSHA - Occupational Health and Safety Administration

Ozone (O_3) - Found in two layers of the atmosphere, the stratosphere and the troposphere. In the *stratosphere* (the atmospheric layer beginning 7 to 10 miles above the earth's surface), ozone is a form of oxygen found naturally which provides a protective layer shielding the earth from ultraviolet radiation's harmful effects on humans and the environment. In the *troposphere* (the layer extending up 7 to 10 miles from the earth's surface), ozone is a chemical oxidant and major component of photochemical smog. Ozone can seriously affect the human respiratory system and is one of the most prevalent and widespread of all the criteria pollutants for which the Clean Air Act required EPA to set standards. Ozone in the troposphere is produced through complex chemical reactions of nitrogen oxides, which are among the primary pollutants emitted by combustion sources; hydrocarbons, released into the atmosphere through the combustion, handling and processing of petroleum products; and sunlight.

Ozone Depletion - Destruction of the stratospheric ozone layer which shields the earth from ultraviolet radiation harmful to biological life. This destruction of ozone is caused by the breakdown of certain chlorine-, fluorine-, and/or bromine-containing compounds (chlorofluorocarbons or halons) which break down when they reach the stratosphere and catalytically destroy ozone molecules.

Ozone Depleting Substances (ODS) and Ozone Depleting Chemicals (ODCs) - CFCs, halons, and other substances that deplete the stratospheric ozone layer as classified by the Clean Air Act of 1990.

Pollution/Pollutants - Refer to all nonproduct outputs, irrespective of any recycling or treatment that may prevent or mitigate releases to the environment.

Pollution Prevention Hierarchy - The Pollution Prevention Act of 1990 established a hierarchy as national policy. The hierarchy follows this order: (1) prevent or reduce pollution at the source wherever feasible; (2) recycle, in an environmentally acceptable manner, pollution that cannot feasibly be prevented; (3) treat pollution that cannot feasibly be prevented or recycled; and (4) dispose of, or otherwise release into the environment, pollution only as a last resort.

PRO-ACT - An environmental information clearinghouse provided by the Pollution Prevention Directorate, HQ AFCEE. They are available to AF customers who can ask an unlimited number of environmental questions and receive up to 40 free hours of PRO-ACT research time per question. They can be reached at DSN 240-4214 or 1-800-233-4356.

Program Element Code (PEC) - Funding designation required for budgeting and programming AF projects. For Pollution Prevention the PEC is ***54 (see Chapter 5).

RCRA - Resource Conservation and Recovery Act

Recycle/Reuse - The process of minimizing the generation of waste by recovering usable products that might otherwise become waste. Examples are the recycling of aluminum cans, waste paper, POLs, engine coolants, and ODS.

Recycled Content - The amount of recovered material, either pre- or postconsumer, in a finished product that was derived from materials diverted from the waste management system. Usually expressed as a percent by weight.

Refuse Reclamation - Conversion of solid waste into useful products, e.g., composting organic waste to make soil conditioners or separating aluminum and other metals for melting and recycling.

Return on Investment (ROI) - An attempt to quantify financial costs and benefits and determine a project's payback period.

SARA - Superfund Amendments and Reauthorization Act.

Source Reduction - As defined in the Federal Pollution Prevention Act, source reduction is "any practice which 1) reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, and disposal; and 2) reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants. The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control." Source reduction does not entail any form of waste management (e.g. recycling and treatment). The Act excludes from the definition of source reduction "any practice which alters the physical, chemical, or biological characteristics or volume of a hazardous substance, pollutant, or contaminant through a process or activity which itself is not integral to and necessary for the production of a product or the providing of a service."

<u>Toxic Chemical</u> - Those chemicals listed in 40 CFR 372.65, also known as the Toxic Release Inventory (TRI) List. The list changes periodically as updates are published in the Federal Register.

<u>Toxic Chemical Use Substitution</u> - This term describes replacing toxic chemicals with less harmful chemicals, although relative toxicities may not be fully known. Examples would include substituting a toxic solvent in an industrial process with a chemical having lower toxicity, or reformulating a product so as to decrease the use of toxic raw materials or the generation of toxic byproducts.

This also includes attempts to reduce or eliminate the use of chemicals associated with health or environmental risks. Examples include the phaseout of lead in gasoline, the phaseout of the use of asbestos, and efforts to eliminate emissions of chlorofluorocarbons and halons. Some of these attempts may involve substitution of less hazardous chemicals for comparable uses, while others involve the elimination of a particular process or product from the market without direct substitution.

<u>Toxic Use Reduction</u> - This term refers to the activities grouped under "source reduction," where the intent is to reduce, avoid, or eliminate the use of toxics in processes and/or products so as to reduce overall risks to the health or workers, consumers, and the environment without shifting risks between workers, consumers, or parts of the environment.

<u>Treatment</u> - Involves end-of-pipe destruction or detoxification of wastes from various separation/concentration processes into harmless or less toxic substances.

<u>Waste Minimization</u> - Source reduction and the following types of recycling:
(1) beneficial use/reuse, and (2) reclamation. Waste minimization does not include recycling activities whose uses constitute disposal and burning for energy recovery.

<u>WIMS-ES</u> - Work Information Management System-Environmental Subsystem. A subsystem of Civil Engineering's WIMS computer management information system for programming and budgeting environmental projects. Allows daily transfer of data between bases, MAJCOMs, and Air Staff.

TABLE A-1
OZONE LAYER DEPLETING CHEMICALS

Halocarbon Number	Chemical Name CLASS I ODS	Primary Uses	CAS Number
CFC-11	Trichlorofluoromethane	1, 2, 3, 4, 5	75-69-4
CFC-12	Dichlorodifluoromethane	1, 2, 4	75-71-8
CFC-113	Trichlorotrifluoroethane	2, 3, 4	76-13-1
CFC-114	Dichlorotetrafluoroethane	1, 2, 3, 4, 6	76-14-2
CFC-115	Chloropentafluoroethane	6	76-15-3
Halon 1202	Dibromodifluoromethane	3	75-61-6
Halon 1211	Bromochlorodifluoromethane	3, 7	421-01-2
Halon 1301	Bromotrifluoromethane	1, 3, 5	75-63-8
Halon 2402	Dibromotetrafluoroethane	1, 3	124-73-2
CFC-13	Chlorotrifluoromethane	6, 7	75-72-9
CFC-111	Pentachlorofluoroethane	0	954-56-3
CFC-112	Tetrachlorodifluoroethane	4	76-12-0
CFC-211	Heptachlorofluoropropane	0	422-78-6
CFC-212	Hexachlorodifluoropropane	0	3182-26-1
CFC-213	Pentachlorotrifluoropropane	0	2354-06-5
CFC-214	Tetrachlorotetrafluoropropane	0	29255-31-0
CFC-215	Trichloropentafluoropropane	0	4259-43-2
CFC-216	Dichlorohexafluoropropane	0	661-97-2
CFC-217	Chloroheptafluoropropane	0	422-86-6
Carbon Tetrachloride	Tetrachloroethane	1, 4, 5, 8	56-23-5
Methyl Chloroform	Trichloroethane (all isomers)	4, 5, 8	71-55-6
Methyl Bromide	Bromomethane	4, 5, 8	74-83-9
Halocarbon #	**CLASS II ODS**	**Uses**	**CAS Number**
HCFC-21	Dichlorofluoromethane	1, 4	75-43-4, DR39289-28-6
HCFC-22	Chlorodifluoromethane	1, 4, 5	75-45-6, DR73666-77-0
HCFC-31	Chlorofluoromethane	0	593-70-4
HCFC-121	Tetrachlorofluoroethane	0	See Note 3 below
HCFC-122	Trichlorodifluoroethane	0	See Note 3 below
HCFC-123	Dichlorotrifluoroethane	1, 3	See Note 3 below
HCFC-124	Chlorotetrafluoroethane	1, 3	See Note 3 below
HCFC-131	Trichlorofluoroethane	0	See Note 3 below
HCFC-132	Dichlorodifluoroethane	0	See Note 3 below
HCFC-133	Chlorotrifluoroethane	0	See Note 3 below
HCFC-141	Dichlorofluoroethane	2	See Note 3 below

HCFC-142	Chlorodifluoroethane	1, 4, 5	See Note 3 below
HCFC-221	Hexachlorofluoropropane	0	See Note 3 below
HCFC-222	Pentachlorofluoropropane	0	See Note 3 below
HCFC-223	Tetrachlorotrifluoropropane	0	See Note 3 below
HCFC-224	Trichlorotetrafluoropropane	0	See Note 3 below
HCFC-225	Dichloropentafluoropropane	0	See Note 3 below
HCFC-226	Chlorohexafluoropropane	0	See Note 3 below
HCFC-231	Pentachlorofluoropropane	0	See Note 3 below
HCFC-232	Tetrachlorodifluoropropane	0	See Note 3 below
HCFC-233	Trichlorotrifluoropropane	0	See Note 3 below
HCFC-234	Dichlorotetrafluoropropane	0	See Note 3 below
HCFC-235	Chloropentafluoropropane	0	See Note 3 below
HCFC-241	Tetrachlorofluoropropane	0	See Note 3 below
HCFC-242	Trichlorodifluoropropane	0	See Note 3 below
HCFC-243	Dichlorotrifluoropropane	0	See Note 3 below
HCFC-244	Chlorotetrafluoropropane	0	See Note 3 below
HCFC-251	Trichlorofluoropropane	0	See Note 3 below
HCFC-252	Dichlorodifluoropropane	0	See Note 3 below
HCFC-253	Chlorotrifluoropropane	0	See Note 3 below
HCFC-261	Dichlorofluoropropane	0	See Note 3 below
HCFC-262	Chlorodifluoropropane	0	See Note 3 below
HCFC-271	Chlorofluoropropane	0	See Note 3 below

Notes on CAS Numbers:

1. DR in a number indicates a deleted registry number that was replaced with another registry number.

2. Some chemicals have multiple CAS numbers because registry numbers were assigned on premise that it was a trade name, although the chemical may be the same as another one already listed.

3. Multiple forms of this chemical exist, all with different CAS numbers. A complete listing is available from PRO-ACT (see Chapter 7 for contact information).

The eight use categories are as follows:

1 Refrigeration: Air Conditioning
2 Blowing Agent for Plastics
3 Fire Extinguishing Agent
4 Solvent: Dry Cleaning Agent; Degreaser
5 Intermediate for Synthesis of Other Compounds
6 Dielectric Gas
7 Aerospace Chemical
8 Fumigant: Pesticide
0 An "0" in the use column indicates the compound has no practical use. These compounds are not manufactured deliberately for any application.

TABLE A-2
THE EPA-17 TARGET CHEMICAL LIST AND TYPICAL USES

ORGANICS	**TYPICAL USES**	**CAS #** ***(for pure substance, not compounds)***
Benzene	Fuels, solvents, inks, paint thinner, component in plastics and tires	71-43-2
Toluene	Solvent in paints and coatings, fuels, cleaning agents, plastics	108-88-3
Xylene (includes ortho-, meta-, and para-)	Solvent in paints and coatings, cleaning agents, fuels	varies
Carbon Tetrachloride	Bearing cleaning and PMEL	56-23-5
Chloroform	Cleaning agents in Bearing shop, present in fluorocarbons	67-66-3
Dichloromethane (methylene chloride)	Wipe down cleaner, paint stripper, foam blowing	75-09-2
1,1,1 Trichloroethane (1,1,1-TCA)	Parts cleaning, degreasing	71-55-6
Trichloroethylene (TCE)	Degreasing, paints	79-01-6
Perchloroethylene (PERK)	Degreasing, dry cleaning	127-18-4
Methyl Ethyl Ketone (MEK)	Paints, cleaning agents adhesives, inks, gun cleaning, thinners	78-93-3
Methyl Isobutyl Ketone (MIBK)	Paints, cleaning agents	108-10-1
INORGANICS	**TYPICAL USES**	**CAS #** ***(for pure substance, not compounds)***
Cadmium and Compounds	Plating operations, batteries, pigments, chemical cleaning	7440-43-9 (Pure Cd)
Chromium and Compounds	Plating and paint preparation	7440-47-3 (Pure Cr)
Cyanides	Plating solutions	varies
Lead and Compounds	Batteries, paint, sealing compounds, lead solders	7439-92-1 (Pure Pb)
Mercury and Compounds	Laboratories, mercury vapor lamps, thermostats	7439-97-6 (Pure Hg)
Nickel and Compounds	Plating operations, batteries, welding	7440-02-0 (Pure Ni)

TABLE A-3
AFFIRMATIVE PROCUREMENT GUIDELINE ITEMS

Category	Products
Vehicular Products	Reclaimed engine coolants
Construction Products	Structural fiberboard Laminated paperboard Cement/concrete containing ground granulated blast furnace slag Carpet Floor tiles Patio blocks
Transportation Products	Traffic barricades Traffic cones
Park and Recreation Products	Playground surfaces Running tracks
Landscaping Products	Hydraulic mulch Yard trimmings compost
Non-Paper Office Products	Office recycling containers Office waste receptacles Plastic desktop accessories Remanufactured toner cartridges Binders Plastic trash bags

Appendix B

Opportunity Assessments:

OA Process,

Data Collection Worksheets

and
Typical Opportunities

APPENDIX B

PERFORMING OPPORTUNITY ASSESSMENTS

What is an Opportunity Assessment?

Identification of pollution prevention options is often called an "opportunity assessment" (OA). This is a systematic approach to studying the selected process. The shop is visited and personnel are interviewed. A process flow diagram (flowchart) is developed; material inputs and waste outputs are listed for each step; and a brainstorming session identifies opportunities for reduction in material use or waste generation . The information needed to evaluate the opportunities - quantities of materials used and wastes generated, costs for materials and waste disposal, environmental or health problems associated with the process, and mission constraints such as MILSPECs or Technical Orders - is gathered during the opportunity assessment.

Opportunity assessments may be accomplished by trained base level personnel, contractors, or a MAJCOM team. Many MAJCOMs decide to build their initial programs with contractor support, but train their personnel to take over the process in the future. Base personnel working in cross-functional teams can potentially generate the best options because of their familiarity with the processes. Examples of worksheets to aid in conducting OAs are also ncluded in this Appendix.

A completed OA includes:

- a description of the process (including Pharmacy or TRI process codes, if available); its purpose; and constraints such as MILSPECs or Technical Orders
- a description of the pollution prevention opportunity
- current quantities of materials used and wastes generated
- the amount of expected reduction in wastes generated or hazardous materials used
- cost information including purchase or disposal costs for each substance; costs of special process equipment; permit application fees; personal protective equipment costs; or costs for training directly attributable to the material
- anticipated benefits and problems (financial, environmental, health, mission, etc.)
- the opportunity’s total cost to implement, and
- the return on investment (ROI) or payback period, in years.

Use the following fundamental sources of information when quantifying chemical usage and waste generation:

- purchase data from supply sources and contracting
- shop interviews (spend time to draw out information, otherwise the interviewee will not realize what information he actually knows or remembers that will help you)
- inventory data from the Hazardous Materials Pharmacy or HazMart

- Bioenvironmental Engineering annual shop surveys and inventories (AF Form 2761)
- any prior installation reports (Toxic Release Inventory, ECAMP, waste minimization studies)
- waste disposal data from hazardous waste manifests and reports as well as disposal contracting information.

Sample Data and Calculations

The following example provides a hypothetical process description and example of the calculations required to support an OA.

Process Description

Process ID: LGMA 14
Title: Wheel Stripping
Program Component(s): EPA-17 (methylene chloride), Hazardous Waste
Organization: LGMA Tire Shop
Purpose: Remove paint from aircraft wheels prior to non-destructive inspection (NDI) as required by Tech Order XX-XX.
Description: Receive wheel, remove tire, soak in 30-gallon solvent vat of methylene chloride for 2 hours, remove paint with air knife, rinse with water, wipe with rags, send to NDI for penetrant application and inspection.
Input units and Origin: Painted wheels, removed directly from aircraft
Output units and Destination: Unpainted wheels; NDI shop.
Production Rate: 160 wheels/year
Wastes generated: Dirty methylene chloride, paint, wastewater, air emissions

Background data:
Solvent requires changeout after 15 wheels
Solvent becomes hazardous waste (HW)
Rinse water goes down the drain, may be hazardous waste, but has never been tested
Four pounds of paint are removed per wheel
Dirty rags are sent out for cleaning and returned for reuse
Solvent/paint mixture costs $2 per pound to dispose as HW
Replacement solvent purchase cost is $1 per gallon

Pollution Prevention Opportunities

1. Change process so paint is stripped using bead blasting or other alternate process
2. Contract for solvent recycling instead of disposing as hazardous waste
3. Buy a solvent distillation unit and recycle the solvent in-house
4. Purify (distill or filter) and reuse the rinse water

5. Cover the solvent tank to minimize air emissions
6. Investigate alternate coatings on aircraft wheels to remove or delay the requirement for the paint stripping process
7. Investigate NDI requirement for inspection (frequency, method, etc.)

Evaluation of Opportunities

1. An alternate stripping process would eliminate solvent purchase and disposal costs, reduce worker exposure, reduce the base's EPA-17 usage, and reduce hazardous waste disposal. However, Technical Order XX-XX requires paint stripping using methylene chloride. Submit AFTO Form 22 for the tech order change, but in the meantime, continue using the approved process.

2. Solvent recycling would not reduce EPA-17 usage or worker exposure, but would eliminate material purchase costs and hazardous waste disposal costs. The base could take credit for a reduction in hazardous waste. A local solvent recycling company with a good environmental reputation is available. They charge $3.50 per gallon to recycle the waste and return clean solvent to the base. The shop would have to purchase a tank and initial solvent supply from the recycling company for $450.

3. There is a huge backlog of work orders in CE, not enough room in the shop for a solvent still, and no manpower to run the still. This alternative may be cost effective but mission constraints make it infeasible at present. Document this option and revisit it in the future.

4. Water recycling is feasible. Equipment is available through GSA and would not be difficult to operate. Water conservation would be achieved and a potential hazardous waste disposal violation would be avoided.

5. The new solvent tank provided by the recycling company has a cover. Keeping the tank covered when not in use will minimize air emissions and avoid potential compliance problems.

6. Alternate coatings will require extensive research and development and are beyond the installation's ability to execute. Consider identifying this as a technology need.

7. Cracks seem to be detectable with ultrasonics; NDI penetrant inspection may be overkill. The wheels may be inspected too often; if cracks are seldom found, consider increasing the time between inspections. Work through the Item Manager Engineers to review the process and submit AFTO 22 if changes are feasible.

Option 2 is the first opportunity selected for further evaluation. Calculate the costs and benefits of this alternative as follows:

(Quantity of hazardous material used)(Conversion factor-gal to lbs)/(# of wheels per vat)
= lbs hazardous material used/wheel

(30 gal solvent/vat)(5.5 lbs/gal)/(15 wheels/vat) = (11 lbs of methylene chloride/wheel);

(lbs hazardous material/wheel) + (lbs hazardous waste removed from wheel) = Total amount of hazardous waste generated/wheel

(11 lbs solvent/wheel) + (4 lbs paint/wheel) = (15 lbs of hazardous waste/wheel)

Gallons of solvent used/year =
[(# of wheels per year)/(# of wheels per changeout)] x (# of gal/changeout)

Gallons of solvent/year = $\frac{\text{160 wheels/year}}{\text{15 wheels/changeout}}$ x 30 gal/changeout = 320 gal/year

Annual HW disposal cost = (15 lb HW/wheel) x (160 wheels/year) x \$2/lb = \$4800/year

Annual solvent replacement cost = 320 gal/year x \$1/gal = \$320/year

Calculate the Return on Investment (ROI):

Payback (yr) = $\frac{\text{(Project Cost)}}{\text{[(Annual Savings)-(Annual Cost)]}}$

1) Project Cost = Initial cost of new tank with solvent
2) Annual Savings (\$/yr) = HW disposal cost + Replacement solvent cost
3) Annual Cost (\$/yr) = Cost to recycle solvent = 320 gal/year x \$3.50/gal = \$1,120

Payback = $\frac{\$450}{(\$4800 + \$320) - (\$1,120)}$ = 0.11 years

This option would be selected for implementation and documented in the MAP:

- The hazardous waste reduction (number of pounds per year) would be added to the hazardous waste reduction the base expects from other selected options, and the total would be shown in the Program Summary Sheet, Chapter 2 of the MAP.
- The cost, benefit, and ROI would be listed along with other selected options in the table for Hazardous Waste Disposal in Chapter 2 of the MAP. Action offices would be assigned to award the contract and train the shop workers on the new procedures and these OPRs would also be listed in the table.

- Required actions, OPRs and estimated completion dates would be shown in the Hazardous Waste Disposal section of Chapter 3 of the MAP.

WORKSHEET 1
SITE DESCRIPTION

- List the operations at this shop/building:

- What are the major products?:

- Provide a rough estimate of production volume per month (e.g., the number of circuit boards produced):

- What are the major waste streams? What media do they affect? How much waste is generated in each?

- Has the shop/building already implemented any waste reduction or recycling techniques? If yes, describe the technique results to date.

- How many people work in this shop/building? How many hours is it operational?

- The following sources contain information that may help you determine the type and amount of waste generated at your shop:
    - Work Flow Diagram
    - Hazardous Waste Manifests
    - Emission Inventories
    - Annual/Biennial Reports
    - Permit/Permit Applications
    - Material Safety Data Sheets
    - Chemical Materials Inventory
    - Permitting Details/Conditions
    - Environmental Audit Reports

WORKSHEET 2
WASTE STREAM ASSESSMENT FORM

Questions	Waste #1	Waste #2	Waste #3	Waste #4
Waste Stream #/ Process Unit				
Brief Description of how waste is generated				
Waste Stream Name (A) air emission (WW) waste water (SW) solid waste (HW) haz waste				
Occurrence (R) regularly (NR) non-recurrent				
Monthly generation rate				
Treatment/Disposal method (R) recycled (L) landfill (S) sewage treatment plant (I) incinerator (O) other				
Disposal Cost				

WORKSHEET 3
MANAGEMENT PRACTICES

Questions	**Y**	**N**
GENERAL		
Does the shop have written procedures for shop inspection/ maintenance?		
Does the shop show signs of poor housekeeping (cluttered walkways, uncovered drums, etc.)?		
Does the aisle space appear adequate for equipment, bulky items?		
Is the drum storage area covered (e.g., all containers are protected from the weather)?		
Are all drums raised off the ground (e.g., on pallets)?		
Does the shop have equipment to prevent releases caused by over-filling of storage tanks (e.g., high level shutdown/alarms, secondary containment)?		
Are there noticeable spills, leaking containers, or leaking valves, pumps, hose fittings?		
Are containers labeled as to their contents and hazards?		
Is there smoke, dust or fumes indicating material losses?		
Does the shop have a training program for raw materials handling, spill prevention, proper storage techniques and waste handling procedures?		
If this is a training facility, are students trained to be environmentally aware?		
INVENTORY CONTROL		
Does the shop have a single point of contact for ordering and distributing new supplies?		
Does the shop have written procedures regarding inventory control?		
Is inventory used in first-in, first-out order?		
Do you dispose of products due to expired shelf-life?		
Are empty containers returned to the supplier, or re-used on-site?		
Does the shop buy products in bulk?		
Estimate the volume of chemicals maintained on-site: If figures are unavailable, provide qualitative assessment: Low, Medium, High (Low = one supply cabinet/ Medium = 1 to 3-55 gallon drums/ High = stock room with more than 50 products with > 5-55 gallon drums) Check the inventory quickly - are there any toxic substances? (E.G., benzene, methyl ethyl ketone, methylene chloride, tetrachloroethylene, toluene, trichloroethylene, xylene - these might be present in degreasers, adhesives, epoxies)		

WORKSHEET 4
OPPORTUNITY ASSESSMENT

Opportunity Title:

Describe the Opportunity:

Waste Stream(s) Affected:

Input Material(s) Affected:

Product(s) Affected:

Indicate Type of Opportunity : (the opportunity may be a combination of source reduction, recycling, and treatment)

Source Reduction
_____Equipment Change
_____Personnel/Procedure Change
_____Material Change
Recycling/Reuse
_____Onsite
_____Offsite
Treatment/Disposal

After source reduction and/or recycling have been implemented, residual wastes may still require treatment and disposal (e.g., still bottoms or spent filters from an on-site solvent recycler).

Treatment required
_____Biological
_____Incineration
_____pH adjustment
_____Precipitation
_____Solidification
_____Other
Disposal
_____Landfill
_____Surface Impoundment
_____Deep Well
_____Other

Feasibility Assessment
Explain why the opportunity appears to be technically feasible:

Estimate the one-time cost to implement the opportunity, taking into account equipment costs, labor, etc.

Estimate the annual recurring costs to implement the opportunity, taking into account materials, manpower, utilities, etc.

Estimate how much money implementation will save the facility annually.

Would the opportunity be difficult to implement?	Y	N
Staff training required	Y	N
Staff/management resistance expected	Y	N
Cost to implement is high	Y	N
Labor is required to install and maintain new equipment	Y	N
Other factors (please add)	Y	N

Typical Opportunities for EPA-17 Reduction

Physical Removal of Paint: The substitution of chemical stripper with media blasting or other physical methods of paint removal such as sanding with vacuum capabilities. This opportunity for pollution prevention can be applied to the following EPA-17 chemicals: benzene; toluene; xylene; dichloromethane; methyl ethyl ketone (MEK); and methyl isobutyl ketone (MIBK). The evaluation of this opportunity must take into account the occupational safety and health implications of process changes. Physical methods of paint removal have the potential to generate hazardous emissions of paint constituents such as lead, hexavalent chromium, and cadmium.

Recycling: Although the Air Force's EPA-17 reduction goals exempt jet fuels, recycling of other petroleum products and plastics helps reduce the purchase of materials containing benzene and toluene. For benzene the recycling of tires is also applicable, in two ways. Using retread tires saves production of new tires from benzene-containing petroleum products, and burning old tires for energy saves the use of fuel oils which contain benzene.

Parts Washers: The use of parts washers with an aqueous base soap and water rather than solvent as replacement for degreasers. This opportunity can be applied to: toluene; xylenes; carbon tetrachloride; chloroform; dichloromethane; trichlorethane (TCA); trichloroethylene (TCE); perchloroethylene (“PERK”); MEK; and MIBK. Hot water and citric-based compounds can also be used as a substitute for MEK and MIBK degreasers.

Product Substitution: There are many opportunities to substitute other materials as a form of source reduction for all EPA-17 chemicals. Opportunities include avoiding the use of canisters which contain fluorocarbons to reduce the use of chloroform, and substitute solvents to replace TCA, TCE, PERK, MEK, and MIBK.

Opportunities for the Inorganics: Reduction opportunities for the inorganic chemicals include reducing the amount of water used in electroplating, to concentrate the cadmium, chromium and nickel, then remove them through precipitation, evaporation, etc. from the waste water. The cadmium, chromium and nickel can then be reused or recycled. Reduction in the use of cyanide can be achieved though avoiding its use in electroplating compounds. Reduction in mercury use can be achieved through substitution of other chemicals. Lead usage can also be reduced through the avoidance of paint and solder containing lead.

Typical Hazardous Waste Processes and Opportunities

Typical Industrial Operation or Process	Hazardous Waste Generated	Hazardous Waste Minimization/Source Reduction Opportunities
Metal working/ heat treating	Coolants; quenching oils; salt baths	Filtration Work Centrifuge for reuse Fuel supplements
Painting	Thinners; heavy metals; polyurethanes; wastewater	Process change - airless sprays - powders - water base primers - HVLP spray guns Segregation Replace water curtain with dry filters in spray booth Solvent substitution Paint substitution
	Waste MEK	Recycle solvents Enzyme wipes
	Alodine/Chromic Acid	On-site treatment (Hexavalent chrome to trivalent chrome)
	Rags	Dry cleaning system
	Paint Booth Filters	Less frequent filter changes (do not compromise air emissions and workplace exposure control) Dissolvable filters Paint booth baffles

Typical Hazardous Waste Processes and Opportunities (cont'd)

Typical Industrial Operation or Process	Hazardous Waste Generated	Hazardous Waste Minimization Opportunities
	Aerosol Cans	Empty and puncture cans, then recycle with scrap metal contract
Fluids change out/ transport vehicle maintenance	Oils; lubricants; coolants; petroleum; alcohols	Fuel supplements Waste segregation Good housekeeping Recycling & Recovery
	Fuel filters	Contact manufacturer for reuse
	Oil filters	Crush and drain, recycle oil, recycle filters with scrap metal contract
Cleaning, degreasing, metal preparation	Solvents; detergents; ketones; freon; alkalis; heavy metals	Fuel supplements Recovery Substitution Jet Washers Filtration Chemical rejuvenation
Electrical/electronic maintenance	Heavy metals; poly-chlorinated biphenyls; solvents; freon	No-clean Substitution Freeze guns
Stripping	Solvents; caustics	Process change: - dry media blasting (plastic beads) - water jet - soda bicarbonate blasting Review stripping schedule Reduce # of planes stripped/year Reduce # times plane must be stripped

Typical Hazardous Waste Processes and Opportunities (cont'd)

Typical Industrial Operation or Process	Hazardous Waste Generated	Hazardous Waste Minimization Opportunities
Metal plating/ finishing	Acids; bases; metal rinses	Process change: - aluminum coating by ion vapor depositing - discharge hard chrome plating - fume suppressants - proprietary solutions Industrial waste treatment - neutralization - ion exchange - electrolyte precipitation - non cyanide baths
Battery shop operations	Acids; bases; cyanides; heavy metals	Neutralization Battery contractors will accept w/o draining fluids
Battery repair and replacement	Heavy metals, acids	Reclamation Neutralization
Laboratory operations	Spent, used, expired chemicals; silver (photography)	Material control Industrial or domestic waste-water treatment
Bulk Petroleum, Oils, and Lubricants (POL) Storage	Water contaminated w/ benzene	Install covers on tanks On-site carbon absorption treatment

Typical Affirmative Procurement Opportunities

This list of examples should not be a limitation, instead, use it to generate ideas and actions unique to your installation. Each action is followed by the office(s) typically responsible for initiating any changes.

- Review and revise specifications for the designated items not only to eliminate requirements for newly produced raw material, but to give preference to recycled material. (Contracting, Civil Engineering)
- Require recycled content in all writing and copy paper. (Contracting, Supply, Defense Printing Service, Government Printing Office)
- Establish preference procedures for chlorine free paper for paper products. (Contracting, Information Management, Defense Printing Service)
- Require all paper deliverables be on recycled, chlorine-free paper and double-sided. (Contracting)
- Require recycled letterhead paper. (Information Management, Defense Printing Service)
- Require recycled newsprint in all base newspapers, news magazines, and base directories. (Public Affairs)
- Require all newly acquired/leased copy machines to be capable of using recycled paper and automatically producing two sided copies. (Contracting)
- Where possible without damage to equipment, require recycled toner cartridges for copy machines and laser printers. (Information Management)
- Require documents to be transferred electronically where possible. (Contracting, Information Management, all base organizations)
- Require grounds maintenance contractors to use composted materials in mulching and landscaping. (Civil Engineering and Contracting)
- Require janitorial contractors to supply trash bags made from recycled plastics. (Civil Engineering and Contracting)
- Require the use of building products containing recycled materials when designing and writing specifications for facility repair or new construction projects. (Civil Engineering and Contracting)

- Specify the use of re-refined oil and reclaimed engine coolants. (Civil Engineering, Transportation)

- Specify retread tires for all vehicles approved for retread use. (Transportation)

- Purchase office products (desk accessories, recycling and trash receptacles, binders) which are made using recycled plastics or other recycled materials. (All)

- Exhaust existing supplies of non-recycled products before using new recycled products. (All)

Typical Energy Reduction Opportunities

Low Cost/No Cost Measures

- Turning off unneeded lights, computers, copiers, etc.
- Reducing heating temperature/increasing cooling temperature
- Insulating walls, ceilings, floors
- Installing storm doors and windows
- Installing weather stripping and caulking
- Keeping furnace serviced
- Planting shrubs around windy side of building to block wind and decrease heat loss from both conduction and convection

Some Investment Required

- Automatic energy control systems and associated equipment
- Furnace modifications including replacement burners, furnaces and/or boilers
- Cogeneration systems
- Solar energy systems

Load Reduction

- Reducing lighting level or using energy efficient bulbs or fixtures, as encouraged by DOE's Federal Lighting Initiative or EPA's Green Lights Program, helps reduce electric and cooling loads.
- Use of efficient computers (such as those that meet EPA's Energy Star Computer requirements) helps reduce cost of energy for personal computers and peripherals.

Air Handling Opportunities - to reduce air handling energy and reduce cost of Variable Speed Drive (VSD) technology

- Variable speed drive fan motor controls
- Smaller, high-efficiency motors and fans
- High-efficiency diffusers

Chiller Plant Opportunities - to eliminate CFCs, reduce chilling energy, reduce reheat, reduce dehumidification costs, avoid disruption of service and reduce technology costs

- Replace older inefficient chillers or retrofit with CFC substitute refrigerants
- VSD on compressor where appropriate
- Downsize pump
- VSD on pumps and cooling tower fans
- Heat pipes and desiccant dehumidification

- Thermal storage systems

Heating - reduce electric resistance use and lower electric and thermal load.

- Heat recovery
- Heat pumps
- Gas
- Solar space heating systems

Hot Water - Improve thermal efficiency and reduce electric resistance use.

- Heat recovery
- Heat pumps
- Cogeneration
- Solar thermal water heaters

Other

- Passive solar systems (wind energy devices, earth-sheltered buildings, etc.)

Appendix C

Sample
Pollution Prevention
Management
Action Plan

SAMPLE MANAGEMENT ACTION PLAN
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ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFI	Air Force Instructions
AFPD	Air Force Policy Directive
AGE	Aerospace ground equipment
AP	Affirmative Procurement
BE	Bioenvironmental Engineering
CAA	Clean Air Act
CEO	Civil Engineering Operations
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CY	Calendar year
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Organization
EO	Executive Order
EPA	Environmental Protection Agency
EPA-17	EPA's Industrial Toxics Project Chemcials
EPC	Environmental Protection Committee
EPCRA	Emergency Planning and Community Right-to-Know Act
ESG	Energy Steering Group
FEMIA	Federal Energy Management Improvement Act
FY	Fiscal year
HCFC	Hydrochlorofluorocarbon
HM	Hazardous materials
HQ	Headquarters
HVAC	Heating, ventilation, and air conditioning
HW	Hazardous wastes
ITP	Industrial Toxics Project
lbs	Pounds
LP	Local purchase
MAJCOM	Major Command
MAP	Management Action Plan

MedLog	Medical Logistics
MSW	Municipal solid waste
NSN	National stock number
OA	Opportunity Assessment
OCR	Office of Collateral Responsibility
ODS	Ozone Depleting Substance
OPR	Office of Primary Responsibility
OSHA	Occupation Safety and Health Act
P2	Pollution Prevention
P2OA	Pollution Prevention Opportunity Assessment
PM	Pest Management
PPA	Pollution Prevention Act
QA/QC	Quality assurance and quality control
RCRA	Resource Conservation and Recovery Act
ROI	Return on investment
TRI	Toxic Release Inventory
US	United States
USAF	United States Air Force

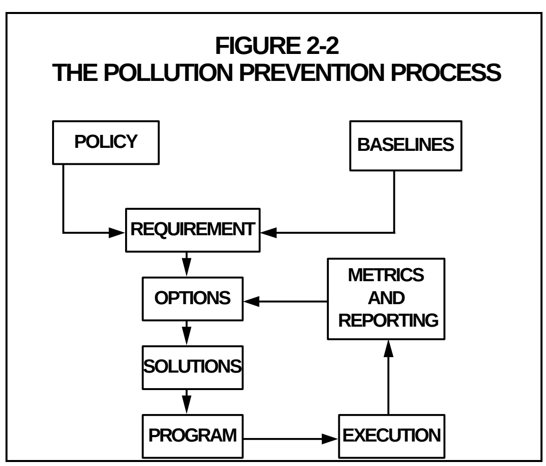
SECTION 1
PROCESS

Pollution prevention programs seek to eliminate the purchase of materials and generation of wastes known to be hazardous or otherwise non-recoverable. USAF activities may be modeled as processes which may include base industrial activities, vehicle maintenance, printing operations, or pest management. Each process relies on a steady stream of materials and may generate wastes as by-products of these processes.

The specific effort of a P2 program is to target process inputs (sources) and outputs (wastes) for reduction or elimination where possible. This is known as source reduction. Where source reduction is not feasible or cannot eliminate waste, materials may be reused or recycled to reduce waste and purchase requirements. Goals to purchase products with recycled content through affirmative procurement help close the recycling loop by creating demand for recycled products.

This section describes the process needed to develop a pollution prevention program to meet Air Force P2 reduction goals. This P2 process is divided into the eight elements as illustrated in Figure 1-1. The following subsections describe each element of the P2 process and list the management actions needed to initiate the P2 activity and to continue functioning in the future (recurring actions). The tables included in the following subsections assign Offices of Primary Responsibility (OPR), Offices of Collateral Responsibility (OCR), when necessary, and the dates of estimated completion and actual completion for each management action.

Figure 1-1 The Pollution Prevention Process



1.1 POLICY

Policy is defined as a statement of values embodied in a goal that the USAF will achieve through commitment of resources. Pollution prevention policy is contained in Air Force Policy Directive (AFPD) 32-70, Environmental Quality, and AFI 32-7080, Pollution Prevention Programs. This section describes the areas in which ----- AFB outlines its internal policies and procedures for meeting the USAF P2 goals listed in the guide. It includes assigning responsibilities and deadlines to each management action. These responsibilities and management actions are presented in Table 1-1.

Table 1-1 Establishment of Pollution Prevention Policies

Action	OPR	Estimated Completion	Actual Completion
Initial: Incorporate ----- AFB P2 program into the Environmental Protection Committee (EPC)	Wing Commander		1993
Recurring: None			
Initial: Establish a P2 working group under the EPC and establish teams in the areas of ODSs, EPA 17s, HW, MSW, AP, PM, and TRI chemicals.	EPC		1993
Recurring: Staff the teams with necessary personnel; evaluate effectiveness of each group; modify structure as required	EPC	Annually	
Initial: Establish format for team meetings and task accomplishments toward meeting P2 goals	P2 Subcommittee		1993
Recurring: Meet as necessary; assign responsibilities based on needs at that time	P2 Subcommittee	As needed	
Initial: Develop P2OA to establish program organization and strategies for meeting all USAF P2 reduction goals	P2 Subcommittee		1995
Recurring: Update P2OA	P2 Subcommittee	Annually	
Initial: Develop the Facility Energy Plan	CES/CEOE	1997	
Recurring: Update Facility Energy Plan	CES/CEOE	Annually	
Initial: Establish Energy Management Steering Group (EMSG), staff appropriately. Establish supporting Energy Working Groups for all appropriate organizations	CES/CEOE		1995

Table 1-1 Establishment of Pollution Prevention Policies (continued)

Action	OPR	Estimated Completion	Actual Completion
Recurring: Staff the teams with necessary personnel; evaluate effectiveness of each group; modify structure as required	EMSG	Annually	

1.2 BASELINE

A baseline is a measurement of the amount of a targeted substance purchased or generated during a specified time period. Baselines establish the beginning numerical status of a targeted substance relative to the P2 goals. Information collected to determine the baseline includes descriptions and quantities of materials purchased or generated, unit costs of purchase or disposal, and a description of each process using the material and generating the waste. As described in a 2 May 1995, memorandum from Headquarters (HQ) USAF/CEV, baselines are not to be adjusted after 26 May 1995, except under the conditions described in the *Metric Reporting Guidance* attached to the memorandum. The *Metric Reporting* Guidance only allows for baseline adjustments when an installation is transferred from one MAJCOM to another. Furthermore, no adjustments will be allowed to compensate for mission changes, personnel increases or decreases, or Base Realignment and Closure Commission actions for installations within the same MAJCOM. The establishment of baselines and the assignment of OPR are presented in Table 1-2.

[Contractor Name] prepared baseline data for the program elements ODSs, EPA 17s, PM, and TRI chemicals. Data for ODSs, EPA 17s and TRI chemicals are based on the Toxic Chemical Inventory Technical Report prepared by [Contractor] in August 1995. The purpose of the report was to identify those EPCRA Section 313 toxic chemicals that were manufactured, processed, or otherwise used in CY94 on ----- AFB. Baseline and inventory data for PM was compiled by ----- AFB and [Contractor] during the P2OA. HW and MSW baselines have been set by ----- AFB based on [MAJCOM] guidance dated __________. Baseline data collected for ODSs, EPA 17s, PM, and TRI chemicals result from annual quantities of products and chemicals procured for ----- AFB.

Table 1-2 Establishment of Pollution Prevention Baselines

Action	OPR	Estimated Completion	Actual Completion
Initial: Establish ODS CY94 baseline	CES/CEV		Feb 1996
Recurring: Track progress toward reaching compliance of elimination of ODS purchases		Annually	

Table 1-2 Establishment of Pollution Prevention Baselines (continued)

Action	OPR	Estimated Completion	Actual Completion
Initial: Establish EPA 17 CY92 baseline **Recurring:** Modify baseline based on variations in mission and in accordance with [MAJCOM]/CEV	CES/CEV	 As required	Feb 1996
Initial: Establish HW CY92 baseline **Recurring:** Modify baseline based on variations in mission and in accordance with [MAJCOM]/CEV	CES/CEV	 As required	Feb 1996
Initial: Establish MSW CY92 baseline **Recurring:** Modify baseline based on variations in mission and in accordance with [MAJCOM]/CEV	CES/CEV	 As required	Feb 1996
Initial: Identify EPA Guideline Items purchased by ----- AFB and determine which purchases do not meet EPA recycled content standards **Recurring:** Evaluate program to ensure all current Guideline Item purchases are addressed	CES/CEV	Dec 1996 Annually	
Initial: Establish energy conservation CY85 baseline **Recurring:** Modify baseline based on variations in mission and in accordance with [MAJCOM]/CEV	CES/CEOE CES/CEOE	 As required	1985
Initial: Establish pesticide management CY93 baseline **Recurring:** Modify baseline based on variations in mission and in accordance with [MAJCOM]/CEV	CES/CEV	 As required	Feb 1996
Initial: Establish TRI chemical CY94 baseline **Recurring:** Modify baseline based on variations in mission and in accordance with [MAJCOM]/CEV	CES/CEV	 As required	Feb 1996

1.3 REQUIREMENTS

Installation requirements identify the quantity of material or waste that must be reduced to meet the Air Force P2 reduction goals. The requirement is the difference between the goal and the baseline, and it identifies what the program needs. For example, the first energy goal is to reduce energy use by 10 percent by 1995 when compared to a 1985 baseline. If the 1985 energy consumption was 0.149 MBtu, a 10 percent reduction amounts to 0.0149 MBtu; this is the requirement. If energy consumption efforts after 1985 have already yielded a reduction of 0.004 MBtu, this can be subtracted, and the remaining requirement is 0.0109 MBtu, or the amount of reduction still needed to attain the reduction goal. This process is repeated to obtain the requirements for the second and third phase energy reduction goals (20 percent by 31 December 2000 and 30 percent by 31 December 2005, respectively). For non-baseline areas (e.g., affirmative procurement), the requirement will equal the difference between the goal and the current measurement. The identification of the requirements for meeting the P2 goals is outlined below in Table 1-3.

Table 1-3 Pollution Prevention Program Requirements

Action	OPR	Estimated Completion	Actual Completion
Initial: Determine requirements for ODSs	P2 Subcommittee		Feb 1996
Recurring: Update requirements	P2 Subcommittee	Annually	
Initial: Determine requirements for EPA 17 chemicals	P2 Subcommittee		Feb 1996
Recurring: Update requirements	P2 Subcommittee	Annually	
Initial: Determine requirement for HW	P2 Subcommittee		Feb 1996
Recurring: Update requirements	P2 Subcommittee	Annually	
Initial: Determine requirement for MSW	P2 Subcommittee		Feb 1996
Recurring: Update requirements	P2 Subcommittee	Annually	
Initial: Determine requirement for AP	P2 Subcommittee		Feb 1996
Recurring: Update requirements	P2 Subcommittee	Annually	
Initial: Determine requirements for energy conservation program	CES/CEOE		Feb 1996
Recurring: Update requirements	CES/CEOE	Annually	
Initial: Determine requirements for pesticide management program	P2 Subcommittee		Feb 1996
Recurring: Update requirements	P2 Subcommittee	Annually	
Initial: Determine requirements for TRI chemical program	P2 Subcommittee		Feb 1996
Recurring: Update requirements	P2 Subcommittee	Annually	

1.4 OPTIONS

When base requirements are outlined, P2 options for meeting the requirements must be identified, and these options are identified through OAs. The *Air Force Installation*

Pollution Prevention Program Guide and the ----- AFB P2OA Report outline the method for conducting OAs. The OAs identify the following: specific waste generating processes, a description of P2 options, the option's cost, the option's value in terms of which substances and program components are affected, how much each substance is reduced for each affected process, the unit cost of purchase or disposal for each substance, and the ROI. Table 1-4 lists the actions necessary to conduct and maintain current OAs.

Table 1-4 Actions for Conducting and Maintaining Opportunity Assessments

Action	OPR	Estimated Completion	Actual Completion
Initial: Develop P2 options that will achieve base requirements for ODSs, EPA 17s, HW, MSW, AP, PM, and TRI chemicals through OAs	P2 Subcommittee and Teams		Dec 1995
Recurring: Accomplish periodic OAs and develop new options as necessary	P2 Subcommittee	As required*	
Initial: Develop expertise to conduct in-house OAs	P2 Subcommittee	Ongoing	
Recurring: None			
Initial: Develop site-specific OA worksheets	P2 Subcommittee		Dec 1995
Recurring: Update worksheets	P2 Subcommittee	As required*	
Initial: Conduct site-specific OAs	P2 Subcommittee		Dec 1995
Recurring: Accomplish site-specific OAs and develop new options as necessary	P2 Subcommittee	As required*	
Initial: Develop energy conservation options that will achieve base requirements	CES/CEOE	Ongoing	
Recurring: Accomplish periodic OAs and develop new options as necessary	CES/CEOE	As required*	

* As required, at a minimum bi-annually, to assure compliance with reduction goals and review of processes.

1.5 SOLUTIONS

Solution sets that allow the USAF to meet its reduction requirements, are compiled from the range of options identified as a result of the OAs. The options in the solution set have been selected for implementation based on their technical feasibility, cost-effectiveness, prevention of pollutant cross-media transfer, and significant contribution to meeting the Air Force P2 reduction goals. The options within the solution set for each reduction goal year are first prioritized based on ROI (when available) and on cost when

ROIs are not available. Table 1-5 lists the management actions necessary to identify solutions.

Table 1-5 Management Actions Necessary to Identify Solutions

Action	OPR	Estimated Completion	Actual Completion
Initial: Select implementable options for ODS, EPA 17, HW, MSW, AP, PM and TRI chemicals	P2 Subcommittee		Feb 1996
Recurring: Continue to accept, evaluate, and prioritize options to maintain a viable pool of solutions for the above goal areas	P2 Subcommittee	Ongoing	
Initial: Select implementable energy conservation options	CES/CEOE		1994
Recurring: Continue to accept, evaluate, and prioritize options to maintain a viable pool of solutions for the goal area	CES/CEOE	Ongoing	
Initial: Consider various Federal threshold levels (EPCRA, OSHA, CAA, etc.) when selecting implementation options	P2 Subcommittee and CEOE*	Ongoing	
Recurring: Continue to evaluate and update threshold levels and requirements when selecting options	P2 Subcommittee and CEOE*	Ongoing	
Initial: Document implementable options in the Program Section of this P2 MAP	P2 Subcommittee and CEOE*		Feb 1996
Recurring: Continue to update and prioritize options in the Program Section of this P2 MAP	P2 Subcommittee and CEOE*	Ongoing	

* Indicates that P2 Subcommittee is OPR for program elements ODSs, EPA 17s, MSW, AP, PM, and TRI; CES/CEOE is OPR for energy conservation.

1.6 PROGRAM

Once the best solution sets have been identified, the actual program must be constructed based on the options in the solution sets. A decision-making body and process must be established to ensure funds are allocated against the highest priority options and that the program is carried into the future. Once funds have been allocated, the options may become projects. Table 1-6 describes this decision-making body and process.

Civil Engineering is the lead organization for consolidating and managing ----- AFB's P2 and budget. P2 projects must be programmed and budgeted in accordance with the associated rules for each appropriation. AFI 32-7001, Environmental Budgeting, provides programming and budgeting information. The following projects are not eligible for P2 funds:

- Acquisition projects
- Air conditioning projects
- Depot level equipment
- Energy conservation MilCon projects
- Halon projects (except for prototype projects for aircraft)
- Environmental certifications and licenses
- Fire extinguisher projects
- Maintenance projects
- Non-environmental projects

Table 1-6 The Decision-Making Process

Action	OPR	Estimated Completion	Actual Completion
Initial: Submit the initial P2 budget to [MAJCOM]	CES/CEV		1994
Recurring: Submit annual P2 budgets to [MAJCOM]	CES/CEV	Dec 15, Annually	
Initial: Enter initial projects and equipment items into the A-106	CES/CEV		1994
Recurring: Enter annual projects and equipment items into the A-106	CES/CEV	Dec 15, Annually	
Initial: Submit initial unfunded P2 projects to [MAJCOM]	CES/CEV		1994
Recurring: Submit annual unfunded P2 projects to [MAJCOM]	CES/CEV	June 15, Annually	
Initial: Establish procedures to classify projects	P2 Subcommittee	Dec 1996	
Recurring: Review procedures and classification system	P2 Subcommittee	Annually	
Initial: Establish decision-making body to review solutions and determine P2 programs	P2 Subcommittee	Dec 1996	
Recurring: Submit annual options to committee for review	P2 Subcommittee	Annually	

1.7 EXECUTION

The tabular information in this section outlines the management actions that must occur to execute a successful P2 program. Timely execution is critical to program success and resource allocation. The management actions that correspond to the execution of the P2 program are listed below in Table 1-7.

Table 1-7 Management Action Execution of the P2 Program

Action	OPR	Estimated Completion	Actual Completion
Initial: Establish execution goals and track percentage of projects executed throughout the fiscal year	P2 Subcommittee and CEOE*		Feb 1996
Recurring: Update goals as projects are completed	P2 Subcommittee and CEOE*	Ongoing	

* Indicates that P2 Subcommittee is OPR for program elements ODSs, EPA 17s, MSW, AP, PM, and TRI; CES/CEOE is OPR for energy conservation.

1.8 METRICS AND REPORTING

The actual benefit of implemented ideas should be measured and compared with the projected benefit. This is done through the use of metrics: measurements used to measure progress. Established metrics are founded upon baselines for each program element. Metrics will be tracked by the ## CES/CEV annually to determine whether the Air Force P2 reduction goals are being met for each program element. Metrics use actual execution data to measure program performance. Modifications to the program will be based on the difference between estimated completion and actual performance. Table 1-8 outlines the actions necessary to measure and report progress.

Table 1-8 Measuring and Reporting Progress

Action	OPR	Estimated Completion	Actual Completion
Initial: Establish procedures to capture and record data for the AFPD metrics in ODSs, EPA 17s, HW, MSW, AP, PM, TRI chemicals and any other legally mandated reports	P2 Subcommittee	Jun 1996	
Initial: Establish procedures to capture and record data for the AFPD metrics in EPA 17s and TRI chemicals	HazMat Pharmacy	Annually	
Recurring: Enter reportable data into the P2 module of the WIMS-ES for AFPD metrics	CES/CEV	Semi-Annually	
Recurring: Measure actual benefits of completed projects for all goal areas	P2 Subcommittee and CEOE*	Annually	

Table 1-8 Measuring and Reporting Progress (Continued)

Recurring: Compare actual benefit and cost of each project completed in this reporting cycle with estimated completion benefit and cost for all goal areas	P2 Subcommittee and CEOE*	Annually	
Recurring: Update requirements with actual benefit data and modify program accordingly for all goal areas	P2 Subcommittee and CEOE*	Annually	
Recurring: Record actual cost data for improving future cost estimates for all goal areas	P2 Subcommittee and CEOE*	Annually	
Recurring: Evaluate the results of implementing solutions, determine the deviation from projected results, and initiate the requirements to generate new options for all goal areas	P2 Subcommittee and CEOE*	Ongoing	
Recurring: Provide status briefings to Wing Commander	CES/CEV	Quarterly	
Recurring: Initiate requirement for more options to be generated for all goal areas	P2 Subcommittee and CEOE*	As required	

* Indicates that P2 Subcommittee is OPR for program elements ODSs, EPA 17s, MSW, AP, PM, and TRI; CES/CEOE is OPR for energy conservation.

SECTION 2
PROGRAM

This section contains a program summary and listing of P2 projects for each program element. Table 2-1 summarizes and describes the relationship among the policy goals, baselines, requirements, benefits, and costs for each of the program elements. The policy goals are quantified according to percent reduction, and projected deadlines are specific for each program element.

Tables 2-2 through 2-7 in this section provide a listing of the P2 options by program element with associated costs, benefits, ROI, and OPR. These tables reflect where each program element stands in regard to HQ and AETC goals. If the program element has previously met Air Force P2 goals, the options listed assist with future reductions. If the program has not met its goals, the options specify what actions may be taken and the reductions that may be realized. Various assumptions were made when calculating benefits and costs. "NA" was entered as not applicable, "NC" was entered as not calculated due to insufficient data, and "Unknown" was entered if the benefit could not be calculated. ROI may be a value of zero because costs may exceed net operating savings, or because no capital costs are incurred with the action. Total benefits on the following charts represent the benefit if all of the proposed options were implemented. The base may choose to use a combination of options to reach the HQ and MAJCOM goals. The purpose of the P2 MAP is to provide adequate reduction options. Therefore, the figure for total benefits may exceed the actual amount of materials to be reduced.

Baseline data collected for ODSs, EPA 17s, PM, and TRI chemicals result from annual quantities of chemicals procured for ----- AFB. HW and MSW baselines are set based on ----- AFB and MAJCOM guidance dated ______. The quantity of products issued are assumed to be equivalent to the quantity of products used during that respective year. Therefore, reductions in application, release, disposal, and transfer are associated with the quantity of chemical purchased for data collection and tracking purposes. Data for MSW is based on actual volumes of MSW being disposed.

All the options and initiatives addressing each of the program elements specified in *Air Force Installation Pollution Prevention Program Guide* originated from the following sources:

- ----- AFB Pollution Prevention Opportunity Assessment
- ----- AFB Energy Conservation and Reduction Plan
- [Contractor Name]

Table 2-1. Summary of ----- AFB's Pollution Prevention Program

Pollution Prevention Program Elements	ODS (lbs)	EPA 17[a] (lbs)	TRI Chemicals (lbs)	Pesticide Management (lbs)	AP	Energy Conservation (KBtu/SF)		
Baseline Year	NA	CY92	CY94	CY93	NA	CY85		
Baseline Quantity	NA	37,636	16,500[c]	9,636[d]	NA	96,636[d]		
Goal Reduction Year End	NA	CY96	CY99	CY00	Annually	CY95	CY00	CY05
Goal Reduction Percent	100%	50%	50%	50%	NA	10%	20%	30%
Reduction Quantity	8,606	18,818	8,250	4,818	NA	9.63	19.26	28.89
Goal	0	18,818	8,250	4,818	NA	86.67	77.04	67.41
Comparison of Inventory Quantities with Baseline Quantities								
CY94 Inventory Quantity	8,606	24,695	16,500[b]	9,259	NA	98.5[b]	--	--
Reduction Quantity Achieved through CY94	NA	12,941	0	377	NA	+2.5	--	--
CY94 Percent Reduction Achieved	NA	34%	0%	4%	NA	-2.6%	--	--
Summary of Additional Requirements to Meet Reduction Goals								
Additional Reduction Quantity Required	8,606	5,877	8,250	4441	NA	12.13	21.76	31.39
Percent Remaining to Meet Reduction Goal	100%	16%	50%	46%	NA	12.6%	22.6%	32.6%
Total Costs Expected	$7,200	$201,710	$33,710	$9,960	NA	$Unknown	$Unknown	$Unknown

Table 2-1. (Continued) Summary of ----- AFB's Pollution Prevention Program

Pollution Prevention Program Elements	Hazardous Waste (lbs)					Municipal Solid Waste (tons)				
Baseline Year	CY95					CY95				
Baseline Quantity	142,000					4,907				
Goal Reduction Year End	CY96	CY97	CY98	CY99	CY00	CY96	CY97	CY98	CY99	CY00
Goal Reduction Percent	11%	22%	33%	44%	55%	6%	23%	30%	39%	45%
Reduction Quantity	15,620	31,240	46,860	62,480	78,100	294.42	1,128.61	1,472.10	1,913.73	2,208.15
Goal	126,380	110,760	95,140	79,520	63,900	4,612.58	3,778.39	3,434.90	2,993.27	2,698.85
Comparison of Inventory Quantities with Baseline Quantities										
CY96 Inventory Quantity	--	--	--	--	--	--	--	--	--	--
Reduction Quantity Achieved through CY96	--	--	--	--	--	--	--	--	--	--
CY96 Percent Reduction Achieved	--	--	--	--	--	--	--	--	--	--
Summary of Additional Requirements to Meet Reduction Goals										
Additional Reduction Quantity Required	15,620	31,240	46,860	62,480	78,100	294.42	1,128.61	1,492.10	1,913.73	2,208.15
Percent Remaining to Meet Reduction Goal	11%	22%	33%	44%	55%	6%	23%	30%	39%	45%
Total Costs Expected	--	--	--	--	$328,570	--	--	--	--	$778,750

a CY 1992 baseline excludes quantities from fuel purchases. Source: USAF, 1995a.

b Data from FY95.

c TRI chemical data totals are from non-exempt amounts in inventory and are inclusive of non-exempt totals for EPA 17s.

d Measured in pounds of active ingredients.

\+ No reduction achieved. Indicates amount above baseline.

NA Not Applicable.

Each project option or action was given a code based on the program element to which the project applies (e.g., HW-1 for HW project number 1, MSW-1 for MSW project number 1, etc.). The initiating source for each option is provided in the narratives in Appendix A. The narratives identify many costs and benefits that are not represented in the tables in this section. Many assumptions for the projects were based on limited data. Prior to implementation of a project, all costs and benefits should be reviewed carefully to verify the true costs and benefits for ----- AFB.

2.1 OZONE DEPLETING SUBSTANCES (ODSs)

Goal: Eliminate the purchase of ODSs as soon as possible.

----- AFB is in the process of eliminating the new purchase of all pure Class I ODSs in accordance with the deadlines specified in the Air Force P2 program. The options listed in Table 2-2 are designed to eliminate the new purchase of products containing ODSs. The Bioenvironmental Engineering (BE) office at ----- AFB evaluates suitable product substitutes and assist shops in implementing the substitutions.

Table 2-2 ODS Elimination Options

(FY) Project Title	ROI	Capital Cost[a]	Benefit (lbs/yr)	OPR
(FY96) ODS-1 Replace Current ODSs with Low- or No-ODS Substitutes	None	$4,000	6,500	CEV
(FY96) ODS-2 Monitor ODS-using Equipment	≥None	$3,200	6,000	CEV
TOTAL		**$7,200**	**≥ 8,606**	

[a] Total only for known capital costs. Does not assume costs not calculated.

2.2 EPA 17 INDUSTRIAL TOXICS PROGRAM CHEMICALS

Goal: Reduce the purchase and use of EPA 17 chemicals by 50 percent by 31 December 1996 from a CY92 baseline of 37,636 pounds (lbs). The CY92 baseline does not include EPA 17 chemicals contained in fuels. This also does not include EPA 17 chemicals that are included in fuels used for fire training.

----- AFB is progressing toward the 31 December 1996 reduction goal. The base has currently achieved a cumulative reduction of 12,941 lbs, or 34 percent through CY94. To achieve the CY96 goal, ----- AFB must reduce EPA 17 purchases by 16% which is an additional 5,877 lbs. The options presented in Table 2-3 are recommendations for continued reduction and product substitutions which will assist ----- AFB in reducing the amount of EPA 17 chemical purchases beyond the Air Force P2 reduction goals. The Bioenvironmental Engineering (BE) office at ----- AFB also evaluates suitable product substitutes and assists shops in implementing the substitutions.

Table 2-3 EPA 17 Chemical Reduction Options

(FY) Project Title	ROI	Cost[b,c]	Benefit (lbs/yr)	OPR
(FY96) EPA-1 Solvent Substitution	None	$13,560[c]	3,500	P2 Subcommittee
(FY96) EPA-2 Solvent Recycling	1.99[a]	$19,500[a]	4,850[a]	P2 Subcommittee
(FY96) EPA-3 Paint Gun Cleaner	1.35	$6,000	1,775	P2 Subcommittee
(FY96) EPA-4 HVLP Sprayer	0.07	$1,650	1,480	P2 Subcommittee
(FY96) EPA-5 Integrated Pest Management	None	10,000	aprox 100	P2 Subcommittee
(FY96) EPA-6 Purchase and Implement Automated Paint Mixer with Electrostatic Sprayers	2.4	151,000	2,800	P2 Subcommittee
TOTAL		**$201,710**	**14,505**	

[a] Figures represents shared options applicable to multiple processes. See Appendix A for details.
[b] Total only for capital costs.
[c] Total for annual cost, if no capitol costs apply.
[NC] Not calculated due to insufficient data.

2.3 HAZARDOUS WASTE

Goal: Reduce HW disposal by 11 percent by CY96, 22 percent by CY97, 33 percent by CY98, 44 percent by CY95, and 55 percent by CY00 from a CY95 baseline of 142,000 lbs.

----- AFB received guidance for new HW pollution prevention metrics from [MAJCOM] on (date). The new metrics begin with a CY95 baseline of 142,000 lbs. Reduction goals are set incrementally until the year 2000 for a total reduction of 55 percent, or 78,100 lbs of hazardous waste. A summary of ----- AFB's hazardous waste generation is provided in Appendix B. Implementation of the projects listed in Table 2-4 will assist ----- AFB in reducing the amount of HW generation toward the Air Force P2 reduction goals.

Table 2-4 Hazardous Waste Reduction Options

(FY) Project Title	ROI	Cost[b]	Benefit (lbs/yr)	OPR
(FY96) HW-1 Solvent Recycling	1.99[a]	$19,500[a]	3,700[a]	P2 Subcommittee
(FY96) HW-2 Solvent Substitution	None	$13,560[c]	4,200	P2 Subcommittee

Table 2-4 Hazardous Waste Reduction Options (continued)

(FY) Project Title	ROI	Cost[b]	Benefit (lbs/yr)	OPR
(FY96) HW-3 On-Site Metals Treatment	6.9	101,000	12,000	P2 Subcommittee
(FY96) HW-4 Filter Analysis	0.85	$12,800	19,400	P2 Subcommittee
(FY96) HW-5 Rechargeable Batteries	0.46	$300	3,500	P2 Subcommittee
(FY96) HW-6 Alternative Paint Stripper	None	$3,990[c]	950	P2 Subcommittee
(**FY96) HW-7** Paint Gun Cleaner	1.35	$6,000	1,775	P2 Subcommittee
(**FY96) HW-8** Hazardous Waste Tracking Team	None	$11,520	25,000	P2 Subcommittee
(FY96) HW-9 HVLP Sprayer	0.07	$1,650	3,700	P2 Subcommittee
(FY96) HW-10 Purchase and Implement Automated Paint Mixer with Electrostatic Sprayers	2.4	$151,000	4,000	P2 Subcommittee
(FY96) HW-11 Replace Lead Acid Batteries with Gel-Cell Batteries	0	$7,250[c]	3,000	P2 Subcommittee
TOTAL		**$328,570**	**81,225**	

[a] Figures represents shared options applicable to multiple processes. See Appendix A for details.

[b] Total only for capital costs.

[c] Total for annual cost, if no capitol costs apply.

2.4 MUNICIPAL SOLID WASTE

Goal: Reduce MSW disposal by 6 percent by CY96, 23 percent by CY97, 30 percent by CY98, 39 percent by CY95, and 45 percent by CY00 from a CY95 baseline of 4,907 tons.

----- AFB received guidance for new MSW pollution prevention metrics from [MAJCOM] on (date). The new metrics begin with a CY95 baseline of 4,907 tons. Reduction goals are set incrementally until the year 2000 for a total reduction of 45 percent, or 2,208 tons of municipal solid waste. Implementation of the projects listed in Table 2-5 will assist ----- AFB in reducing the amount of MSW generated and assist in reaching the Air Force P2 reduction goals. These options are detailed in the project narratives in Appendix A.

Table 2-5 Municipal Solid Waste Reduction Options

(FY) Project Title	ROI	Cost	Benefit (tons/yr)	OPR
MSW-1 Source Reduction Education Program	None	$0	233	P2 Subcommittee
MSW-2 Reduce collection of MFH Grass Clippings	None	$0	69	P2 Subcommittee
MSW-3 Point Papers from Waste Generators	None	$0	558	P2 Subcommittee
MSW-4 Electric Hand Dryers	3.51	$108,000	30	P2 Subcommittee
MSW-5 Improve Existing Recycling Program	5.47	$107,000	783	P2 Subcommittee
MSW-6 Wood Waste Recycling Program	6.28	$30,000	1,000	P2 Subcommittee
MSW-7 Yard Waste Composting	21	$241,500	700	P2 Subcommittee
MSW-8 Mixed Waste Composting	8.64	$247,250	1,295[b]	P2 Subcommittee
MSW-9 Backyard Composting	6.35	$45,000	284[c]	P2 Subcommittee
TOTAL		**$778,750**[a]	**>2,208**	

[a] Total includes capital costs only.
[b] Includes 700 tons of MSW-7.
[c] Includes 69 tons of MSW-2.

2.5 AFFIRMATIVE PROCUREMENT

Goal: Ensure 100 percent of all EPA Guideline Items purchased each year contain recycled materials meeting EPA guideline standards.

Currently ----- AFB has not implemented an affirmative procurement program or a system that routinely monitors the procurement of EPA Guideline Items. The single option presented in Table 2-6 is a recommendation for developing an affirmative procurement program at ----- AFB. The program should address affirmative procurement of all current and proposed EPA Guideline Items.

Table 2-6 Affirmative Procurement Options

(FY) Project Title	Cost	Benefit	OPR
AP-1 Develop Affirmative Procurement Program	NC	Unknown	P2 Subcommittee

[NC] Not calculated due to insufficient data.

2.6 ENERGY CONSERVATION

Goal: Reduce energy consumption by 10 percent by 31 December 1995, 20 percent by 31 December 2000, and 30 percent by 31 December 2005 from CY85 baselines. ----- AFB's CY85 baseline is 96.3 KBtu/SF. In 1995, ----- AFB's energy consumption was 98.8 KBtu/SF. They currently are not meeting their energy conservation goals.

The base Energy Management Program is managed by the Civil Engineer Squadron's Maintenance Engineering Element. Further information can be obtained from the Chief, Maintenance Engineering at (xxx) xxx-xxxx.

2.7 PESTICIDE MANAGEMENT

Goal: Reduce purchases and application of pesticides 50 percent by 31 December 2000 from a CY93 baseline of 9,636 lbs.

----- AFB is progressing toward the CY00 reduction goal. A total reduction of 4 percent of the baseline, or 377 lbs of active ingredients, was achieved in CY94. To reach the 50 percent reduction goal by CY00, ----- AFB must reduce pesticide active ingredient application by an additional 46 percent, or 4,441 lbs. Table 2-7 presents an option to assist ----- AFB in meeting this goal.

Table 2-7 Pesticide Management Options

(FY) Project Title	ROI	Cost	Benefit (lbs/yr)	OPR
PM-1 Integrated Pest Management Program	None	$9,960	>4,818	P2 Subcommittee
TOTAL		**$9,960**	**>4,818**	

2.8 TRI CHEMICALS

Goal: Reduce release and off-site transfers of TRI chemicals 50 percent by 31 December 1999 from a CY94 baseline of 16,500 pounds.

In order for ----- AFB to reach the 50 percent goal, a reduction of 8,250 lbs of TRI chemicals must be made. Implementation of the projects listed in Table 2-8 will assist ----- AFB in reducing release and off-site transfers of TRI chemicals. A summary of ----- AFB's TRI chemicals is provided in Appendix C.

Table 2-8 TRI Chemical Reduction Options

(FY) Project Title	ROI	Cost[a]	Benefit (lbs/yr)	OPR
TRI-1 Replace Lead Acid Batteries with Gel Cell	None	$7,250[a]	500	P2 Subcommittee
TRI-2 Replace ODSs	None	$7,200[a]	5,000	P2 Subcommittee
TRI-3 Solvent Substitutes	None	$13,560[a]	3,500	P2 Subcommittee
TRI-4 Glycol Ether Solvent Substitutes	None	$5,700[a]	5,000	P2 Subcommittee
TOTAL		**$33,710**	**14,000**	

[a] Total for annual cost, if no capital costs apply.

SECTION 3
EXECUTION

This section summarizes the management actions necessary to initiate and implement options identified in Section 2. These actions are specific to each ----- AFB project. Prior to implementation, a detailed engineering cost estimate should be prepared. The costs and benefits provided in the project narratives are estimates. This section is subdivided by each of the eight program elements (ODSs, EPA 17, HW, MSW, AP, energy conservation, pesticide management, and TRI chemicals). The options chosen to help achieve the reduction goals for each program element are listed under the element, and each option has a table outlining the steps to execute the option.

3.1 OZONE DEPLETING SUBSTANCES

The Clean Air Act identified many substances that contribute to the depletion of the Earth's stratospheric ozone layer. USAF policy outlines a plan to eliminate the purchase of newly-produced ODSs. The purchase ban takes effect on different dates for different ODS applications. ----- AFB has curtailed the new purchase of all Class I ODS refrigerants and equipment utilizing Class I ODS refrigerants, including air conditioning units and vehicles. For products containing ODSs, the [MAJCOM] goal is to eliminate all purchases as soon as possible. Table 3-1 illustrates projects which will contribute to ----- AFB achieving the USAF P2 goals while avoiding any negative mission impacts.

Table 3-1 Achieving P2 Goals: ODSs

Action	OPR	Completion Date	
		Estimated Completion	**Actual Completion**
ODS-1 Replace Current Freon with Low-or No-ODS Substitute			
Identify all ODS uses (See ODS-1 narrative)	CEV		Feb 1996
Determine which systems may be able to use ODS substitutes	CEV	Jan 1997	
Evaluate potential substitute products for effectiveness	CEV	Ongoing	
Discontinue purchase of current products	HazMat Pharmacy	Ongoing	
Purchase and use substitute products	HazMat Pharmacy	Ongoing	

Table 3-1 Achieving P2 Goals: ODSs (continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
ODS-2 Monitor Equipment Using ODSs			
Identify team of two individuals that will set up a system for tracking ODS-containing equipment	CEV	Feb 1997	
Maintain the tracking system to identify the equipment that needs maintenance	CEV	Ongoing	
Commit personnel and materials to conduct routine maintenance and modifications	CEV	Jun 1997 & Ongoing	

3.2 EPA 17 CHEMICAL PURCHASES

Controlling hazardous materials is essential to a successful P2 plan. This includes reducing the quantity and types of hazardous wastes, as well as implementing proper distribution, use, storage, and disposal. The EPA has targeted 17 chemicals and chemical categories from the list of substances identified under Title III of the Superfund Amendments and Reauthorization Act for voluntary purchase reduction. USAF has made the reductions mandatory for all bases as part of the Air Force P2 program. These chemicals will be tracked and measured against a CY92 baseline. As stated in Section 2, ----- AFB has achieved a 34 percent cumulative reduction in the purchase of EPA 17 chemicals since the CY92 baseline. To reach the reduction goals, an additional 16 percent reduction must be made. Table 3-2 illustrates management actions for options essential to reducing the purchase of EPA 17 chemicals in order to reach the Air Force P2 reduction goals.

Table 3-2 Achieving P2 Goals: EPA 17 Chemical Purchases

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
EPA-1 Solvent Substitution			
Identify solvents that are used on the base that contain EPA 17 chemicals	CEV		Feb 1996
Determine potential substitutes of EPA 17 chemicals used on the base	CEV		Feb 1996

Table 3-2 Achieving P2 Goals: EPA 17 Chemical Purchases (continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
Access and evaluate substitute chemicals for use in the different applications	CEV	Dec 1996	
Begin to phase out EPA 17 chemicals	CEV	Feb 1997	
Sample and analyze resultant waste for TCLP	CEV	May 1997	
EPA-2 Solvent Recycling			
Evaluate the requirements for a solvent recycling unit	CEV		Feb 1996
Determine all potential paint shop users of centralized unit	CEV		Feb 1996
Identify vendor and allocate system	CEV	Oct 1996	
Allocate transfer devices for shops that will use the system	CEV	Oct 1996	
Begin implementation of the solvent recycling for paint shops	CEV	Jan 1997	
EPA-3 Paint Gun Cleaner			
Determine all potential users on closed-loop paint gun cleaners	CEV		Feb 1996
Evaluate the applicability of cleaning system with existing equipment	CEV	Jun 1996	
Evaluate potential vendors and determine cost for multiple purchase	CEV	July 1996	
Purchase and install systems	CEV	Dec 1996	
EPA-4 HVLP Sprayers			
Determine all potential users of HVLP sprayers	CEV		Feb 1996
Evaluate potential vendors	CEV	July 1996	
Develop appropriate parameters for design and purchase of system	CEV	July 1996	
Purchase and install systems	CEV	Dec 1996	
Train shop personnel in new procedures and monitor use	CEV	Jan 1997	

Table 3-2 Achieving P2 Goals: EPA 17 Chemical Purchases (continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
EPA-5 Integrated Pest Management			
Contact state extension service for information on IPM plan, base specific	CEV	Dec 1996	
Access Model Pesticide Reduction Guide (to be released in Jun 1996)	CEV	Jul 1996	
Evaluate potential for IPM	CEV	Feb 1997	
Train personnel in IPM techniques	CEV	Jun 1997	
EPA-6 Implement Automated Paint Mixer and Electrostatic Sprayers			
Identify automated paint mixer system and electrostatic sprayers	Corrosion Control		Jun 1995
Identify funding for purchase	CEV	Jun 1996	
Purchase system	CEV	Sep 1996	
Install system	CEV/Corrosion Control	Jan 1997	
Train employees on proper use	CEV/Corrosion Control	Mar 1997	

3.3 HAZARDOUS WASTE DISPOSAL

Hazardous wastes are most often regulated under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substance Control Act for polychlorinated biphenyl waste. RCRA requires that a generator of RCRA hazardous waste certify that a waste minimization program is in place as part of the biennial report for hazardous waste generators. The EPA’s interim final guidance, published in January 1993, identifies what is necessary to included in a program in order to comply with certification requirements. This plan should include efforts undertaken during the year to reduce the volume or toxicity of wastes generated and changes in the volume and toxicity actually achieved in comparison to previous years. Efforts listed in the HW section of this plan fulfill the requirements of RCRA and of the P2 MAP. ----- AFB must reduce hazardous waste by 55 percent to reach the 31 December 2000 goal from the updated CY95 baseline quantity. Table 3-3 lists those management actions required to implement each additional HW project and continue to reduce HW generation beyond the Air Force P2 reduction goals already achieved.

Table 3-3 Achieving P2 Goals: Hazardous Waste Disposal

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
HW-1 Solvent Recycling			
Evaluate the requirements for a solvent recycling unit	CEV		Feb 1996
Determine all potential paint shop users of centralized unit	CEV		Feb 1996
Identify vendor and allocate system	CEV	Oct 1996	
Allocate transfer devices for shops that will use the system	CEV	Oct 1996	
Begin implementation of the solvent recycling for paint shops	CEV	Jan 1997	
HW-2 Solvent Substitution			
Identify solvents that are used on the base that contain EPA 17 chemicals	CEV		Feb 1996
Determine potential substitutes of EPA 17 chemicals used on the base	CEV		Feb 1996
Access and evaluate substitute chemicals for use (by application)	CEV	Dec 1996	
Begin to phase out EPA 17 chemicals	CEV	Feb 1997	
Sample and analyze resultant waste for TCLP	CEV	May 1997	
HW-3 On-Site Metals Treatment			
Identify all shops that could use metal removal technology	CEV		Feb 1996
Identify appropriate metal treatment system for the components and concentrations in the waste waters	CEV		Feb 1996
Identify vendor and select metal treatment system	CEV	Dec 1996	
Possibly conduct treatability study with vendor support	CEV	Feb 1997	
Identify best treatment technology	CEV	April 1997	
Purchase and implement treatment technology	CEV	Aug 1997	
Identify personnel to operate the system	CEV	Aug 1997	

Table 3-3 Achieving P2 Goals: Hazardous Waste Disposal (continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
HW-4 Filter Analysis			
Identify all shops that currently dispose paint overspray waste as hazardous	CEV		Feb 1996
Contract with laboratory for TCLP analysis of paint booth filters and paint waste	CEV	July 1996	
Establish tracking of filter disposal (as hazardous waste of municipal solid waste)	CEV	Dec 1996	
HW-5 Rechargeable Batteries			
Determine amount of rechargeable batteries that require purchase	CEV	Mar 1996	
Determine applicability; test several flashlights with the rechargeable batteries on a two month trial period	CEV	Aug 1996	
Purchase necessary batteries and chargers for use if applicable	CEV	Dec 1996	
HW-6 Alternative Paint Stripper			
Identify alternative paint stripper to DX-440	CEV		Feb 1996
Evaluate effectiveness of substitute chemical	CEV	Aug 1996	
Purchase appropriate chemical substitute for use	CEV	Oct 1996	
HW-7 Paint Gun Cleaner			
Determine all potential users on closed-loop paint gun cleaners	CEV		Feb 1996
Evaluate the applicability of cleaning system with existing equipment	CEV	Jun 1996	
Evaluate potential vendors and determine cost for multiple purchase	CEV	July 1996	
Purchase and install systems	CEV	Dec 1996	

Table 3-3 Achieving P2 Goals: Hazardous Waste Disposal (continued)

Action	OPR	Completion Date: Estimated Completion	Completion Date: Actual Completion
HW-8 Hazardous Waste Tracking Team			
Scope and develop a tracking system to track hazardous waste generation at ----- AFB	CEV		April 1996
Load information for 1995 and begin loading 1996 information	CEV	July 1996	
Track hazardous waste information monthly	CEV	Aug 1996	
Begin specified opportunity assessments for large generators	CEV	Jan 1997	
Identify new generators and increased generation, determine reduction alternatives	CEV	Ongoing	
HW-9 HVLP Sprayer			
Determine all potential users of HVLP Sprayers	CEV		Feb 1996
Evaluate potential vendors	CEV	July 1996	
Develop appropriate parameters for design and purchase of system	CEV	July 1996	
Purchase and install systems	CEV	Dec 1996	
Train shop personnel in new procedures and monitor use	CEV	Jan 1997	
HW-10 Purchase and Implement Automated Paint Mixer and Electrostatic Sprayers			
Identify automated paint mixer system and electrostatic sprayers	Corrosion Control		Jun 1995
Identify funding for purchase	CEV	Jun 1996	
Purchase system	CEV	Sep 1996	
Install system	CEV/Corrosion Control	Jan 1997	
Train employees on proper use	CEV/Corrosion Control	Mar 1997	
HW-11 Replace Lead Acid Batteries with Gel Cell Batteries			
Identify shops using lead acid batteries	CEV	Jun 1996	
Determine applicability to gel cell batteries	CEV	Sep 1996	

Table 3-3 Achieving P2 Goals: Hazardous Waste Disposal (continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
Purchase applicable gel cell batteries to acceptable equipment	CEV	Dec 1996	
Install gel cell batteries	CEV	Feb 1997	

3.4 MUNICIPAL SOLID WASTE DISPOSAL

MSW is generated from various sources on-base including military family housing (MFH), non-appropriated fund activities (e.g., auto hobby shop, arts and crafts, etc.), administrative offices, commercial areas (e.g., commissary and base exchange), industrial shops, and operational squadrons. Refuse collection at ----- AFB, with the exception of refuse generated by construction contracts, is managed by CE Maintenance Engineering with separate contracts for the main base and military family housing (MFH). Resource Recovery and Recycling Program (RRRP) and the Defense Reutilization and Marketing Office (DRMO) are the two principal organizations at ----- AFB tasked with managing the collection and sale of recyclable and reusable materials. Table 3-4 outlines the actions required to implement each of the MSW projects outlined in the program section of this report.

Table 3-4 Achieving P2 Goals: Municipal Solid Waste Disposal

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
MSW-1 Source Reduction Education Program			
Design program guidelines to accomplish MSW education and communication	P2 Subcommittee	Dec 1998	
Choose personnel for program team	P2 Subcommittee	Dec 1998	
Establish milestones and tracking criteria for program team	P2 Subcommittee	Dec 1998	
MSW-2 Reduce Collection of MFH Grass Clippings			
Develop information and strategy for communicating option to MFH residents	P2 Subcommittee	Dec 1998	
Choose personnel for program team	P2 Subcommittee	Dec 1998	
Establish milestones and tracking criteria for program team	P2 Subcommittee	Dec 1998	

Table 3-4 Achieving P2 Goals: Municipal Solid Waste Disposal (continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
MSW-3 Point Papers from Waste Generators			
Develop required format and schedule for point papers	P2 Subcommittee	Feb 1998	
Identify party to evaluate papers	P2 Subcommittee	Feb 1998	
Determine facility managers which participate	P2 Subcommittee	Feb 1998	
Establish evaluation criteria and implementation timeline	P2 Subcommittee	Jun 1998	
MSW-4 Electric Hand Dryers			
Identify number and placement of dryers	P2 Subcommittee	Feb 1998	
Evaluate potential vendors	P2 Subcommittee	Feb 1998	
Purchase systems and contract installation	P2 Subcommittee	Feb 1998	
MSW-5 Improve Existing Recycling Program			
Provide communication and education materials to promote the program	P2 Subcommittee	Feb 1998	
Choose location most beneficial for additional receptors	P2 Subcommittee	Feb 1998	
Purchase additional receptors to sort office / mixed paper	P2 Subcommittee	Feb 1998	
Purchase additional receptors to collect aluminum cans	P2 Subcommittee	Feb 1998	
Develop monitoring program for recyclables collected through program	P2 Subcommittee	Feb 1998	
MSW-6 Wood Waste Recycling Program			
Arrange for Golf Course Maintenance to lease the CE chipper	P2 Subcommittee	Jun 1998	
Coordinate with industrial facilities to accept processed chips from base	P2 Subcommittee	Sept 1998	
Insure contractors sort C&D wood and pallets	P2 Subcommittee	Jun 1998	

Table 3-4 Achieving P2 Goals: Municipal Solid Waste Disposal (continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
Purchase truck scale to measure wood waste quantities	P2 Subcommittee	Jun 1998	
Develop system for tracking tonnage and monitoring disposal of wood waste	P2 Subcommittee	Jun 1998	
MSW-7 Yard Waste Composting			
Develop program materials for education and communication on yard waste composting	P2 Subcommittee	Jul 1998	
Choose source reduction team staff to implement program	P2 Subcommittee	Jul 1998	
Select and purchase necessary equipment for composting process	P2 Subcommittee	Jul 1998	
Develop tracking system of composting benefits to MSW disposal	P2 Subcommittee	Sept 1998	
MSW-8 Mixed Waste Composting			
Develop program materials for education and communication on mixed waste composting	P2 Subcommittee	Jul 1998	
Choose source reduction team staff to implement program	P2 Subcommittee	Jul 1998	
Select and purchase necessary equipment for composting process	P2 Subcommittee	Jul 1998	
Develop tracking system of composting benefits to MSW disposal	P2 Subcommittee	Sept 1998	
MSW-9 Backyard Composting			
Develop program materials for education and communication on backyard composting	P2 Subcommittee	Jul 1998	
Choose source reduction team staff to implement program	P2 Subcommittee	Jul 1998	
Select and purchase bins necessary composting process	P2 Subcommittee	Jul 1998	
Develop tracking system of composting benefits to MSW disposal	P2 Subcommittee	Sept 1998	

3.5 AFFIRMATIVE PROCUREMENT

Affirmative procurement is the process of procuring products containing recovered materials. RCRA, as amended, and EO 12873 establish federal requirements for management of MSW and the procurement of products containing recovered materials. The EPA has designated the following specific items ("guideline items") containing recovered materials for procurement:

- Building insulation products
- Cement and concrete containing fly ash
- Paper and paper products
- Retreaded tires
- Lubricating oils
- Ground granule furnace slag
- Engine coolants
- Structural fiberboard
- Laminated paperboard
- Carpet
- Floor tile
- Patio blocks
- Traffic cones
- Traffic barricades
- Playground surfaces
- Running tracks
- Hydraulic mulch
- Yard trimming compost
- Office recycling containers
- Office waste receptacles
- Plastic desktop accessories
- Toner cartridges
- Binders
- Plastic trash bags

The EO requires agencies to review their specifications for these designated items and to procure materials containing recovered materials whenever possible. Establishing an affirmative procurement plan is integral to achieving this reduction goal and should include the following:

- A preference program that establishes open competition between products containing recycled and non-recycled materials
- A promotion program that actively promotes the desire to buy recycled products
- An annual review and monitoring program that evaluates the success of the affirmative procurement program

The single option in the area of affirmative procurement is the recommendation that ----- AFB develop an affirmative procurement program to incorporate the above items. Table 3-5 outlines the actions required to develop the program.

Table 3-5 Achieving P2 Goals: Affirmative Procurement

Action	OPR	Completion Date	
		Estimated Completion	**Actual Completion**
AP-1 Develop Affirmative Procurement Program			
Evaluate the current status of affirmative procurement at ----- AFB	CEV, P2 Subcommittee	Dec 1996	
Develop and implement a program to affirmatively procure 100 percent of EPA Guideline Items	CEV, P2 Subcommittee, Logistics Organizations	Jun 1997	
Track and record progress toward annual achievement of affirmative procurement requirements	Contracting	Sep 1997	

3.6 ENERGY CONSERVATION

EO 12902 and the Energy Policy Act of 1992 extended the energy conservation goals of the Federal Energy Management Improvement Act (FEMIA) of 1988. FEMIA had initially established the goal to reduce energy consumption by 10 percent per square foot in federal buildings between CY85 and CY95. The new requirements extended the FEMIA Federal Building Reduction Goal to a required reduction of 20 percent per gross square foot by 31 December 2000 and 30 percent by 31 December 2005, as measured in BTUs. ----- AFB has a proactive energy conservation program that is pursuing programs to accomplish these conservation goals. The Chief of Maintenance Engineering is responsible for the energy program, meeting Energy Conservation goals, and obtaining funding for projects.

Currently, ----- AFB is 3 percent above the CY85 energy baseline. To meet their goals, reductions of 23 percent and 33 percent must be made for CY00 and CY05, respectively. ----- AFB's Energy Management Program is managed by the Civil Engineer Squadron's Maintenance Engineering Element. Further information can be obtained from the Chief, Maintenance Engineering at (xxx) xxx-xxxx.

Table 3-6 Achieving P2 Goals: Energy Conservation

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
Promote base-wide energy conservation awareness	CEOE and P2 Subcommittee	Ongoing	
Present a mock energy bill to commanders and shop chiefs, demonstrating requirements	CEOE	Sept 96	
Make items available to base populace to help conserve heating/cooling energy	CEOE and P2 Subcommittee	Feb 97	
Investigate feasibility of implementing physical controls on heating/cooling	CEOE	Jun 97	
Provide incentives for energy conservation	P2 Subcommittee	Sept 97	

3.7 PESTICIDE MANAGEMENT

AF P2 programs are committed to reducing the release of pollutants into the environment by minimizing or eliminating harmful discharges to air, land, and water at the source. A key component in this process for ----- AFB will be the reduction or elimination of pesticide applications. Table 3-6 outlines the actions needed to implement the pest management options which are necessary to achieve pollution prevention goals.

Table 3-6 Achieving P2 Goals: Pesticide Management

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
PM-1 Integrated Pest Management Program			
Establish pest management team	P2 Subcommittee	Jun 1996	
Obtain Pest Management Guide from AFCEE/EP	P2 Subcommittee	Jul 1996	
Develop pest identification	P2 Subcommittee	Sep 1996	

Table 3-6 Achieving P2 Goals: Pesticide Management (continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
Establish tolerance levels	P2 Subcommittee	Oct 1996	
Establish pest monitoring program	P2 Subcommittee	Dec 1996	
Establish approved treatment processes	P2 Subcommittee	Apr 1997	
Track pesticide usage reduction	P2 Subcommittee	July 1997	

3.8 TRI CHEMICALS

Executive Order 12856 requires all federal agencies to comply with EPCRA and to commit resources to fulfill the intentions of the Pollution Prevention Act. Section 313 of EPCRA requires AF installations to submit annual TRI reports by 1 July each year for the previous calendar year's data. The first report covered 1994 and stands as the baseline by which the progress toward [MAJCOM] goals will be measured.

[Contractor] compiled baseline TRI (EPCRA) data for ----- AFB in an August 1995 technical report. TRI chemicals for ----- AFB, including the EPA 17 chemicals, are listed in Appendix C. Table 3.7 lists the actions needed to implement the options necessary to reduce TRI chemical total releases and off-site transfers in accordance with reduction goals.

Table 3-7 Achieving P2 Goals: TRI Chemicals

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
TRI-1 Replace Lead Acid Batteries with Gel Cell			
Identify shops that use lead acid batteries	CEV	Jun 1996	
Determine applicability to gel cell batteries	CEV	Sep 1996	
Purchase applicable gel cell batteries to acceptable equipment	CEV	Dec 1996	
Install gel cell batteries	CEV	Feb 1997	
TRI-2 Replace All ODS Compounds			
Implement ODS-1 and ODS-2	CEV	Feb 1997	

Table 3-7 Achieving P2 Goals: TRI Chemicals (Continued)

Action	OPR	Completion Date	
		Estimated Completion	Actual Completion
TRI-3 Solvent Substitutes			
Identify solvents that are used on the base that contain EPA 17 chemicals	CEV		Feb 1996
Determine potential substitutes of EPA 17 chemicals used on the base	CEV		Feb 1996
Access and evaluate substitute chemicals for use in the different applications	CEV	Dec 1996	
Begin to phase out EPA 17 chemicals	CEV	Feb 1997	
Sample and analyze resultant waste for TCLP	CEV	May 1997	
TRI-4 Replace Glycol Ether Containing Materials			
Identify the products that contain Glycol Ether and determine the shops that the materials are issued	CEV		Feb 1996
Identify potential substitutes to Glycol Ether containing materials	CEV		Feb 1996
Allocate substitutes and test their applicability to the cleaning processes	CEV	Aug 1996	
Identify and purchase larger quantities of substitute products for use	CEV	Dec 1996	

SAMPLE MAP APPENDIX A: Examples of Project Narratives

PROJECT NUMBER: ODS-1

PROJECT TITLE: Replace Current Freon (and other ODS containing substances) with Low- or No-ODS Substitutes

FUNDING REQUIREMENT: None

INSTALLATION: ----- AFB

Current Process: Some products issued at ----- AFB during CY94 contain ODSs. Equipment used at ----- AFB, including water coolers, chillers, and air conditioners, use freon. These equipment, in some cases, leak. The necessitates purchase of freon to replace the freon which is lost. Other ODS containing chemicals used at ----- AFB include solvents, lubricants, cleaners, insecticides, and sealants. The materials issued at ----- AFB that contain ODSs are listed in Table ODS-1.1. Table ODS-1.1 identifies the material name and NSN, ODSs contained in the material, the organization/shop/building that the materials were issued, and the quantity in pounds.

New Process: This option involves identifying and replacing Ozone Depleting Substances (ODSs) with compatible substitutes that do not contain ODSs. Material substitution of ODS-containing products will help ----- AFB achieve its ODS reduction goals. There are basically two types of ODS containing materials: 1) cleaning compounds, and 2) freon for cooling equipment. Table ODS-1.2 lists alternatives to the ODS containing cleaning materials. The base must evaluate whether these substitutes will be applicable to the current process.

Most products used in conjunction with aircraft or AGE maintenance are designated by TO specifications. Therefore, before products designated by a TO can be substituted with another product, the substitute product must first be approved by a single point manager at a designated depot base. TO substitutes may be researched on the PRO-ACT database system operated by the Air Force Center for Environmental Excellence, Brooks AFB, at (800) 233-4356. PRO-ACT is an environmental literature clearing house that offers free database and literature searches.

POLLUTION PREVENTION GOAL: [MAJCOM] has mandated a goal of eliminating all purchases of ODSs as soon as possible.

SAVINGS/BENEFITS: Using the issue inventory prepared for the CY94 EPCRA survey at ----- AFB, products containing ODSs issued through Base Supply, and Medical Logistics, as well as those in the available CEMAS information, were identified. These products, and the workplaces which they were assigned to, are shown in Table ODS-1.1. Off-base purchases of ODS containing materials may not be identified on Table ODS-1.1. If strictly enforced, this option could reduce the ODS purchase by 80%. Therefore, a reduction of roughly 6500 lbs of ODS purchases could be realized.

COSTS: In general, costs associated with product substitution will be considered negligible if comparable products can be obtained. Initially one person would be required to identify ODS substitutions basewide. The cost associated with this would be approximately $4,000 (or 200 hours). The costs associated with the purchase of specific alternative materials are presented in Table ODS-1.3.

Addition costs associated with this option could result from required changes or upgrades in process equipment.

IDENTIFIED ALTERNATIVES: Alternatives for major identified ODSs are presented in the Table ODS-1.2.

Table ODS-1.2		
ODS	**Alternative**	**Vendor**
1,1,1-TCA	Various products are available depending on application (see list below)	Ecolink 1-800-886-8240
CFC-12	SUVA-134 (Freon-134)	Dupont-Fluorochem Lab 1-800-242-4618
HCFC-22	SUVA-134 (Freon-134)	Dupont-Fluorochem Lab 1-800-242-4618
CFC-11	SUVA-123[a]	Dupont-Fluorochem Lab 1-800-242-4618
Freon 113	Various products are available depending on application (see list below)	Ecolink 1-800-886-8240

a SUVA-123 contains low levels of ODSs, but contains much less than CFC-11.

The most commonly encountered ODSs at ----- AFB were CFC-113 and HCFC-22 (Class II ODS). Suva-134 is an acceptable alternative for each of these materials.

Any shops using 111-TCA and/ or CFC-113 for cleaning applications should consider one or more of the alternative materials listed in Table ODS-3 on the desired application. Each of the listed products can be used in place of either 111-TCA or CFC-113. All of the listed products are available through Ecolink. Vendor information is provided below.

Table ODS-1.3			
PRODUCT	**DESCRIPTION**	**PRICE**	**APPLICATIONS**
ECOLINK 2005	Non-flammable aerosol. CFC-Free contact cleaner/ electrical solvent.	$60/ gallon $10/ 14 oz. aerosol	Cleaning electrical contacts and other critical components in spot-cleaning applications.
ELECTRON (aerosol & bulk)	Non-Aqueous Dielectric Solvent	$15/ gallon $7/ 15 oz. aerosol	Electrical Maintenance, Degreaser Motors, Generators, Hydraulics, brake Cleaner, Hand Wipe.
ELECTRON QED	Fast drying, non-aqueous (also available with terpene=QEDT).	$20/ gallon	Wipe-down or dip tank when very fast dry, non-aqueous cleaning is required.
ELECTRON QEDT	Fast drying, non-aqueous solvent, (like QED) w/distilled terpene.	$23/ gallon	Wipe-down or dip tank when high solvency, very fast dry, non-aqueous cleaning is required.
MICROPURE CDF	Electronics Grade De-Flux, Board solvent	$35/ gallon	Printed circuit boards, microcircuits.

Table ODS-1.3 - Cont'd			
PRODUCT	**DESCRIPTION**	**PRICE**	**APPLICATIONS**
PARTS PREP*	Semi-Aqueous Degreaser	$35/ gallon	removes carbon, grease, flux, lubricating oils, and uncured epoxy resins.
POSITRON	Non-Aqueous, Ultra-High Purity Dielectric solvent.	$17/ gallon	Ultra low non-volatile residue (NVR), critical cleaning, electrical maintenance.
VORTEX	Water rinsable citrus terpene blend.	$22/ gallon	Aggressive solvent for cleaning all organic and inorganic soils, (grease, cosmoline, rosin flux). Wipe, rinse or steam off after use.
VORTEX-NS		$22/ gallon	Aggressive solvent for cleaning all organic and inorganic soils. Non-rinsable, no surfactant.

* Recommended to replace III-TCA only.

FUND APPROPRIATION: PPP
FEDERAL STOCK NO./CLASS:
INITIATIVE SOURCE: [Contractor name]
APPLICATION TO OTHERS: Industry-wide

VENDORS:

Ecolink
1-800-886-8240
Various ODS alternative materials

Dupont Fluorchem Lab
1-800-242-4618
Suva-123
Suva-134

PROJECT NUMBER: EPA-1

PROJECT TITLE: Solvent Substitution

FUNDING REQUIREMENT: Nonrecurring

INSTALLATION: ----- AFB

Current Process: The shops listed below currently use EPA-17 compound containing solvents for cleaning purposes. Most of the cleaning applications are for painting operations, while others are for degreasing and grime removal. In using these solvents for these applications, EPA-17 chemicals are purchased, the volatile chemicals are released as air emissions, and the resultant contained materials must be disposed as hazardous waste. The shops that currently use these compounds are listed below.

Shop Identification	Process Code	Building	Chemical	Amount Used	Purpose
Building Maintenance	PTSPO01	6027	Thinners - Acetone, Toluene, MEK	1000	Painting operation clean-up
Allied Trades / Welding	ATWCPO01	558	DX-440	1050	Painting operation clean-up
CEMIRT	CEMAB01	1134	Methylene Chloride	600	Removing carbon scale from parts
Fuel System Maintenance	NA	316	MEK	66	Solvent - cleaning
AGE	AGEFC01	264	MEK	98	Solvent - cleaning
Test Fabrication Shop	NA	156	MEK	1600	Solvent - cleaning
Auto Hobby Shop	AHSPO01	934	MEK	60	Solvent - cleaning
Vehicle Maintenance	VHMPO01	559	MEK	420	Painting clean-up
84 Test Fabrication Shop	84TPO01	729	MEK	270	Painting clean-up
Watercraft Maintenance	WCMPO01	5025	Thinners - Acetone, Toluene, MEK	80	Painting operation clean-up

New Process: The shops identified above could use substitute solvents for conducting their cleaning applications. Available substitutes for painting operation clean-up include Safe Strip and Prep Rite. These alternatives do not contain EPA-17 materials. These alternatives are not intended for use as paint thinners. However, they are effective for cleaning brushes, rollers, and overspray. An alternative to methylene chloride for carbon deposit removal has also been identified. Rip Tide, a product from Ecolink, has been proven by several other Air Force Bases to provide clean-up capabilities similar to methylene chloride. Degreasing and grime removal can be achieved with Prep Solv and Blend 300.

Several types of substitutes and vendors of these materials are available. One vendor, that carries a very diverse product line is Ecolink (800) 886-8240. The base can discuss their cleaning application, and upon request, Ecolink will send several samples of their product(s) for testing. As a suitable substitute is identified, larger purchases can then be made.

Shops and suitable substitutes that have been identified are provided in the following:

Shop	Chemical	Amount Used	Purpose	Identified Substitute
Building Maintenance	Thinners - Acetone, Toluene, MEK	1000	Painting operation clean-up	Safe Strip or Prep Rite
Allied Trades / Welding	DX-440	1050	Painting operation clean-up	Safe Strip or Prep Rite
CEMIRT	Methylene Chloride	600	Removing carbon scale from parts	Rip Tide
Fuel System Maintenance	MEK	66	Solvent - cleaning	Safe Strip or Prep Rite
AGE	MEK	98	Solvent - cleaning	Safe Strip or Prep Rite
Test Fabrication Shop	MEK	1600	Solvent - cleaning	Safe Strip or Prep Rite
Auto Hobby Shop	MEK	60	Solvent - cleaning	Safe Strip or Prep Rite
Vehicle Maintenance	MEK	420	Painting operation clean-up	Safe Strip or Prep Rite
84 Test Fabrication Shop	MEK	270	Painting operation clean-up	Safe Strip or Prep Rite
Watercraft Maintenance	Thinners - Acetone, Toluene, MEK	80	Painting operation clean-up	Safe Strip or Prep Rite

POLLUTION PREVENTION GOAL: The 1992 baseline for EPA-17 chemicals at ----- AFB is 37,636 lbs. In 1994, ----- AFB achieved a 34 percent reduction in the purchase of EPS-17 chemicals from the CY92 baseline. An additional 16 percent reduction is required to achieve the 31 December 1996 goal of 50 percent. Implementation of this option is estimated to provide a reduction of 10 percent (approximately 3,500 lbs) of the baseline procurement.

SAVINGS/BENEFITS: Use of solvents that do not contain EPA-17 chemicals would contribute to ----- AFB's goal of reduced EPA-17 procurement. The substitute solvent would also reduce air emissions and may reduce hazardous waste generation.

COSTS: There are no initial investment costs associated with this option. Because the substitute solvents are more expensive than the thinner currently used this option will also result in an estimated annual additional cost of $13,560. See the EPA-1 Costs Comparison table for a full breakdown of cost information.

FUND APPROPRIATION: PPP

FEDERAL STOCK NO./CLASS:

INITIATIVE SOURCE: [Contractor Name]

APPLICATION TO OTHERS: Industry-wide

VENDORS/ PRODUCTS:

Ecolink (800) 886-8240

- Safe Strip - Paint and Resin Solvent
- Prep Rite - Paint and Coatings Remover
- Prep Solv - Grease and grime
- Rip Tide - Cleaning chemical for more difficult residues

EPA-1 Solvent Substitution Costs Comparison

Cost Element	Status Quo Operational Cost			EPA-2 Inital Investment Costs				EPA-2 Annual Operating Costs				Cost Summary	
	Unit Cost	No. of Units	Cost	Unit Cost	No. of Units	Cost	Diff. Savings	Unit Cost	No. of Units	Cost	Diff. Savings	% of Cost	Present Value
DIRECT CAPITAL COSTS													
None			$0.00			$0.00	0			$0.00	$0.00	0.0	$0.00
INDIRECT CAPITAL COSTS			$0.00			$0.00							
None			$0.00			$0.00	0			$0.00	$0.00	0.0	$0.00
OPERATING COSTS			$0.00			$0.00							
ENV. MANAGEMENT (hours)	$20.00	40	$800.00			$0.00	0	$20.00	10	$200.00	$600.00	1.5	$1,596.45
THINNER (gallon)	$11.00	390	$4,290.00			$0.00	0			$0.00		0.0	$0.00
SUBSTITUTE SOLVENT (gallon)			$0.00					$33.00	390	$12,870.00	($8,580.00)	94.9	$47,414.43
HAZ WASTE DISPOSAL (drum)	$490.00	5	$2,450.00			$0.00	0	$490.00	1	$245.00	$1,960.00	3.6	$1,955.65
ANALYTICAL COSTS			$0.00			$0.00	0			$0.00	$0.00	0.0	$1,000.00
TOTAL COSTS/SAVINGS			$3,760.00			$0.00	0			$13,560.00	($6,020.00)	100	$51,966.52

PAYBACK PERIOD (YEARS):	**None**
NET PRESENT VALUE OF BENEFITS AND INVESTMENT:	**($26,830.00)**

NOTE: ( ) INDICATE NEGATIVE VALUE

PROJECT NUMBER: HW-1

PROJECT TITLE: Solvent Recycling

FUNDING REQUIREMENT: Nonrecurring

INSTALLATION: ----- AFB

Current Process: Paint and clean-up solvents represent a significant quantity of hazardous waste generated at -----AFB. The paint and clean-up solvents at several shops are drummed and disposed as hazardous waste at several -----AFB shops. The shops that dispose their clean-up solvents are listed below.

Shop	Process Code	Building	Solvents	Haz Waste (lbs)	Purpose
Building Maintenance	PTSPO01	6027	Thinners - Acetone, Toluene, MEK	1000	Painting operation clean-up
Allied Trades / Welding	ATWCPO01	558	Thinners - Acetone, Toluene, MEK	800	Painting operation clean-up
Corrosion Control	CRCPO01	315	Thinners - Acetone, Toluene, MEK	600	Painting operation clean-up
84th Test Fabrication Shop	84TPO01	156	Thinners - Acetone, Toluene, MEK	1250	Painting operation clean-up
Auto Hobby Shop	AHSPO01	934	Thinners - Acetone, Toluene, MEK	400	Painting operation clean-up (separate from customer painting)

New Process: Under this option, a solvent distillation system would be used to reclaim paint solvents from solvent waste. The reclaimed solvents would be used for equipment cleaning. Use of reclaimed solvents would reduce the amount of hazardous waste generated. Typically up to ninety percent of paint and thinner wastes can be reclaimed as thinner. A solvent distillation system is currently in use at several shops at -----AFB, including Corrosion Control. Corrosion Control, however, needs a larger recycling system in order to make better use of their solvent recycling system.

A centralized distillation system can be used for the paint wastes. A central location (to these shops) could be identified by the base. A larger distillation system (for over 5000 gallons/year) could be purchased to recycle the paint solvent wastes from these and other shops. In addition, a civilian or military individual would need to be identified to operate the system. Based on the total quantity of material requiring reclaiming, one individual would operate the system approximately sixty hours per month.

This type of centralized system is used very effectively at other Air Force Bases. For example, at Robins AFB (Warner Robins, GA) several distillation systems are used to recycle solvents from different applications. Robins AFB has been operating these systems for nearly 10 years.

The individual savings in EPA-17 materials are provided in the following:

Shop	Building	Chemicals	Amount Potentially Saved (lbs)	% of Baseline
Building Maintenance	6027	Thinners - Acetone, Toluene, MEK	900	2.3
Allied Trades / Welding	558	Thinners - Acetone, Toluene, MEK	720	2.5
Corrosion Control	315	Thinners - Acetone, Toluene, MEK	540	3.3
84th Test Fabrication Shop	156	Thinners - Acetone, Toluene, MEK	1125	3.7
Auto Hobby Shop	934	Thinners - Acetone, Toluene, MEK	360	<1

POLLUTION PREVENTION GOAL: New hazardous waste reduction goals and pollution prevention metrics have been set by the base based on [MAJCOM] guidance dated 6 February 1996. The new metrics begin with a 1995 baseline of 142,000 lbs and set incremental goals for reductions each year until 2000. The reduction goals for hazardous waste are as follows: 11 percent by CY96, 22 percent by CY97, 33 percent by CY98, 44 percent by CY99, and 55 percent by CY00. This option is estimated to achieve a reduction of nearly 3 percent (3,700 lbs) of the baseline generation.

SAVINGS/BENEFITS: A significant quantity of solvent waste would be saved through this option. Savings in disposal and procurement costs would generate a net revenue savings for the base in addition to reducing hazardous waste generation. Implementation of this option will provide an environmental benefit by reducing the amount of purchased products with EPA-17 materials.

COSTS: There are capital and operational costs associated with this option. The capital cost for a large distillation system would be approximately $17,000 for the system, shipping, and set-up. The other primary cost for each shop will be associated with purchase and installation of a drum transfer system. The estimated cost for the drum transfer systems are $1000 each. Estimated annual savings are $9,800 basewide. See the HW-1 Costs Comparison table for a full breakdown of cost information.

FUND APPROPRIATION: PPP

FEDERAL STOCK NO./CLASS:

INITIATIVE SOURCE: [Contractor name]

APPLICATION TO OTHERS: Industry-wide

VENDORS/ PRODUCTS:

Finish Thompson, Inc.	Renzmann Solvent Distillation	Hoyt Corporation
814-455-4478	516-231-3030	800-343-9411

HW-1 Solvent Recycling: Costs Comparison

Cost Element	Status Quo Operational Cost			EPA-3 Initial Investment Costs				EPA-3 Annual Operating Costs				Cost Comparison	
	Unit Cost	No. of Units	Cost	Unit Cost	No. of Units	Cost	Diff. Savings	Unit Cost	No. of Units	Cost	Diff. Savings	% of Cost	Present Value
DIRECT CAPITAL COSTS													
PROCESS EQUIPMENT			$0.00	$18,000.00	1	$18,000.00	(2,000)			$0.00	$0.00	12.6	$18,000.00
UTILITY CONNECTIONS/SYSTEMS			$0.00	$1,000.00	1	$1,000.00	(500)				$0.00	0.7	$1,000.00
SITE PREPARATION			$0.00	$500.00	1	$500.00	(250)			$0.00	$0.00	0.4	$500.00
INDIRECT CAPITAL COSTS													
None			$0.00				0			$0.00	$0.00	0.0	$0.00
OPERATING COSTS													
ELECTRICITY (Kw-hr)	$0.05		$0.00	$0.05				$0.05	11,000	$528.00	($550.00)	3.1	$4,390.23
WATER (1000 gal)	$1.92		$0.00	$1.92			0	$1.92	40	$76.80	($76.80)	0.4	$613.04
ENV. MANAGEMENT (hours)	$20.00	200	$4,000.00			$0.00	0	$20.00	100	$2,000.00	$2,000.00	11.2	$15,964.45
THINNER (gallon)	$11.00	900	$7,350.00			$0.00	0	$11.00	150	$1,650.00	$8,250.00	9.2	$13,170.00
HAZ WASTE DISPOSAL (drum)	$490.00	15	$7,350.00			$0.00	0	$490.00	4.00	$1,960.00	$5,390.00	11.0	$15,645.17
LABOR	$10.00	400	$4,000.00	$10.00		$0.00	0	$10.00	920	($5,200.00)	($5,200.00)	51.5	$73,436.49
TOTAL COSTS/SAVINGS			$10,450.00			$19,500.00	(19,500)			$15,436.80	$9,813.20	100	$142,720.05

PAYBACK PERIOD (YEARS):	**1.99**
NET PRESENT VALUE OF BENEFITS AND INVESTMENT:	**$58,831.19**

PROJECT NUMBER: MSW-1

PROJECT TITLE: Source Reduction Education Program

FUNDING REQUIREMENT: Recurring

INSTALLATION: ----- AFB

Current Process: Refuse collection at ----- AFB, with the exception of refuse generated by construction contracts, is managed by CE Maintenance Engineering with separate contracts for the main base and military family housing (MFH). Contractors collect garbage from dumpsters located on the base. Several dumpsters collect bulk waste items with service costs the same as for garbage. CE Grounds maintains ----- AFB's grounds including the airfield, flight line, general office areas, and MFH. Also Grounds is responsible for fallen limbs and trees and roadside wastes. Golf Course Maintenance maintains the ------- Golf Course. The tree waste from the course is burned one or two times annually under state permit. Resource Recovery and Recycling Program (RRRP) and the Defense Reutilization and Marketing Office (DRMO) are the two principal organizations at ----- AFB tasked with managing the collection and sale of recyclable and reusable materials. At present, no formal source reduction program exists at ----- AFB.

New Process: A comprehensive source reduction education program may reduce the amount of MSW generated at ----- AFB up to 5 percent. Source reduction would be initiated and promoted through educational and informational exchanges on the base. Such exchanges would be initiated by a waste reduction program staff. The main method of promoting a source reduction program would include distributing educational materials designed to give consumers specific recommendations on how to use source reduction to reduce MSW.

At a residential level, the waste reduction program staff would inform base residents how to adopt less wasteful practices at home by giving guidelines on purchasing decisions and waste recycling and prevention. Billboards would be placed at base gates and base shopping areas to raise awareness of MSW reduction goals, the reduction hierarchy (source reduction, recycling, composting), and to track progress in solid waste disposed. Education programs would be used to increase consumer's demand for source reduction practices. For example, stimulating the market for bulk food purchases would eliminate packaging and individual container needs.

POLLUTION PREVENTION GOAL: New municipal solid waste reduction goals and pollution prevention metrics have been set by the base based on [MAJCOM] guidance dated 6 February 1996. The new metrics begin with a 1995 baseline and set incremental goals for reductions each year until 2000. The reduction goals for MSW are as follows: 6 percent by CY96, 23 percent by CY97, 30 percent by CY98, 39 percent by CY99, and 45 percent by CY00. This option is estimated to reduce solid waste by 5 percent of the baseline quantity.

SAVINGS/BENEFITS: The source reduction program would result in savings from avoiding the cost of disposal. It is estimated the program would divert 233 tons from landfill disposal at a cost of $25/ton for a savings of $5,813.

COSTS: No capital costs are associated with the development of a source reduction program. Operation and Maintenance costs are estimated at $13,400/yr for salary of one half-time staff member ($10,400) and a program budget for educational materials of $3,000. However with the diverted waste from landfill disposal, the total estimated annual cost is $7,588 with a cost of $33 per ton of MSW diverted. Table MSW-1 provides a cost breakdown for this option.

FUND APPROPRIATION: PPP

FEDERAL STOCK NO./CLASS:

INITIATIVE SOURCE: Parsons Engineering-Science

APPLICATION TO OTHERS: Limited

MSW-1 Source Reduction Education Program

Item	Unit Cost	Quantity	Estimated Cost[1]
Capital Equipment			
None			$0
Subtotal			$0
Operation and Maintenance			
Staff (1 person, half time)	$10.00 /hr	1040 hours	$10,400
Educational Materials	$3,000.00 /year	1 unit	$3,000
Subtotal			$13,400
Cost Avoidance			
Disposal	$25.00 /ton	233 tons	($5,813)
Subtotal			($5,813)
Net Annual Cost			$7,588
Tons of MSW Diverted			233
Cost per ton of MSW Diverted[2]			$33

[1] Parentheses indicate cost savings. Savings on disposal cost is computed only on tons currently disposed off base (that is, does not include tons disposed on base).
[2] Does not include capital cost.

PROJECT NUMBER: AP-1

PROJECT TITLE: Develop Affirmative Procurement Program

FUNDING REQUIREMENT: Recurring

INSTALLATION: ----- AFB

Current Process: Currently, ----- AFB has not implemented an affirmative procurement program or a system that routinely monitors the procurement of EPA Guideline Items.

New Process: The new process will assist ----- AFB in meeting affirmative procurement goals by outlining actions required to procure EPA Guideline Items and develop a tracking system to monitor progress toward these goals. Dedicated attention to the affirmative procurement program will allow ----- AFB to achieve the goal of 100 percent of all EPA Guideline Items purchased each year contain recycled materials.

POLLUTION PREVENTION GOAL: ----- AFB has not met its affirmative procurement goal of ensuring that 100 percent of all EPA Guideline Items purchased each year contain recycled materials meeting EPA guideline standards.

SAVINGS/BENEFITS: In order to determine savings, benefits, and costs resulting from the implementation of this project, the following should be determined on a quarterly basis by both the Civil Engineering and the Logistics Squadron, Supply Flight:

- Identify the number of stock numbers and quantity of procured recycled paper products, retread tires, recycled building thermal insulation, cement containing fly ash, and re-refined lubricating oil;
- Identify the total number of stock numbers and quantity of all procured paper products, tires, building insulation, cement, and lubricating oil;
- Identify the amount of recycled building insulation and cement containing fly ash used by Base contractors; and
- Identify the total amount of building insulation and cement used by Base contractors.

COSTS: Costs associated with this option cannot be quantified based on the data currently available. In order to determine the true costs and benefits for this project, the following information should be determined:

- The unit costs and quantities procured of currently used non-recycled products and the associated substitute materials; and
- The recurring costs associated with the labor and materials needed to track the information listed above.

FUND APPROPRIATION:

FEDERAL STOCK NO./CLASS:

INITIATIVE SOURCE: Parsons Engineering-Science

APPLICATION TO OTHERS: Limited

PROJECT NUMBER: PM-1

PROJECT TITLE: Integrated Pest Management Program

FUNDING REQUIREMENT: Recurring

INSTALLATION: ----- AFB

Current Process: Many of the pesticide activities performed at ----- AFB include alternative pest management techniques. Examples of these activities include roach baiting and glue traps. However, a significant portion of the pest management activities include spray pesticides. Pesticides are generally dissolved in a solvent and applied with either vehicle or backpack sprayers.

New Process: Development of a full integrated pest management program is recommended for ----- AFB. The major steps involved in developing and implementing an integrated pest management program are presented below. The overall goal of integrated pest management is to reduce pesticide usage through a variety of techniques designed to minimize the requirements for pesticide usage while maximize the effectiveness of those pesticides which are used.

Development and implementation of an integrated pest management program includes the following processes:

- **Establish a Pest Management Team**

A Pest Management Team would be established for ----- AFB. The team would include members from each shop that use pesticides as well as representatives of the P2 subcommittee. The Pest Management Team would be responsible for tracking and maintaining the Integrated Pest Management Program. Records of pesticide usage and reductions would be maintained by the team. Effective usage reduction techniques and problem areas would be identified. The team would also be responsible for identifying and maintaining current integrated pest management/pesticide minimization techniques for the base.

- **Pest Identification**

Awareness of which organisms inhabiting base grounds are true pests is an important step in the Integrated Pest Management Program. Most of the organisms which are commonly found cause little or no damage or serve beneficial roles. Only a few of the species are actually plant feeding or nuisance pests. Because many of the pests and nonpests are similar, accurate identification is essential to an effective Integrated Pest Management Program.

Major pest species include aphids, lace bugs, spider mites, tent caterpillars, webworms, roaches, and certain beetles.

- **Establish Tolerance Levels**

Tolerance levels for identified pests should be established. Treatment should not be applied when pests are below the tolerance levels and should be discontinued when population are returned to below the tolerance levels. It is important to remember that most pests may exist at limited population levels without representing any threat. Eradication attempts, however, can lead to reduction of the natural enemies of pests, pesticide resistance, and pesticide overuse.

Tolerance levels should be established using a variety of criteria. These criteria should include the pest type, species, abundance, and life stage, as well as the vigor and value of the plant forms that they threaten. Effectiveness and costs of pesticide usage should also be considered.

The tolerance levels should provide effective guidelines for pesticide usage, but should not be considered strict rules. Each application of pesticides should be considered individually.

- **Establish Pest Monitoring**

Effective pest monitoring is a key to a successful Integrated Pest Management Program. Early detection of pests can allow quick treatment when populations reach tolerance levels. This strategy will allow the pest population to be maintained under control with a minimum of both pesticide usage and landscape damage.

Pest monitoring should include detailed record keeping. Well maintained records will allow the Integrated Pest Management Team to identify key problem pests, problem regions, and seasonal patterns in pest populations.

There are several techniques available for pest monitoring. These techniques include monitoring turf and landscape, bird and animal feeding, and physical evidence of pests as well as insect sampling. Each of these techniques should be implemented in the monitoring program.

Turf monitoring should include awareness of symptoms of pest damage. If landscape is observed to be deteriorated, further investigation should be used to confirm the exact cause of the damage. Recognition of other possible sources of damage is important. Alternative causes include heat or drought stress, disease, chemical damage, nutritional deficiencies or other problems.

Physical evidence includes skeletonized leaves, fecal pellets, sawdust-like debris, stem tunneling, silken tubes and/or webbing.

A variety of insect sampling techniques are available. Because no one technique is effective for all pest insects, the sampling program should included varied sampling strategies.

Insect sampling strategies include:

Disclosing Solution - A disclosing solution is used to flush out insects. Either two to four tablespoons of liquid dish washing soap or one tablespoon of one percent pyrethrins should be added to two gallons of water and poured over one square meter (1.2 square yards) of turf. Insects will come to the surface within five to ten minutes. They can then be collected, identified, and counted. This technique is effective for such insects as webworms, army worms, bill bugs, and mole crickets.

Flotation - This technique takes advantage of the fact that many insects float in water. Insert a metal cylinder about an inch into the ground. The cylinder should be around eight to nine inches in diameter. A coffee can with both ends cut off is suitable. Fill the cylinder with water and maintain the water level well above the soil surface for three to five minutes. Insects which float to the surface can be easily collected and identified. As an alternative, a large soil core can be collected with a golf course cup cutter or similar tool and placed in a bucket of water.

Soil Examination - For insects which can not be observed by the above methods, direct examination is required. The simplest method is to cut away three sides of a square into the ground with a knife or shovel and peel back the sod. It is important to examine the entire root zone. The process should be repeated several times to assure representative population levels.

A soil core can also be collected and examined. If the soil is replaced in the hole and the sod cap replaced, followed by irrigation, the turf damage can be minimized.

Traps - A variety of traps using lights, pheromones, and food scents can be used to monitor insect levels.

Other Methods - Many other methods of monitoring pests may also be identified. Determining exactly which methods are the most effective for ----- AFB would be the responsibility of the Integrated Pest Management Team.

- **Establish Treatment Processes**

Alternative treatment process are also important to the Integrated Pest Management strategy. Available techniques include Cultural Methods, Biological Control, and lastly Pesticides.

Cultural Methods of pest management include selection of turfs which tend to attract a minimum of pests or are pest resistant. Turfs which are selected should be maintained effectively. Healthy plants are most able to withstand pests at higher levels with minimal damage.

Biological Pest management is a developing technique. Microorganisms which are harmful to pests are used to control populations. This strategy is effective for treatment without damaging landscape or the environment. However, there are drawbacks including storage and distribution. Biological controls are generally most effective on areas where relatively high pest levels can be tolerated.

At some point pesticide application becomes necessary. But integrated pest management strategy should still be included at this time. Pesticides should be applied only in the limited areas which are identified as problematic. Application of pesticides should be used at times when the life cycle of the pests make them the most susceptible.

Use of a small amount of pesticide during an early vulnerable stage of development can prevent the need for larger applications later. Knowledge of the target pests and their life cycles will allow effective use of this strategy.

Application technique is also important. When treating turf the lawn should be mowed first, if possible. In addition, the turf should be watered before application to drive insects to the surface. Each of these activities will increase the effectiveness of the applied pesticide. Irrigation of the area after application will help protect the turf and other animals from exposure. Always read labels and follow all pesticide instructions completely. Never mix pesticides unless the instructions say to do so.

- **New Guidance**

Currently AFCEE/EP is developing a Model Pesticide Reduction Guide in cooperation with AFCESA/CEO due to be released in June 1996. ----- AFB should access this guide and identify applications to the base's pest management program.

POLLUTION PREVENTION GOAL: The CY93 baseline for pesticide usage is 9,636 lbs. The pollution prevention goal is a reduction of total active ingredients of 50 percent by CY00. The CY94 usage of pesticides was 9,259 lbs, an decrease of 377 lbs from the baseline. A reduction of 4,441 lbs is required to meet the CY00 goal. This quantity represents 46 percent of the baseline usage. This option is estimated to achieve significant reductions in pesticide usage reduction. Dedicated commitment to this program should allow ----- AFB to achieve or exceed the CY00 goal.

SAVINGS/BENEFITS: This program is capable of achieving significant reductions in pesticide usage levels. A dedicated effort to maximized integrated pest management should provide steady reductions in the amount of pesticides used. If fully implemented, this option should achieve a reduction of at least the 46 percent required to meet the P2 goal by CY00.

COSTS: The primary costs associated with this option are labor. Initial establishment of the Integrated Pest Management Team, including database set-up, is estimated to require 320 hours (4 individuals for 2 weeks), at a cost of $6400. Maintenance of the program is estimated to require 448 hours per year (2 individuals for 8 hours every other week plus quarterly meetings of 4 individuals for 2 hours). A budget of $1000 per year for testing and materials could also be required. The total annual costs are estimated to be $9,960.

FUND APPROPRIATION: PPP

FEDERAL STOCK NO./CLASS:

INITIATIVE SOURCE: [Contractor Name]

APPLICATION TO OTHERS: Industry Wide

PROJECT NUMBER: TRI-1

PROJECT TITLE: Replace Lead Acid Batteries with Gel Cell Batteries

FUNDING REQUIREMENT: Recurring

INSTALLATION: ----- AFB

Current Process: Lead acid batteries are used by many of the shops at ----- AFB. When the batteries are drained they are taken to the Electro/Environmental Shop for servicing. The sulfuric acid is drained from the batteries and neutralized with sodium bicarbonate in water and then discharged to the sanitary sewer. If the batteries can be recharged, they are filled with fresh sulfuric acid and returned to service. If the batteries are dead, they are disposed to DRMO as hazardous waste.

Sulfuric Acid is a TRI chemical.

New Process: Gell Cell batteries can be used to replace conventional lead acid batteries. Approximately 3000 lbs of lead acid batteries are purchased and disposed each year at ----- AFB. Under this option, the HazMat Pharmacy Administrator can identify the shops that currently purchase lead-acid batteries and determine those that can be replaced with Gel Cell batteries. Gel Cell batteries are fully enclosed and last several lifetimes longer than conventional lead-acid batteries. Therefore, purchase of sulfuric acid is not warranted and excessive disposal is avoided. Gel Cell batteries do not contribute to TRI releases or off-site transfers. Gel Cell batteries do, however, contain some hazardous metals.

POLLUTION PREVENTION GOAL: The CY94 baseline for TRI chemicals is 16,499 pounds. The pollution prevention goal is a reduction of TRI chemicals by 50 percent by CY99. A reduction of 8,249.5 pounds is required to meet the CY99 goal. Replacing the conventional lead-acid batteries with Gel Cell batteries is estimated to achieve a reduction of 3 percent (5,000 lbs) of the baseline generation.

SAVINGS/BENEFITS: The Gel Cell batteries cost more than the lead-acid batteries. However, they are maintenance free (as claimed by current users at other bases (Maxwell AFB) and vendors). The reduced labor associated with these batteries will provide economic savings exceeding the increases material costs. Estimated annual savings are $58,000. A summary of economic estimates is presented in the TRI-1 Cost Comparison table.

COSTS: No capital costs are associated with this program. The primary cost for this program is the cost of Gel Cell batteries. Labor of one hour per Gel Cell battery is assumed in the TRI-1 Cost Comparison table. Actual labor required to implement this option should be lower than this estimate.

FUND APPROPRIATION: PPP

FEDERAL STOCK NO./CLASS:

INITIATIVE SOURCE: [Contractor Name]

APPLICATION TO OTHERS: Limited

VENDORS/ PRODUCTS:

Power Sonic
(415) 364-5001

Concorde Battery
(818) 813-1234

TRI-1 Replace Lead Acid Batteries with Gel Cell Batteries: Cost Comparison

Cost Element	Status Quo Operational Cost			HW-8 Initial Investment Costs				HW-8 Annual Operating Costs				Cost Comparison	
	Unit Cost	No. of Units	Cost	Unit Cost	No. of Units	Cost	Diff. Savings	Unit Cost	No. of Units	Cost	Diff. Savings	% of Cost	Present Value
DIRECT CAPITAL COSTS													
None			$0.00			$0.00	0			$0.00	$0.00	0.0	$0.00
INDIRECT CAPITAL COSTS													
None			$0.00			$0.00	0			$0.00	$0.00	0.0	$0.00
OPERATING COSTS													
LEAD ACID BATTERIES	$61.00	50	$3,050.00			$0.00	0			$0.00	$3,050.00	0.0	$0.00
HAZARDOUS WASTE DISPOSAL	$0.80	3,000	$2,400.00										
SODIUM BICARBONATE (50 pound)	$10.00	24	$240.00			$0.00	0			$0.00	$240.00	0.0	$0.00
SULFURIC ACID (5 gal)	$15.00	20	$300.00			$0.00	0			$0.00	$300.00	0.0	$0.00
GEL CELL BATTERIES			$0.00			$0.00	0	$141.00	50	$7,050.00	($7,050.00)	97.2	$31,420.28
HW Manager Labor	$20.00	40	$800.00								$800.00	0.0	$0.00
LABOR	$10.00	200	$2,000.00			$0.00	0	$10.00	20	$200.00	$1,800.00	2.8	$891.36
TOTAL COSTS/SAVINGS			$6,390.00			$0.00	0			$7,250.00	$1,240.00	100	$32,311.64

PAYBACK PERIOD (YEARS):	**0.00**
NET PRESENT VALUE OF BENEFITS AND INVESTMENT:	**$5,526.40**

NOTE: ( ) INDICATE NEGATIVE VALUE

SAMPLE MAP APPENDIX B: Hazardous Waste Generation

1994 Hazardous Wastes Shipped

Waste Description	Process Description	Weight (lbs)
Mercury	Aircraft Maintenance & Spills	500
Alkaline Batteries	Batteries: Maintenance Operations	1,500
Lead	Batteries: Maintenance Operations	2,500
Mercury Batteries	Batteries: Maintenance Operations	500
Nickel Cadmium Batteries	Batteries: Maintenance Operations	1,850
Sulfuric/ Chromic Acid Solution	Batteries: Maintenance Operations	800
Waste Batteries, Wet Acid	Batteries: Maintenance Operations	3,000
Waste Sulfuric Acid, Spent	Batteries: Maintenance Operations	300
Methylene Chloride, Isopropyl Alcohol	Degreasing / Cleaning Solvents	1,400
Monoethanolamine (Cleaning Liquid)	Degreasing / Cleaning Solvents	180
Petroleum Distillates	Degreasing / Cleaning Solvents	1,200
Xylene / MEK	Degreasing / Cleaning Solvents	4,800
Xylene Isopropanol	Degreasing / Cleaning Solvents	200
Xylene, MEK	Degreasing / Cleaning Solvents	2,550
Waste Isopropanol	Degreasing / Cleaning sovents	200
Benzene, Aliphatic Hydrocarbons	Degreasing / Stoddard Solvents	7,095
Xylene, Paint Residue	Degreasing: Small Arms Cleaning	300
Benzene, Ethyl Benzene	Gas Fuel Filters	2,900
Lead, Chromium	Gas Mask Filters	4,005
Benzene, MEK	Miscellaneous Processes	800
Benzene-Chloroform	Miscellaneous Processes	2,400
Chromium	Miscellaneous Processes	1,200
Chromium	Miscellaneous Processes	1,500
Cyanide Wastes	Miscellaneous Processes	200
Hazardous Waste Liquid	Miscellaneous Processes	200
Lead / Chromium	Miscellaneous Processes	2,100
Methylene Chloride, 1,1,1 Trichloroethane	Miscellaneous Processes	200
Petroleum Naptha	Miscellaneous Processes	1,027
Propane / Isobutane	Miscellaneous Processes	1,500
Sodium Hydroxide, Hydroxy Benzoic Acid	Miscellaneous Processes	200
Sodium Hydroxide, Sodium Bromide	Miscellaneous Processes	1,200
Toluene Naphtha	Miscellaneous Processes	2,500
Waste Aerosol	Miscellaneous Processes	1,200
Waste Compressed Gas	Miscellaneous Processes	290
Waste Flammable Liquid	Miscellaneous Processes	100
Waste Sodium Hydroxide	Miscellaneous Processes	100
Waste Trichloroisocyanuric Acid, Dry	Miscellaneous Processes	40
Waste Article Explosive	Munitions & Explosives Handiling	<1
Waste Booster, Explosive	Munitions & Explosives Handiling	1,500
Waste Cartridge for Weapons, Blank	Munitions & Explosives Handiling	<5
Waste Cartridges, for Weapons, Inert Projectile	Munitions & Explosives Handiling	140
Waste Cartridges, Power Device	Munitions & Explosives Handiling	20

Waste Cartridges, Power Device	Munitions & Explosives Handiling	<1
Waste Cartriges for Weapons, Inert Projectile	Munitions & Explosives Handiling	<1
Waste Flares, Aerial	Munitions & Explosives Handiling	10
Waste Igniters	Munitions & Explosives Handiling	<1
Waste, Rocket Motor	Munitions & Explosives Handiling	630
Toluene, Xylene	Painting Operations	3,960
Toluene, Xylene, Paint Residue	Painting Operations	24,480
Waste Paint	Painting Operations	1,380
MEK, Cadmium	Painting Operations: Paint Booth	19,400
Benzene, Xylene	Petroleum / Hydrocarbon Spills	8,830
Silver	Photo / X-Ray Processing Waste	6,500
Cadmium, Chromium	Sand Blasting Grit (Bead)	800

SAMPLE MAP APPENDIX C: EPCRA Section 313 Chemicals

	CAS #	Total Issued Quantity (lbs)	Non-Exempt Quantity (lbs)
1,1,1-Trichloroethane (Methyl chloroform)	71-55-6	991.75	947.51
1,2,4 - Trimethylbenzene	95-63-6	10.64	7.24
1,2-Butylene oxide	106-88-7	0.08	0.08
1,2-Dichloroethylene	540-59-0	0.00	0.00
1,4-Dioxane	123-91-1	0.54	0.54
2,4-D [Acetic acid, (2,4-dichloro-phenoxy)-]	94-75-7	12.75	0.00
2,4-Dinitrotoluene	121-14-2	0.05	0.00
4,4' Isopropylidenediphenol	80-05-7	0.18	0.18
Acetaldehyde	75-07-0	0.02	0.00
Acetone	67-64-1	1,731.55	73.98
Acetonitrile	75-05-8	166.00	0.00
Acrylamide	79-06-1	4.96	0.00
alpha-Naphthylamine	134-32-7	0.03	0.03
Aluminum (fume or dust)	7429-90-5	6.02	2.25
Aluminum oxide (fibrous form)	1344-28-1	7.50	0.00
Ammonia	7664-41-7	6.50	3.68
Ammonium nitrate (solution)	6484-52-2	1.10	0.00
Ammonium sulfate (solution)	7783-20-2	88.02	0.00
Antimony	7440-36-0	68.26	0.00
Antimony Compounds	N010	10.39	4.73
Arsenic	7440-38-2	1.79	0.00
Asbestos (friable)	1332-21-4	5.50	5.50
Barium	7440-39-3	1.67	0.00
Barium Compounds	N040	110.51	1.56
Benzene	71-43-2	2,388,983.93	7,186.72
beta-Naphthylamine	91-59-8	0.03	0.03
Bromochlorodifluoromethane (Halon 1211)	353-95-3	29.70	29.70
Cadmium	7440-43-9	256.64	0.00
Cadmium Compounds	N078	30.75	0.00
Carbon tetrachloride	56-23-5	0.00	0.00
Chlorine	7782-50-5	22865.5	16,000.00
Chlorodifluoromethane (HCFC-22)	75-45-6	5,070.34	142.03
Chromium	7740-47-3	1.67	0.00
Chromium Compounds	N090	260.02	5.53
Cobalt	7740-48-4	316.37	0.00
Cobalt Compounds	N096	3.86	0.00
Copper	7440-50-8	3.84	3.55
Copper Compounds	N100	1.39	1.39
Cumene hydroperoxide	80-15-9	0.18	0.00
Cyanide Compounds	N106	1,680.85	24.56
Cyclohexane	110-82-7	2,899,692.70	8,994.79
Di(2-ethylhexyl) phthalate (DEHP)	117-81-7	2.11	0.00
Dibutyl phthalate	84-74-2	0.12	0.00
Dichlorodifluoromethane (CFC-12)	75-71-8	6.34	6.34
Dichloromethane (Methylene chloride)	75-09-2	955.88	178.75
Epichlorohydrin	106-89-8	0.00	0.00

Ethylbenzene	100-41-4	1,161,605.45	3,593.55
Ethylene glycol	107-21-1	9,740.14	254.24
Formaldehyde	50-00-0	4.43	3.26
Freon 113 [Ethane, 1,1,2-trichloro-1,2,2	76-13-1	2,554.50	2,554.50
Glycol Ethers	N230	16,630.16	14,911.12
Hydrochloric Acid	7647-01-0	22.93	22.69
Hydrogen fluoride	7664-39-3	7.28	7.19
Hydroquinone	123-31-9	260.44	260.19
Isopropyl alcohol (mfg-strong acide process)	67-63-0	1,744.99	1,003.18
Lead	7439-92-1	2,458.15	0.00
Lead Compounds	N420	2,848.78	2.59
m-Xylene	108-38-3	0.38	0.00
Manganese	7439-96-5	308.69	0.00
Manganese Compounds	N450	1,134.87	0.00
Mercury	7439-97-6	0.45	0.00
Mercury Compounds	N458	14.16	0.00
Methanol	67-56-1	283.62	197.51
Methyl ethyl ketone	78-93-3	7,276.42	2,618.37
Methyl isobutyl ketone	108-10-1	318.26	1.35
Methyl ter-butyl ether	1643-04-4	4,059,553.83	12,576.76
n-Butyl alcohol	71-36-3	1,097.85	0.00
Nickel	7440-02-0	565.75	0.00
Nickel Compounds	N495	552.00	0.00
Nitric acid	7697-37-2	5.43	0.00
Nitrilotriacetic acid	139-13-9	6.38	0.00
Nitorbenzene	98-95-3	1.38	0.00
o-Dinitrobenzene	528-29-0	0.05	0.00
Pentachloroethane	76-01-7	0.02	0.00
Phenol	108-95-2	160.39	4.06
Phosphoric acid	7664-38-2	308.73	8.42
Phthalic anhydride	85-44-9	0.04	0.00
Propoxur [Phenol, 2-(1-methylethoxy...	114-26-1	18.11	0.00
Propylene oxide	75-56-9	0.00	0.00
Saccharin (manufacturing)	81-07-2	0.21	0.00
sec-Butyl alcohol	78-92-2	0.46	0.00
Silver	7440-22-4	0.47	0.47
Styrene	100-42-5	34.15	21.25
Sulfuric Acid	7664-93-9	5,309.77	2,508.80
tert-Butyl alcohol	75-65-0	2.31	1.85
Tetrachloroethylene (Perchloroethylene)	127-18-4	164.19	146.09
Toluene	108-88-3	12,779,317.48	39,591.35
Trichlorofluoromethane (CFC-11)	75-69-4	6.34	6.34
Vinyl chloride	75-01-4	0.00	0.00
Vinylidene chloride	75-35-4	0.01	0.00
Xylene (mixed isomers)	1330-20-7	5,818,861.28	18,640.79
Zinc (fume or dust)	7440-66-6	179.60	0.00
Zinc Compounds	N982	1,686.36	1.40
TOTAL		**29,198,434.72**	**132,557.99**
50% Reduction Quantity			**66,279.00**

Green Zia Environmental Excellence Program
New Mexico Environment Department
PO Box 26110
Santa Fe, NM 87502
505-827-0677
Pat_gallagher@nmenv.state.nm.us

Green Zia Environmental Excellence Program

Printing

Guidance for improved environmental performance and pollution prevention in your printing business

Acknowledgements

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Table of Contents

The Green Zia Environmental Excellence Program

Guidance materials for printing.

Introduction

This workbook contains information on how to establish a pollution prevention program specific for a printing operation. The workbook also contains waste management and regulatory guidance materials to help assure that you are in compliance with environmental, health, and safety regulations. Used together, this information can help you establish a pollution prevention program that will help you be in compliance and reduce waste. Use of the tools from start to finish also helps you qualify for the Green Zia Environmental Excellence Program.

The Green Zia Environmental Excellence Program is a voluntary program based on quality management principles that is designed to help New Mexico businesses achieve environmental excellence through pollution prevention programs.. This program is administered by a partnership of state, local, and federal agencies, academia, private industry, and environmental advocacy groups. This packet has been specifically developed for a printing operation and is designed to meet the needs of a small business.

The basic logic of the Green Zia Environmental Excellence Program is that:

- waste or pollution is the result of inefficiency;
- reducing waste increases profits;
- waste that is not created cannot pollute.

This guidance has been developed to aid in your company's understanding of best management practices to help your company comply with environmental health and safety regulations and to reduce waste and associated liabilities.

It is important to remember that environmental health and safety regulations are triggered by the use of equipment and chemicals. Better use of chemicals, use of safer chemicals, and efficient operation of machinery can help reduce your regulatory burden—if you aren't using hazardous materials, then you have fewer regulations to be concerned with! This program is based on first understanding work processes and materials use and then improving work practices to reduce cost, waste, and regulatory concerns.

Working through the Green Zia Environmental Excellence Program will result in a system that helps address environmental issues in cost effective ways, based on sound business practices. The system provides a framework for continuous improvement over time and contributes to a thorough understanding of environmental issues in your business.

What is Pollution Prevention?

Simply put, pollution prevention means not creating a waste in the first place. Pollution prevention is achieved by the efficient use of resources, including raw materials, energy, water and even time and distance. The goal is to produce a product or deliver a service as efficiently as possible, with the least amount of wasted materials and the least possible environmental impact.

The bottom line is that pollution prevention or improved efficiency can help businesses save money and help protect the environment at the same time.

What is Environmental Excellence?

Environmental excellence means moving beyond compliance with environmental, health and safety regulations by establishing an environmental management system that incorporates pollution prevention into core business practices.

A prevention-based environmental management system will:

- Help a business identify *all* the environmental compliance and health and safety concerns as well as costs associated with a waste generating process, and
- Use prevention approaches to reduce or eliminate the waste and reduce the associated costs.

In the Green Zia Environmental Excellence Program, attention is focused on the *process* that generates the waste, not the waste. Identifying and implementing process improvements will reduce waste and costs. This is a major shift from the traditional, reactionary approach that concentrates only on managing wastes or pollutants already created to an anticipatory approach that concentrates on prevention of wastes or pollutants to improve environmental and economic performance. This prevention-first environmental management system will identify cost effective ways to achieve "beyond compliance" status, creating a win-win situation between economics and environment.

The Green Zia Tools

The Green Zia Program provides tools to establish a basic prevention-based environmental management system. Management and employees walk through the tools as a team to gain a complete understanding of their operation. Examples have been worked out for the auto repair business. We encourage you to customize the examples to your own operations. The packet includes a series of process maps (Tool 1) for some operational areas of the auto repair business. Tools 2-6 are also explained and illustrated to help you develop your program. Use of these tools on a regular basis will help your company qualify for the Green Zia Environmental Excellence Program.

Green Zia Tools:

Knowledge of Process

Tool 1: Process Mapping: Illustrates the work steps materials pass through as they are transformed into your final product. Maps allow for the identification of all inputs and outputs such as water, chemicals, electricity or other materials from a process, helping you to understand wastes and their sources. Maps also help you understand regulated activities.

Full Cost Accounting

Tool 2: Activity-Based Costing: Identifies the true costs of wastes or losses and helps participants identify areas to target for pollution prevention, by assigning dollar values to these wastes and losses.

Pinpointing Problems

Tool 3: Root Cause Analysis: Creates a cause and effect diagram to highlight why and where the losses occur in the process. Understanding why and where the loss occurs will help participants focus on specific areas for improvement.

Problem Solving

Tool 4: Brainwriting: Addresses problems by generating as many alternatives as possible to minimize loss.

Prioritization of Options

Tool 5: Bubble-up-bubble-down: Ranks alternatives to determine the optimal solution. Factors such as cost, ease of implementation and effectiveness are considered in evaluating and ranking the alternatives.

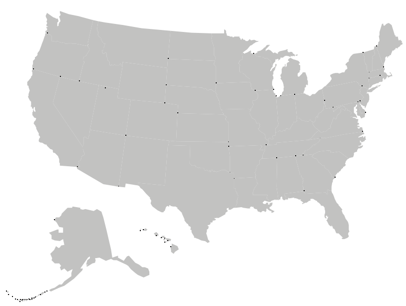
Ensuring Success

Tool 6: Action Plan: Details each step that needs to be taken to implement the alternative and reduce or eliminate the loss from the process.

Tool #1: Process Mapping

To begin incorporating pollution prevention into your business, you must first get a full understanding of where wastes are being generated. This tutorial will discuss the advantages of using process maps to logically evaluate each step of your process.

Warm-up Exercise



Maps have been used throughout the ages for many purposes from helping sailors navigate the seas to providing a safe route for climbers hiking to the tallest peaks. You have probably drawn maps to your home or office so that someone could visit. It is important that the information on this map is complete and accurate or, as you may have found, your guest will get lost!

Take a minute now and think of a coffee shop or restaurant nearby that everyone in the group knows. Draw a map from the building you are currently in to this establishment - include traffic lights, landmarks, and any other important features along the way. Now compare maps with the other members of your group. Are they the same? If a person not familiar with the area were to use your map, would they have found their way?

Introduction

Are you aware of the amount of waste that your business generates? Could this waste be turned into profit? By considering methods of reducing wastes, recycling used and unused raw materials, and reusing lost material, you could not only help the environment but also reduce your raw material and waste disposal costs.

This section discusses process mapping, a method of analyzing a process in order to catalogue all the materials used and lost in the process. With process mapping, you will systematically identify the series of steps materials pass through as they are transformed into the final product. Evaluating your process in this manner will allow you to recognize the opportunities to prevent losses and possibly streamline operations. Each loss identified during the process mapping is an opportunity to prevent that loss.

A series of process maps have been developed for printing operations and are included in this packet. You should customize these maps for your operation, since no two businesses are exactly alike. These maps become a reference for you to use for your pollution prevention program and can be updated to reflect changes as you improve your operations. These maps are also great for training new employees and for other problem solving needs.

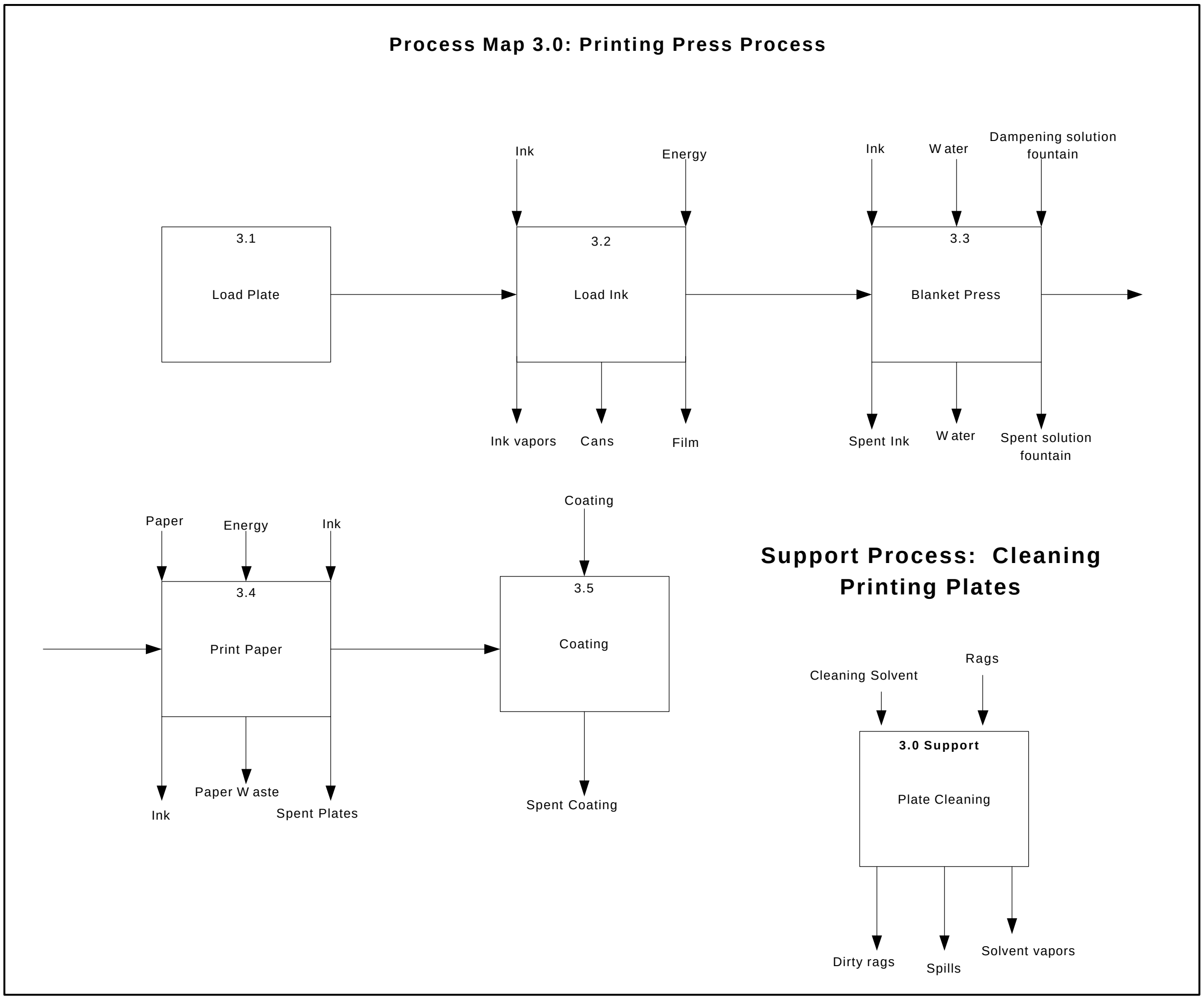
Large businesses and manufacturers use these tools to understand and improve their manufacturing processes. Small businesses can benefit by using these tools as well!

It is helpful to also prepare a narrative to go along with your process maps to explain the process in detail. We recommend that you include regulatory activities in the narratives as part of your environmental management system. Narratives are also included in this packet; please revise to reflect your business operations.

Create a team of employees to complete this exercise. During this exercise you will:

- Examine and revise the process maps and narratives in the packet to accurately reflect your operation
- Fully understand the functionality of each step of a process
- Identify the inputs and outputs/losses within the process
- Communicate findings in a clear and concise manner to members of the team.

Example of a process map for printing:



Please review the process maps in the back of this booklet and make changes to reflect your operation.

Once you have reviewed and revised the process maps to your operation, move to the next section…Activity-Based Costing!

Tool #2: Activity-Based Costing

Every waste or environmental loss costs you money. By determining the activities that cause waste, you can focus your pollution prevention efforts to minimize the cost to your business and protect the environment. This tutorial will introduce you to a method of evaluating your waste.

Warm-up Exercise

Your daughter approaches you one evening and says that she is planning to buy a car. With the $400 she has left over each month, after paying all of her bills, she is sure she will be able to afford the $220 monthly car payment.

What are the other costs of operating and maintaining a car that she is forgetting? Consider not only the annual costs, such as insurance, but also the intermittent (once in a while) costs. Can she really afford this car?

Introduction

Once you have determined the losses in your processes through your process maps, you can discover how these losses are affecting your “bottom line”. How much does it cost you to discard 10% of your raw materials, or 2% of your finished products? Which activities have losses that most hurt the profitability of your company? This tool will help you look at the cost of the losses in your business and see how much these losses are costing you. The results may surprise you!

Which losses should you care about? The Pareto Principle suggests that 80% of the problems in a business come from 20% of machines, raw materials or operators. (The same is true for any facet of a business, for example, 80% of sales come from 20% of your customers, etc.) Once you have assigned costs to your activities, you can figure out which 20% of your activities are contributing to 80% of your costs. The Pareto Principle is very important in activity-based costing as it is used to focus on the most important areas for improvement in your pollution prevention program. Use of the Pareto Principle for the activity-based costing section will help you quickly identify areas of your business to focus your prevention efforts.

New Terms

<u>Activity based costing (ABC)</u> - An accounting method used to assign the cost of your losses to the activities that generate these losses. By assigning costs to activities, you will discover the activities should be targeted for prevention.

<u>Environmental costs</u> -The costs associated with the losses in your process.

<u>Intermittent or support operations</u> – Operations that occur once in a while that are necessary for the key processes to operate.

<u>Pareto principle</u> - A principle that suggests that 80% of anything can be attributed to 20% of the factors involved. For example, 80% of your environmental costs can be attributed to 20% of your activities.

Activity-Based Costing

1. Make a list of all the activities in your operation. Be sure to include the activities from your process map as well as any intermittent operations (such as cleaning or maintaining equipment.).

   Regular activities:

   - Making proofs
   - Developing film
   - Printing
   - Mixing inks
   - Selecting paper
   - Binding
   - Packaging

   Support activities:

   - Cleaning print presses
   - Record keeping
   - Equipment maintenance
   - Recycling solvent
   - Cleaning ink cans and ink-covered items
   - Managing waste ink
   - Managing dirty rags
   - Equipment maintenance

2. List all of the losses in your operation. Look on your process map and add any others that you think of.

3. Reviewing your process maps, identify the operations in your plant that generate most of your waste or pollution problems. For example, does solvent use cause most of your environmental problems? Do wastewater from roller washes or air emissions from solvent-based inks your biggest problem result in your biggest problem? Does the 80/20 Rule apply? Focus your efforts for now on the areas of your operations that you do the most or that create the biggest environmental problem for you.

4. Use process maps to review material use and losses for your selected process or operation. You will use these maps as a guide to assign costs to these losses.

5. Identify which major costs or general ledger costs apply to the material use and losses on the process maps (utilities, chemical purchase costs, waste disposal

costs, costs that are easy to get information on and that you typically consider when looking at your processes). Enter into Table 1. (See example provided)

6. Identify which other activities are related to the use of these materials that are not in the major costs (protective equipment such as gloves or goggles, monitoring, record keeping, maintenance, permits, rag laundering service, waste management service contracts, fees to the state or city, storage space for chemicals, the cost of spill clean-up and reporting). These activities are not usually considered when thinking about the cost of a process, yet the costs associated with them can be significant.

7. Write the activities in the first column of Table 2. Along the top list all the costs or services required for these activities. Add or delete categories as appropriate for your business. Put an "x" for every cell that applies.

8. Count the total number of "x's" in Table 2. Then circle the x's that represent what you estimate to be about the top 20% of the most expensive activities in your operation. Again, you are using the 80/20 rule: 20 percent of your activities will probably add up to about 80% of your total costs.

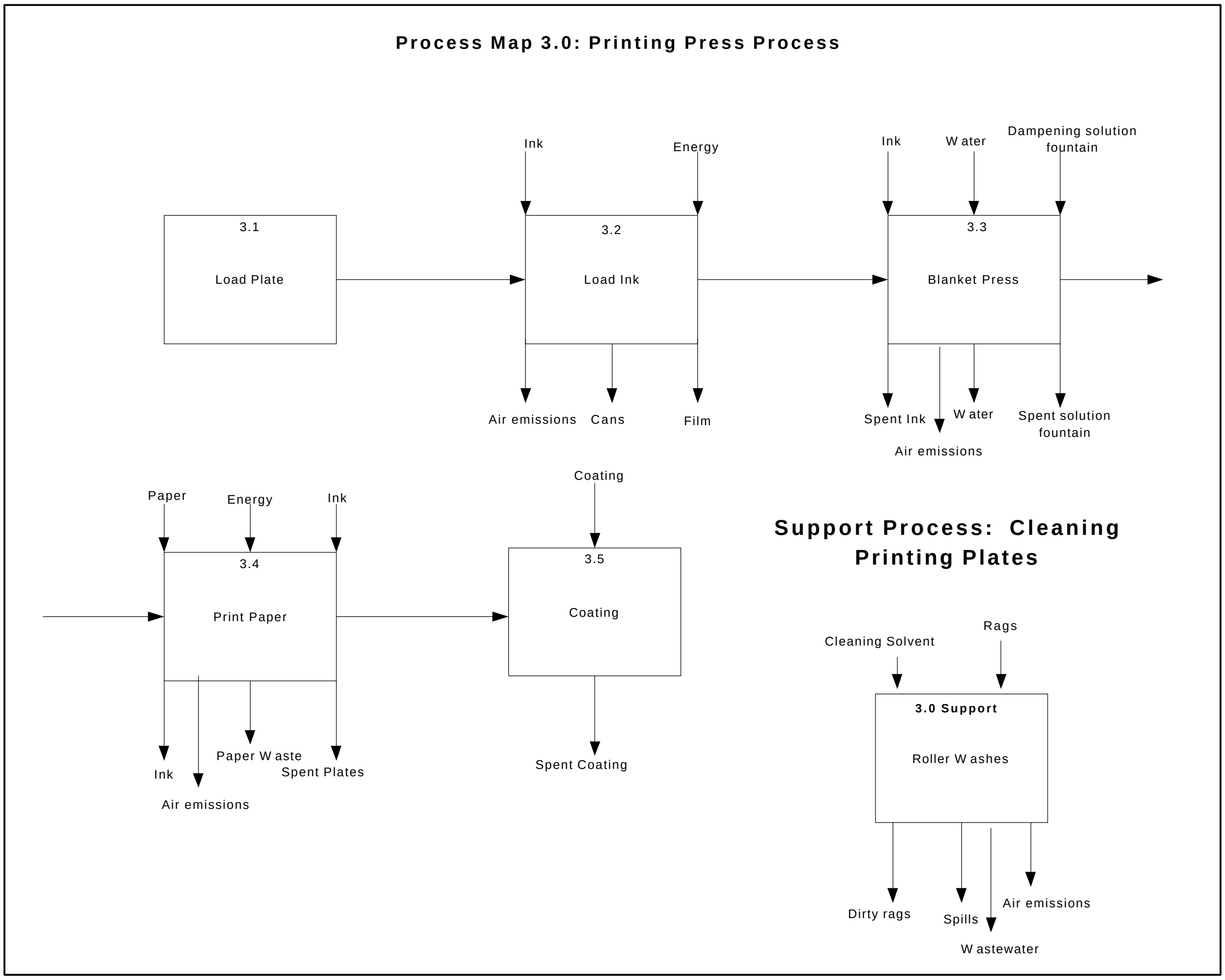
9. Then estimate only the cost of each of these top 20% of activities that you circled and write them in a new table. Cost estimates are allowable as you are using this method to prioritize your most expensive activities. You can refine costs once you have chosen a project to work on. (In the example, the top 20% of the cost categories chosen have the estimate beside them.) Add these numbers into Table 1 under the appropriate waste stream in the "Hidden costs" line.

10. Add the ledger costs and the hidden costs together to discover the true costs.

11. Create a Pareto Chart. Create a chart showing all these costs graphically. On the x axis (vertical), place costs in dollars, on the y axis (horizontal), show the true costs of the wastes. This chart will help graphically show how all the costs stack up against each other. Does the 80/20 Rule apply here? Use this chart to identify the most expensive processes. This can be used to identify the first area for improvement. Which waste stream do you think you should focus on from this Pareto chart?

An example of Activity-Based Costing is provided in the next section. Please note that this is an example to demonstrate how to assess costs. The costs included are not from an actual case study. Water and energy costs are not included in this example but should be considered in developing improvement and cost saving projects. The example provided addresses only the major processes in a printing operation. Environmental improvement can be applied to every waste generating activity in your operation!

Activity-Based Costing Example



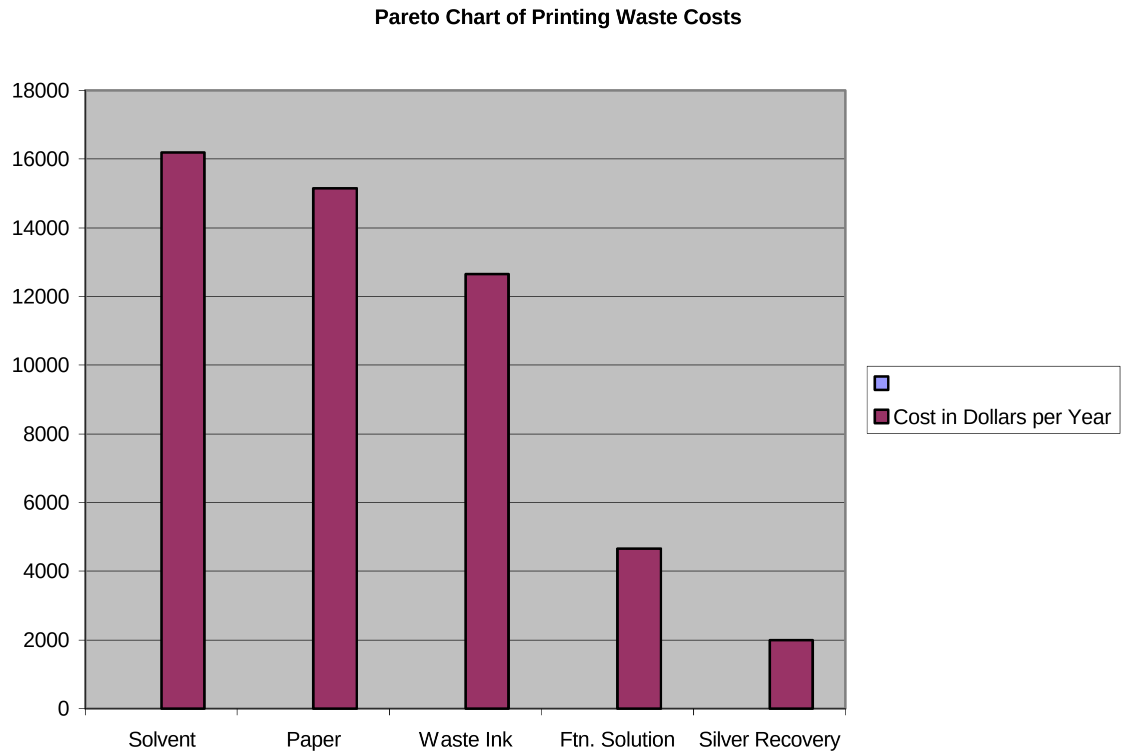
Activities	Materials and Losses
Proof Making Printing Binding Maintenance	Wastewater *Fountain Solution *Energy (major cost across organization) Silver from developing *Waste Ink *Solvent *Rags *Paper (*) indicates most important waste streams and materials

Table 1. Activity-Based Costing Analysis (Per year)

Workstep						
Costs/Losses	Solvent	Waste Ink	Fountain Solution	Silver Recovery	Waste Paper	Total
Raw material	$2,000	$3,000	$2,500	$2,000	$2,500	$12,000
Disposal fees	$2,500	$6,000	$500	+$500	$5,000	$13,500
Other ledger costs					$150	$150
Hidden Costs	**$11,700**	**$3,650**	**$1,650**	**$500**	**$7,500**	**$25,000**
Total	**$16,200**	**$12,650**	**$4,650**	**$2,000**	**$15,150**	**$50,650**
%of Total	.320	.250	.092	.039	.300	1.0

Table 2. Hidden Cost Analysis (per year)

Solvent					
Activities/Cost Factors	Materials	Space	Utilities	Services	Labor and or fee costs
HW Gen. fees					X ($2,000)
Reporting					x
Red rags laundering	x	x		X ($4,000)	x
Recycling contract	x			X ($5,200)	x
Vent. equip	x	x	x	x	X ($500)
Air Permit	x			x	x
Total hidden costs for solvents					***($11,700)***
Ink					
Record keeping					x
HW Gen. fees					X ($650)
Recycling services	x	x		X ($3,000)	
Cleaning equip.	x			x	x
Total hidden costs for ink					***($3,650)***
Fountain solution					
HW Gen. fees					x
Discharge fees					X ($1,650)
Cleaning equip/filters	x				x
Water use fees					x
Total hidden costs for fountain solution					***($1,650)***
Silver Recovery					
Materials mgmt.	x	x			x
Discharge fees				x	X ($500)
Filters	x			x	x
Total hidden costs for silver recovery					***($500)***
Paper					
Handling				x	X ($7,500)
Total hidden costs for waste paper					***($7,500)***



Pareto Chart for Printing. The Pareto Chart illustrates costs relative to each other and helps choose areas to target for pollution prevention activities. In this example, solvent use, the most expensive loss, will be the focus of the pollution prevention efforts in the following sections.

Now that the process mapping and activity-based costing are completed, you have a sense of the relative environmental costs of your operations. Since solvent use is the target, we will use the following problem-solving and decision-making tools to find a way to reduce solvent use, increase efficiency and save money.

Most of your work is done. These two tools can be revised as needed. Use these maps and information annually (or more often!) to keep improving your operation on an ongoing basis. Now that you have identified your most expensive wastes, you can now move towards solving problems and eliminating waste…the next tool is Root Cause Analysis!

Table 1. Activity-Based Costing Analysis (Per year)

Workstep							
Costs/Losses							Total
Labor							
Raw material							
Disposal fees							
Other ledger costs							
Hidden Costs							
Total							
%of Total							

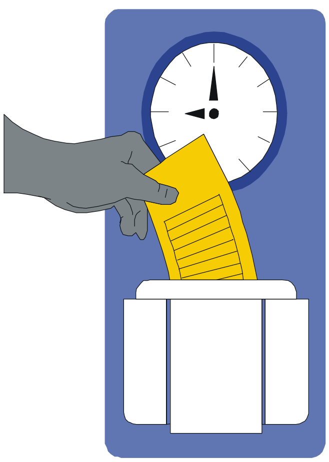
Table 2. Hidden Cost Analysis (per year)

Activities/Cost Factors	Materials	Space	Utilities	Services	Labor
Waste Stream					
Monitoring					
Reporting					
Repairs					
Recycling disposal service					
Spill clean-up					
Storage					
Record keeping					
Generator fees					
Total hidden costs for (waste stream)					
Waste Stream					
Monitoring					
Reporting					
Repairs					
Recycling disposal service					
Spill clean-up					
Storage					
Record keeping					
Generator fees					
Total hidden costs for (waste stream)					
Waste Stream					
Monitoring					
Reporting					
Repairs					
Recycling disposal service					
Spill clean-up					
Storage					
Record keeping					
Generator fees					
Total hidden costs for (waste stream)					

Tool #3: Root Cause Analysis

Now that you have recognized the activities in your process that are costly or expensive to your business, you can begin to focus your efforts on pollution prevention. This tool presents a method of detecting the underlying reason for an environmental loss so that the loss can be prevented.

Warm-up Exercise



Think of all of the times that you have been late for work and list the different reasons for your delay. Maybe your alarm clock did not go off, or perhaps your child was sick and you needed to arrange for a sitter. Did you spend too much time reading the newspaper or did you need to run to the store to pick up milk.

Arrange all these reasons in the categories listed below, or create an additional category. Some of the items on your list may be entered more than once. Now consider the last time you were late for work. Why were you late? Circle the reason.

MACHINES
broken alarm clock

PEOPLE
sick child

METHODS
reading the newspaper

MATERIALS
out of milk

Introduction

In the last tool you determined the key losses responsible for the greatest amount of environmental costs. In order to try to prevent a loss, you must first understand why it is occurring. The underlying reason for a loss is also known as its “root cause”. The root cause will answer the question: What *ultimately* caused the loss? Determining the root cause of an environmental loss is very similar to determining the root cause of being late for work

A cause and effect diagram is one method of determining the root cause for a loss. This tool provides a visual description of all possible causes for a specific loss. Once all the possible causes are depicted on the diagram, the most plausible cause or causes are identified. It is imperative that all persons involved in determining the root cause are in agreement. The next step is to write a “Dear Abby” letter summarizing the cause or causes for a loss will ensure that all participants see the problem in the same way.

During this exercise you will:

- Construct a cause and effect diagram with all potential causes for a loss.
- Discuss the most probable cause or causes.
- Write a Dear Abby letter describing the reason for the loss.

Root Cause Analysis

After participating in process mapping and activity based costing exercises, it was determined that the largest loss, solvent use, accounts for approximately 80% of all environmental costs in the printing operation. The next step is to discover the root cause of this loss.

To determine the root cause of a loss, you must ask, “Why is the loss occurring?” One way of gathering information concerning the generation of a loss is called a cause and effect diagram, or fish bone diagram, since it resembles a fish bone. Major categories of possible causes for the loss are first defined and entered on the diagram as an offshoot from a main horizontal line. Next, all possible causes of the waste are assigned to a category and entered on the diagram. Once all the causes are defined, an agreement is made as to the most plausible reason for the loss.

Divide the causes into four major categories - Methods, Machines, Materials, and People - and then write down all the possible reasons why solvents could be lost from the process and assign them to a category. Begin the diagram and then write down some of the things that immediately come to mind. An example has been provided in Figure 2.

Several things may come to mind. Inks must be mixed to meet color specifications. Fountain solutions containing solvents must be prepared. Rollers must be cleaned thoroughly. Waste drums containing inks and solvents must be managed properly. Red rags from cleaning processes generate hazardous waste. Drums containing red rags accumulate liquid solvent in the bottom of storage drums creating health and safety issues and hazardous waste. Spills must be cleaned. Machine maintenance is critical in assuring production with minimal downtime. Also people operating the machines are critical and training and a good work attitude are critical to efficient operations. All of these ideas should be entered under one of the four categories in the fishbone diagram: Machines, Methods, Materials and People as in the example in Figure 2.

Now that all the possible causes of solvent being lost during the printing process are categorized, it is time to determine the most probable cause. Go back to the diagram and circle the most probable causes. One of these should be the root cause**.** Then, working with employees as a team, discuss which one of these major causes is the root cause. To come to clear understanding of the root cause, we suggest that the team write a short "Dear Abby" letter describing his or her interpretation of the problem to ensure that each person sees the problem the same way. Once the letter is in place, the group becomes Abby and seeks to solve the problem. *(see Figure 3)*

Another method for determining the root cause of a problem is the "5 whys".

By asking the question "why?" five times, you may get to the root cause of a problem. An example of how the five whys works is as follows.

The Five Whys:

1. Why has the machine stopped forcing an interruption in production?
   A circuit breaker tripped due to an overload.
2. Why was there an overload?
   There was not enough lubrication for the bearings.
3. Why was there too little lubrication for the bearings?
   The pump was not pumping enough lubrication.
4. Why was there not enough lubricant being pumped?
   The pump shaft was vibrating because of abrasion
5. Why was there abrasion?
   There was no filter, which allowed chips of metal to get into the pump.

The solution is then to place a filter on the pump to capture metal chips.

Both tools can be used to find the root cause of the problem. For most problems to be permanently solved the root cause must be addressed. The fishbone diagram is a good visual tool that helps you understand all the areas that contribute to a problem.

Understanding all the contributing factors will help facilitate problem solving. The Five Whys will also help you move past dealing with the symptoms of the problem to solving the real problem.

Examples of the fishbone diagram and a Dear Abby letter are included as well as a blank fishbone diagram for your use.

The next tool will present brainwriting - a method to generate ideas.

Figure 1: Printing Process - Process Map

Process Map 3.0: Printing Press Process

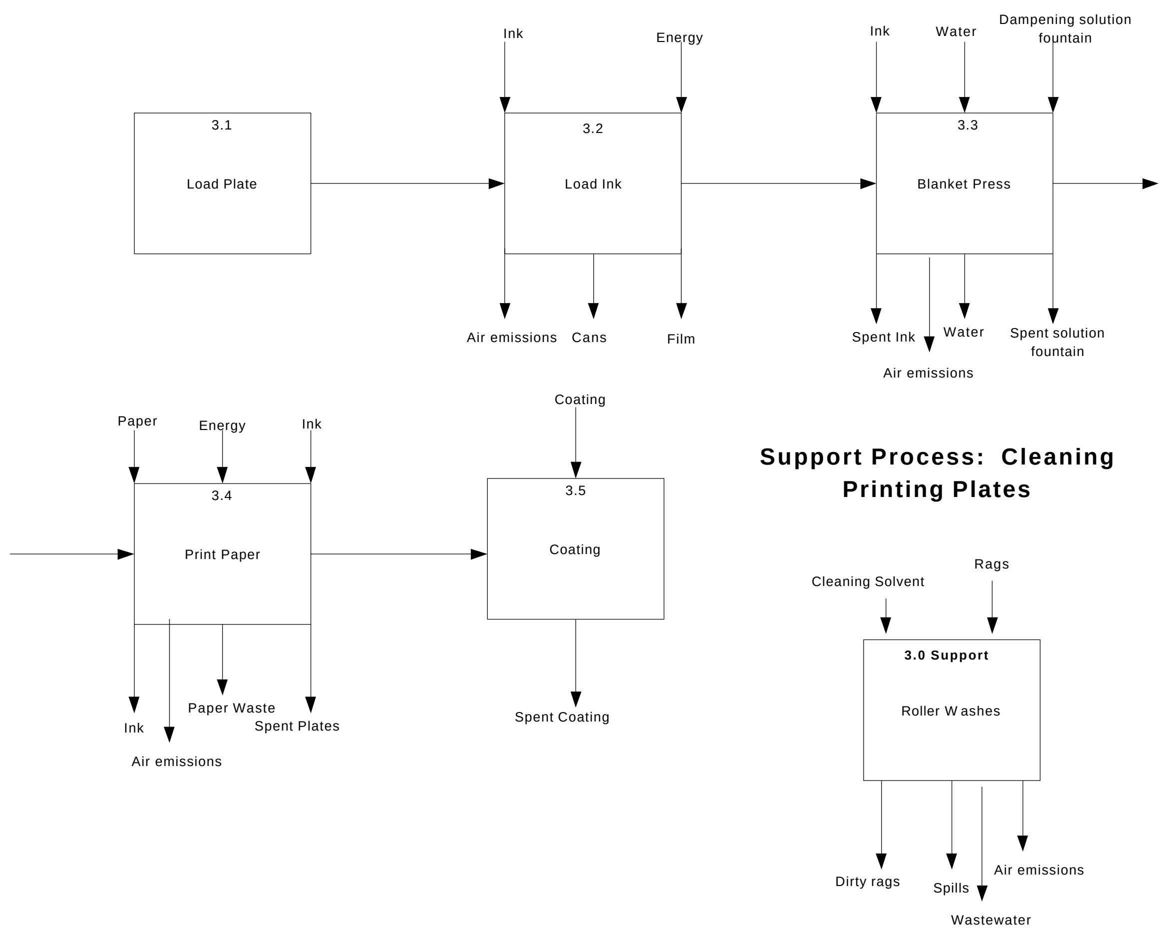


Figure 2: Cause and Effect Diagram

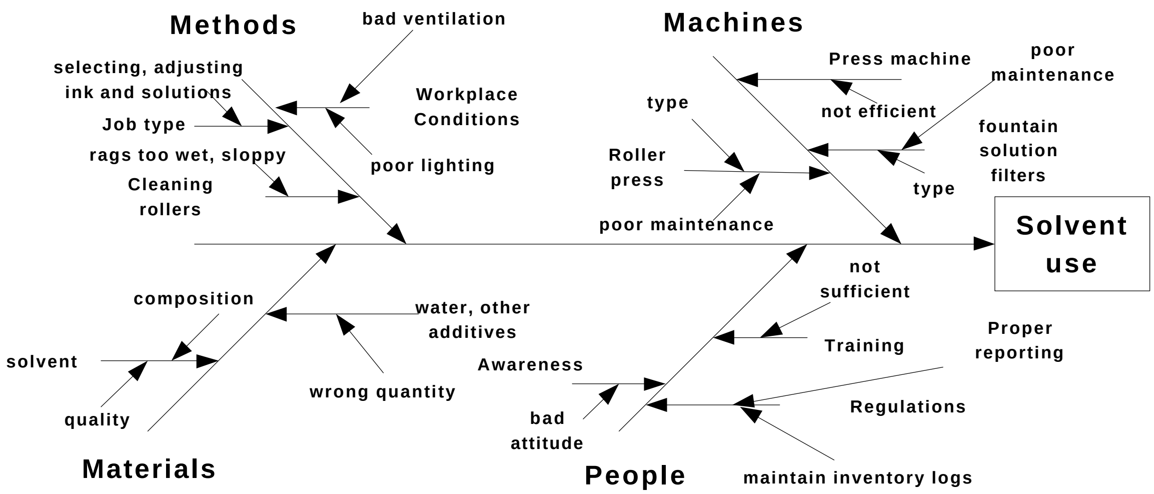


Figure 3: Dear Abby Letter

Dear Abby,

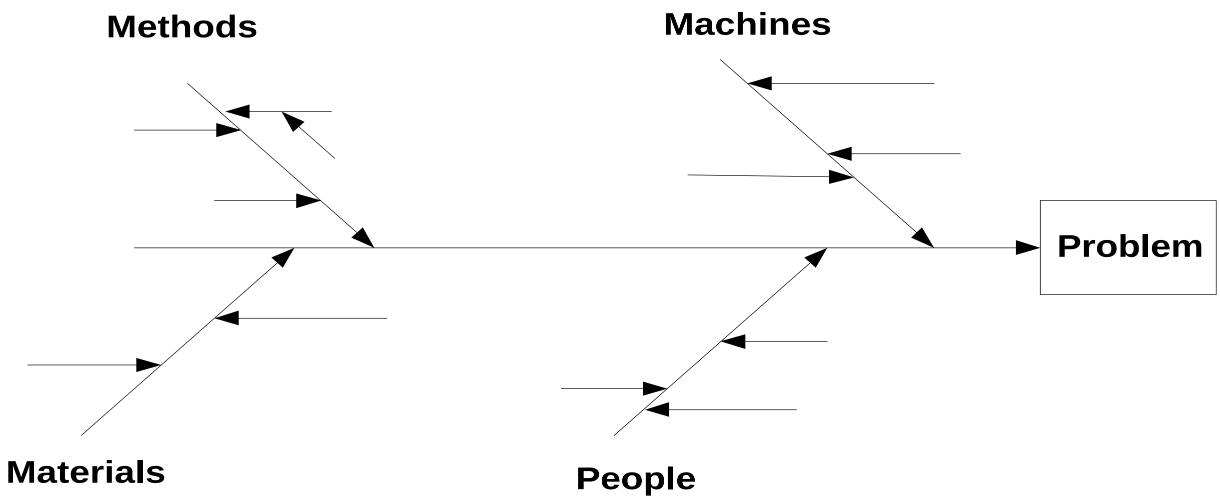
We run a small printing operation. Use of solvent is our most expensive business issue. Solvents are highly regulated and we must comply with lots of regulations from air quality to hazardous waste to health and safety. Some printing plants have had to pay lots of money for air quality permits, waste management and special equipment to meet regulations. These are issues that we wish to take seriously.

Our group did root cause analysis and we believe that our biggest problem is use of solvents. Employees affect solvent use from loading the ink, to maintaining the equipment, to keeping the presses clean and making sure we are in compliance with regulations. However, as you know, our employees have a billion things to do every day and they often don't stick around for enough time to get proper training.

Can you help us?
Signed,

Pressed for time in Albuquerque

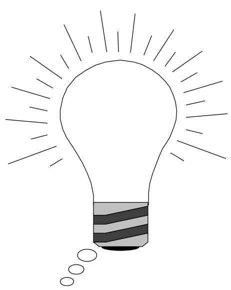
Figure 4. Root cause analysis: Fishbone Diagram



Tool #4: Brainwriting

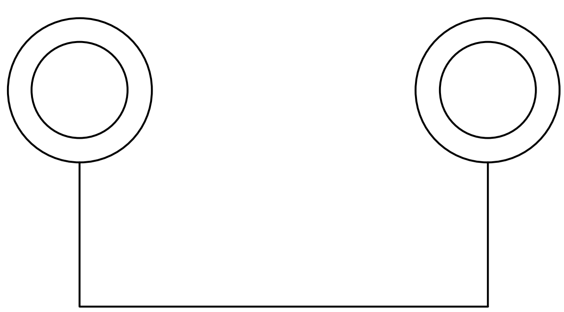
To address an opportunity effectively, it is important to recognize all alternatives. Very rarely is there one "right" way of preventing pollution. Instead, there are many different potential solutions. This tutorial presents a technique of listing many different alternatives for an opportunity.

Warm-up Exercise



You know the old adage "two heads are better than one". This is especially true when trying to come up with new ideas. When you generate ideas in a group you will notice that each member of the group brings their unique set of experiences and strengths to the table.

Try the following exercise with your group. Look at the picture below (turn it on it's side and upside-down). What does it remind you of? Write down all the images that come to mind-even images that seem crazy should be included. Now go around the room, each person sharing one image with the group. One person should volunteer to keep a list of all the images. Repeat this step until every member of the group is out of images. How many images did the group come up with? How does this compare with the number of images you generated alone?



Introduction

In the last tool you evaluated all the probable causes of a loss and determined the underlying reason, or root cause. Once the root cause has been identified, you may be tempted to jump to a premature solution. When you address a loss without considering all the alternatives of prevention you may be overlooking the most appropriate option(s).

Looking for alternatives for pollution prevention by addressing its root cause is the next step towards addressing an opportunity. There are several tools available to help groups develop alternatives. You already explored one tool during the warm-up exercise. In this exercise you will explore another method-brainwriting. Brainwriting requires maximum interaction and creativity between group members. The group should consider all possible alternatives, regardless of how far-fetched they appear to be. Alternatives raised by the group may seem contradictory, or they may build on one another making them better. A comprehensive list of alternatives can then be compiled.

During this exercise you will:

- Conduct a brainwriting session.
- Develop a list of all possible alternatives for an opportunity for improvement.

Brainwriting

First you have completed your process map to see how you can optimize your processes and reduce losses. *(see Figure 1)* In the example provided, Activity-Based Costing helped to identify that 80% of the environmental costs associated with printing was due to solvent use. Not only are solvents expensive, they are considered a hazardous waste and a hazardous air pollutant and they must be handled very carefully. Spills must be avoided to eliminate employee exposures and site contamination.

Root cause analysis determined that the greatest losses occurred due to employee handling practices. Employees control the printing processes from the beginning to the end and also must deal with environmental, health and safety compliance issues.

The next step is to develop as many alternatives to solve the problem as possible. This is done through the process of brainwriting. Through brainwriting, staff works together to generate as many alternatives as possible regardless of how crazy they seem. In fact, to make it more interesting you can give a prize to the person that comes up with the craziest idea.

Make copies of the blank brainwriting sheet included at the end of this chapter. Make enough sheets so that each person on the brainwriting team has one per person with one blank sheet in the middle of the table. Place these sheets in the center of the table. Each person should take a sheet and write two alternatives on it and then place the sheet back in the center. Then take another sheet of paper and write two more alternatives on it. Every time someone picks up a sheet of paper, encourage them to read what others have written and try to make improvements to the alternatives listed. Someone could even say they think someone's idea is completely out in left field, if they try to make it better. Keep repeating this process until everyone runs out of ideas.

Now list all the alternatives that were discovered.

The alternatives on each sheet of paper should be read aloud and discussed. Many of the ideas may be the same and some may have small variations. The group should debate the small variations and eliminated the impossible alternatives. One comprehensive list should be developed-each idea only written once, although all variations of the same idea should be included.

Examples of brainwriting are provided below.

The next tool will present 'bubble-up-bubble-down"…a method for selecting the best option to prevent loss.

Figure 1: Printing Process Map

Process Map 3.0: Printing Press Process

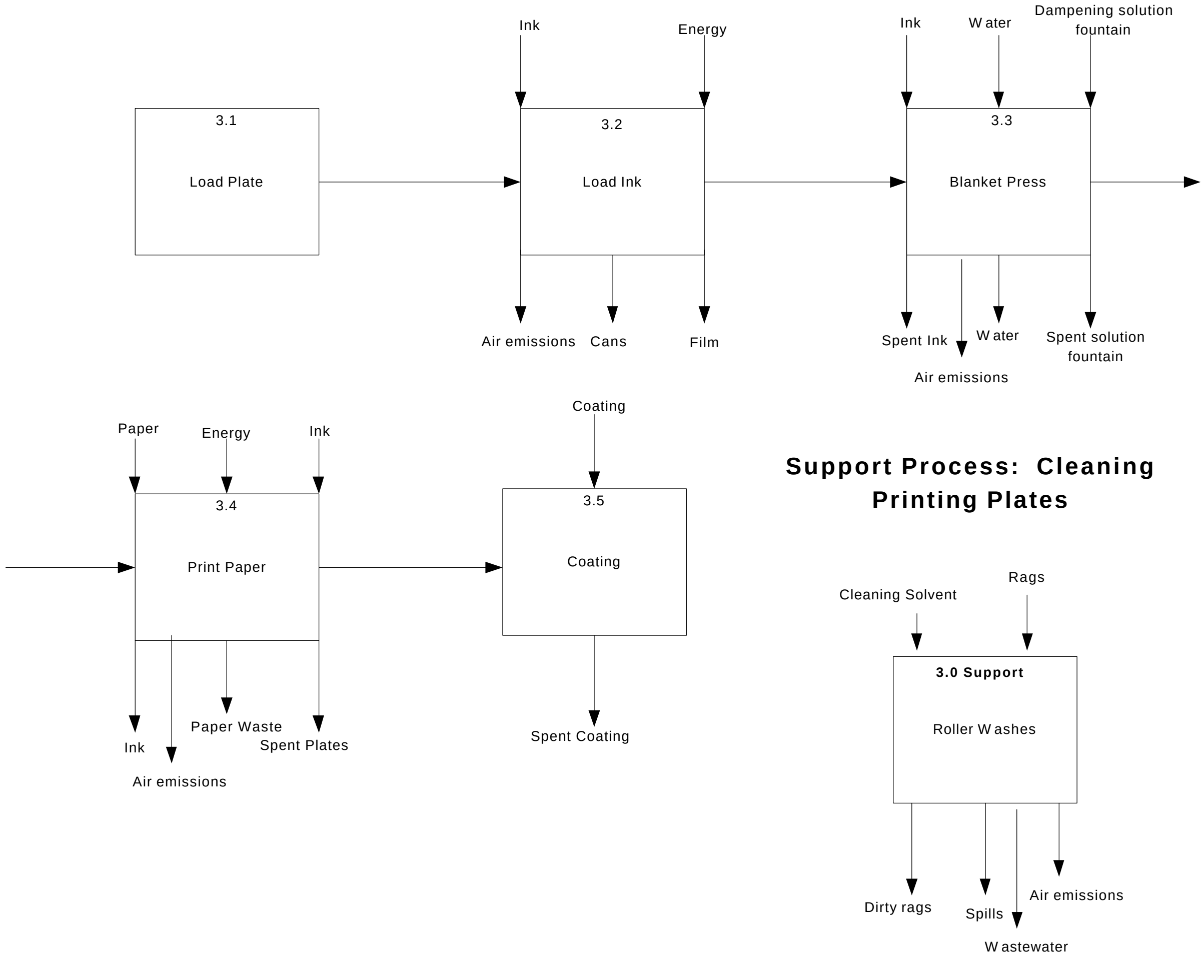


Figure 2: Sample of brainwriting

1. Use non-toxic solvent to eliminate all environmental problems.	2. Train people to maintain filtration system better.
3. Employees could use a centrifuge to remove liquid solvent from rags before sending off for cleaning.	4. Investigate alternative printing systems.
5. Start a "clean shop" program to train employees to keep work areas clean to prevent spills and waste.	6. Begin an employee incentive program to reward best operating practices for operating printing machine and reduce loss from rejects and excessive solvent use.
7. Start an energy conservation program and focus on presses.	8. Institute a program to use less solvent in all cleaning operations…less solvent on the rags to clean, less solvent in the fountain solutions.
9. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.	10. Test solvent to see if we are replacing too soon.

Figure 3: List of alternatives

1. Use non-toxic solvent to eliminate all environmental problems.
2. Train people to maintain filtration systems better.
3. Purchase a centrifuge system to remove liquid solvent from rags before sent off for laundry.
4. Investigate alternative printing systems.
5. Start a “clean shop” program to train employees to keep work areas clean to prevent spills and waste.
6. Begin an employee incentive program to reward best operating practices for operating presses to eliminate rejects and reduce solvent use.
7. Start an energy conservation program and focus on presses.
8. Institute an employee program to use less solvent in all areas…less on rags, less for cleaning, less in operations.
9. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.
10. Test solvent to see if we are replacing too soon.

Figure 4: Brainwriting Sheet

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

Tool #5: Bubble Up-Bubble Down

You have now generated a list of alternatives for preventing an environmental loss in your business. But how do you choose the best alternative? This tutorial presents one method of prioritizing alternatives to ensure that the most appropriate alternative is selected.

Warm-up Exercise

Most of us use lists from time to time to make sure that we don't forget to do the things that we need to get done. Without a shopping list, for example, we may return from the store without milk, the reason why we went in the first place. Certain limitations, like time or money, may cause us to drop things off our list. We often need to prioritize and make sure that the most important things get done.

Make a list of the things that you need to get done tomorrow (try to list at least ten things). List these items in the order that they come to mind. Now prioritize this list by putting the most important items on the top of the list and the least important items on the bottom. You should now have a "rank ordered" list. If you only have time to complete one of the items on your list, which would it be? You should have answered the item on the top of the list the most important item.

Introduction

A comprehensive list of pollution prevention alternatives was developed in the last tool using a technique called brainwriting. The alternatives generated during this tutorial can range from operational changes, such as employee training and improvements in operations, to technology changes, such as changing a solvent. The next step is to choose one alternative that is capable of being worked with successfully. Additionally, it is important to select the optimal solution for your business. To accomplish this, you must consider the *feasibility* of each alternative. Such factors as effectiveness, implementability, cost, and potential ramifications of each alternative should be discussed. Personal preferences and biased information should not enter into the decision-making process.

There are several tools available to aid a group in selecting an alternative and avoid bias. These tools allow a group to rank and prioritize alternatives using a systematic approach. When all the alternatives are listed, suggestions are made by the group to improve even the worst alternatives. At this point, many of the alternatives may be eliminated: every realistic alternative remains on the list. These remaining alternatives can then be sorted based on the factors presented above and any other factors that may effect a particular business. The method of selection presented in the exercise is the bubble-up-bubble-down. This tool uses a forced pair comparison to rank alternatives. Using this method you will be able to find the most effective solution to the selected loss.

During this exercise you will:

- Evaluate all alternatives.
- Use the bubble-up-bubble-down method to reach a decision on the best alternative.

Bubble-Up, Bubble-Down

Take the list of alternatives and compare the first two alternatives. Decide which of the two is the best and move this alternative to the top of the list. Go to the next, or third alternative and compare it to the second. If it is better than the second, move it up and compare it to the first, if not, leave it in the third position. Continue this process until all the alternatives are rank ordered. This process should go fairly quickly. Make sure you listen to everyone's opinions and objections. Again, factors to consider are cost, effectiveness and the ability to implement the alternative.

Bubble-up, Bubble-down should generate much discussion among employees on the best solutions. These discussions will help to increase buy-in to the alternatives. As a rule, employees never resist their own ideas.

An example of how the Bubble-Up Bubble-Down method was applied to the list of alternatives generated in the last tool are listed below.

Typically, the three or four alternatives that "bubbled-up" to the top of the list are the easiest and cheapest to implement, the "low-hanging fruit". The alternatives in the middle may require more research or study to see if they are feasible. The ideas at the bottom of the list may require major equipment changes or capital investments. It is important to keep the entire list on file as part of your continuous environmental improvement program.

The next step is to develop an action plan. Action planning is essential to assure that ideas are implemented!

Figure 2: List of alternatives, prioritized through Bubble-Up, Bubble-Down

1. Begin an employee incentive program to reward best operating practices for operating presses to eliminate rejects and reduce solvent use.
2. Start a "clean shop" program to train employees to keep work areas clean to prevent spills and waste.
3. Institute an employee program to use less solvent in all areas…less on rags, less for cleaning, less in operations.
4. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.
5. Purchase a centrifuge system to remove liquid solvent from rags before sent off for laundry.
6. Train people to maintain filtration systems better.
7. Start an energy conservation program and focus on presses.
8. Use non-toxic solvent to eliminate all environmental problems.
9. Investigate alternative printing systems.
10. Test solvent to see if we are replacing too soon.

Tool #6: Action Planning

Being able to successfully manage a project is important when trying to accomplish a task, especially when you are under a deadline. You need to set up a schedule, ensure that you have the necessary resources, and assign the right person to each part of the job. In this tutorial you will create an "action plan" for the implementation of an alternative to prevent pollution.

Warm-up Exercise

Your group has been assigned the task of making chocolate chip cookies. The cookies need to be ready in one hour and the cooking time is twelve minutes. Pick a person to manage this project. The manager must then assign the ten tasks listed below to individuals in the group.

You will need to know how much time is required for each task, what tasks need to be accomplished before others, what resources (i.e. bowls, flour etc.) are required, and what the most efficient way of organizing these tasks (and remember the clock is ticking). Create a schedule.

Making chocolate-chip cookies:

Mix dry ingredients
Mix wet ingredients
Put the batter on the pan and put pan into the oven
Combining wet and dry ingredients
Turn on the oven
Taste cookies
Wash tools and utensils
Grease pan
Take cookies out of the oven

Developing an Action Plan

Before you begin to implement your alternative you should complete this questionnaire. It will ensure that you are being thorough in your planning and have considered all the important issues that may arise such as the resources that are needed and the problems that may occur. *(see Figure 2)*

Things to consider in developing an action plan are resources needed, both financial and human resources; the need for pilot testing or bench scale testing; information sources from he outside such as trade associations, vendors and suppliers and the Environment Department. Other issues such as employee support and maintaining product or service quality should be considered. A list of questions that should be considered during action planning is as follows:

Action Planning Questionnaire

1. What is the overall objective and ideal situation?
2. What steps are needed to get there from here?
3. What actions need to be done?
4. Who will be responsible for each action?
5. What is the best sequence of action?
6. How long will each step take and when should it be done?
7. How can we be sure that earlier steps will be done in time for later steps that depend on them?
8. What training is required to ensure that all staff have sufficient know-how to execute each step in the plan?
9. What standards do you want to set?
10. What volume or quality is desirable?
11. What resources are needed and how will you get them?
12. How will you measure results?
13. How will you follow up each step and who will do it?
14. What checkpoints and milestones should be established?
15. What are the make/break vital steps and how can you ensure they succeed?
16. What could go wrong and how will you get around it?
17. Who will this plan affect and how will it affect them?
18. How can the plan be adjusted without jeopardizing its results for the best response and impact?
19. How will you communicate the plant to generate support?

Now put all this information in an Action Plan Form. Most of the information you need should come from your answers to the questionnaire. The specific task, or step, to be accomplished is written in the first column under “Action.” In the following column list the person who is responsible for completing this task. A performance standard should then be provided. This standard is a way of establishing how well a task needs to be performed.

Under “monitoring technique” enter a measurable goal or target used to track the plan’s implementation. A firm deadline should then be set, and finally, indicate the resources that are needed to perform each task. This form will help you organize your thoughts, keep track of all the actions that need to be completed, and ensure that the proper quality is being maintained.

Use the form provided to track implementation of the project and to measure its success. A sample action planning form is included at the end of this section.

Overall Target: Employee Incentive Program					
Action	Responsible person	Performance standard	Monitoring technique	Completion deadline	Resources needed
1.Develop Program incentives	Carol	List of incentives	Discuss ideas with Marge the owner	Jan 15	Team of Carol and Mark
2.Design a program for review and giving incentives	Marcy	Approved program by Marge	Marge approves, allocates funding.	Feb 1	Action #1 complete
3. Meet with employees	Carol, Mark and Marge	Highly interactive meeting	Question employees before and after	Feb 15	Firm date for meeting; meeting room
4. Set up improvement/suggestion box, system	Carol	System in place, all employees are aware, easy to use	Number of ideas submitted	March 1	Box, access to company computer, review team
5. Review Team	Carol and Mark	Review team reviews suggestions monthly	Marge evaluates work	March 7	Ideas accepted/implemented
6. Incentives awarded	Marge	Ideas implemented, paying off in $$, improvements	Check on progress, success	June1	Cash bonuses, days off, etc

Congratulations!!! You have completed the Pollution Prevention Training. Now it is time to put these tools to work and remember pollution prevention is an ongoing process. If you continue to implement pollution prevention in your business, you will increase the efficiency of your process while helping the environment. Simply revisiting your process maps and Pareto Chart once a year and using the tools to continue to make improvements will make a big difference in your operation. Ongoing use of these tools will help you to participate in the Green Zia Environmental Excellence Program.

Here are a few suggestions to make pollution prevention continue to work for you:

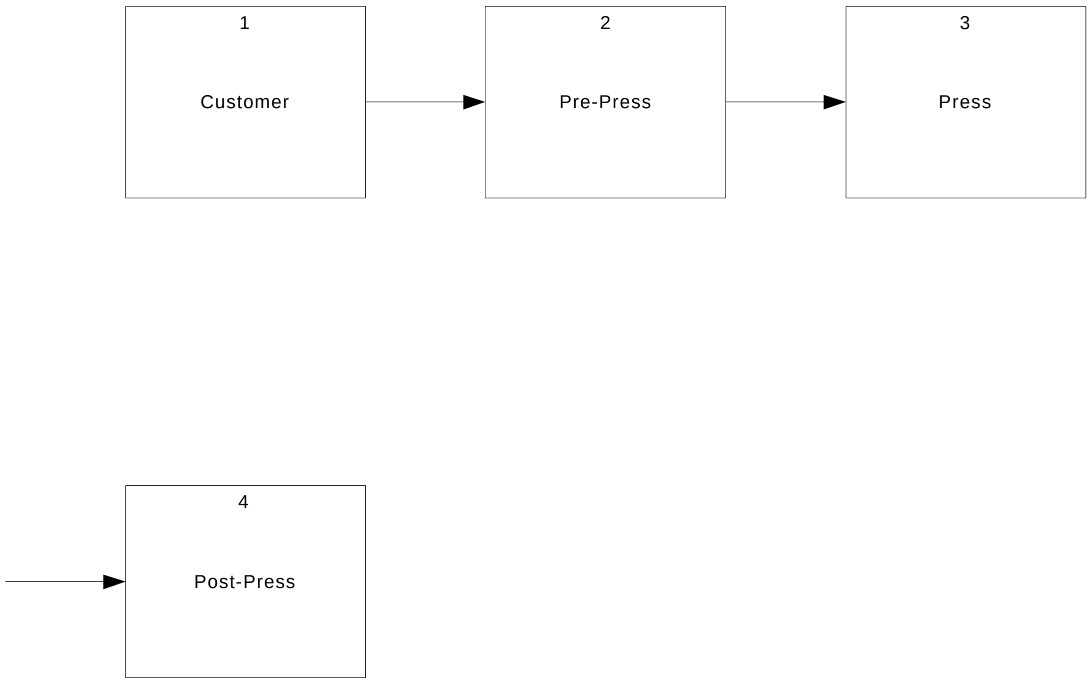
- Return to the Nothing to Waste activities and concepts as you make environmental improvement decisions.
- Schedule regular pollution prevention reviews of your business.

Remember: Pollution Prevention saves resources, saves money, and prevents accidents!

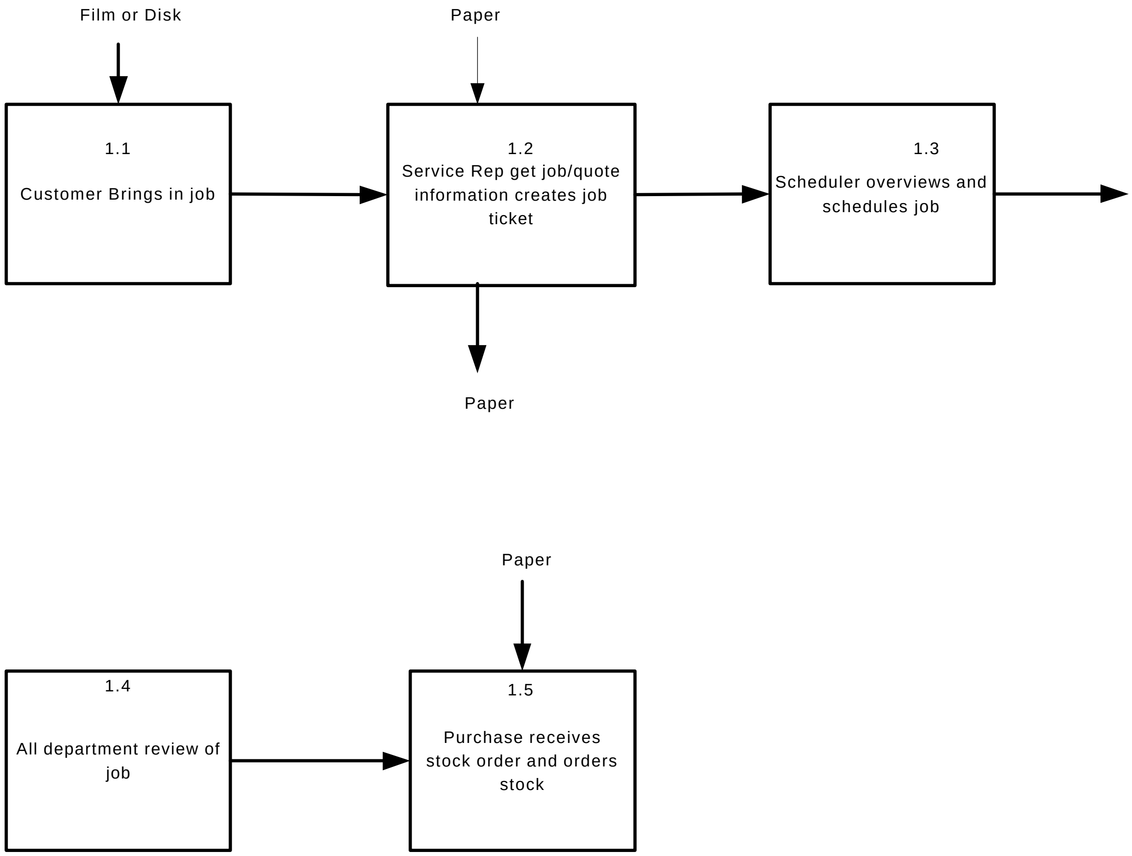
Overall Target					
Action	Responsible person	Performance Standard	Monitoring Technique	Completion Deadline	Resources Needed
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Process Maps for Printing

General Process Map for Lithography Printing



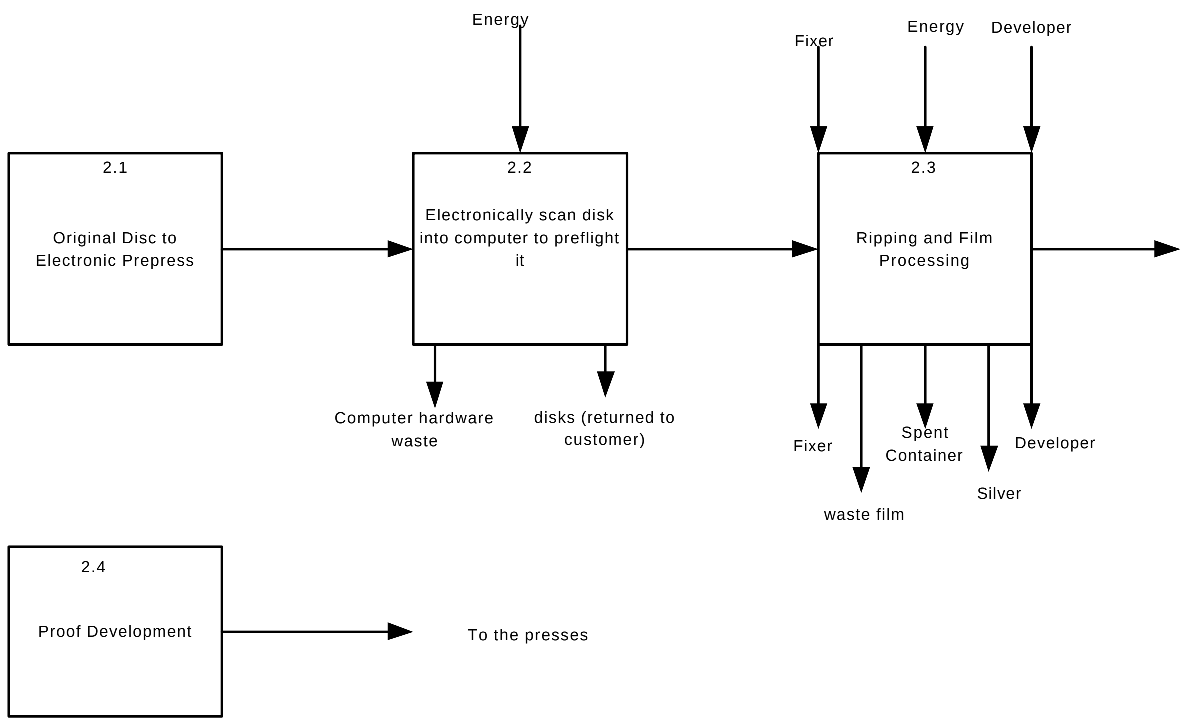
Map 1.0: Process Map for Customer



Customer 1.0

1.1 Customer Brings in Job
The customer brings the job to the printing company on disc or film. The customer has the design already finished and wants the design printed at the printing company.
1.2 Service Representative gets Job
The service representative gets the job and quotes information about that job. He/she also creates the job ticket for that job.
1.3 Scheduler Overviews and Schedules Job
The scheduler gets the job, overviews it, and schedules the job. This includes scheduling the stock order for the necessary supplies to do the job. If the job requires outside work, such as binding, envelopes, cutting thick paper, etc., the scheduler will schedule contractors to do this after the job is printed.
1.4 Purchase department Receives Stock Order
During this process, the purchase department receives the stock order and orders the stock. Paper choices include virgin paper, recycled paper, chlorine-free paper and kenaf.
1.5 All-Department Review of the Job
The department reviews the job to decide if there are any problems with the job and if the supplies are ready to go.

Process Map 2.0A: Pre-Press



<u>Pre-Press 2.0</u>

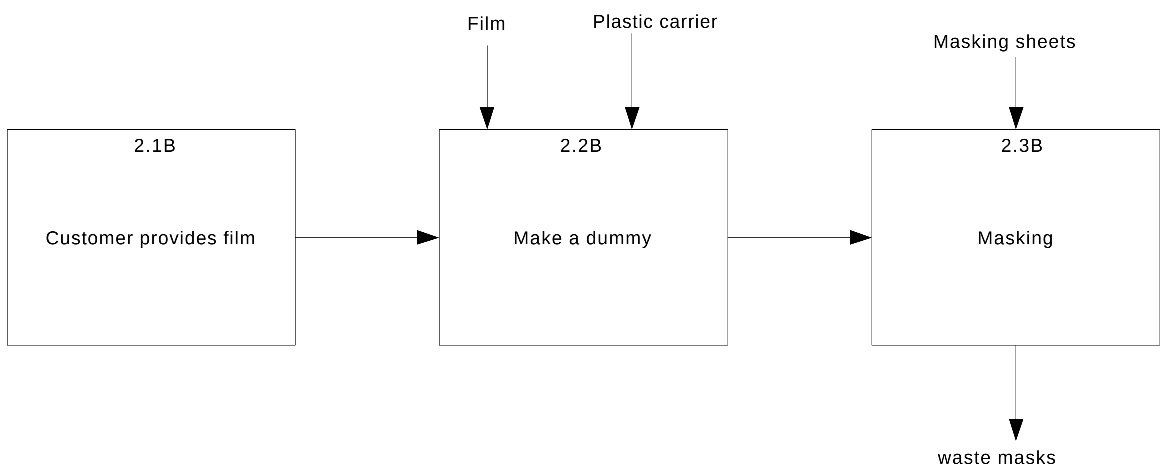
2.1 Original Disc is Taken to Electronic Pre-Press
The original design is taken into the computer run to be electronically examined.

2.2 Electronically Scan Disc
The disc is pre-flighted (make sure format is correct and there is no viruses).

2.3 Computer File Taken to Sci-tex Machine
The computer file is taken to the Sci-tex Machine to print out file onto film. While the machine prints the file onto film fixer and developer removes the silver from the film. This step creates fixer, developer, and spent containers.

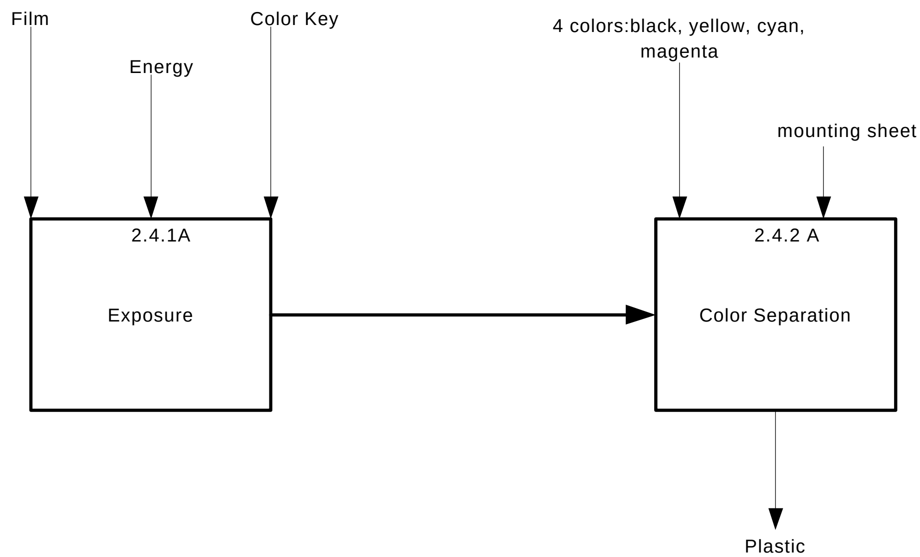
2.4 Water Proof Film
Film is put on a transfer sheet and water proofed so the customer can see the design before it is plated.

Process Map 2.0B: Traditional Prepress



No narrative prepared for this process.

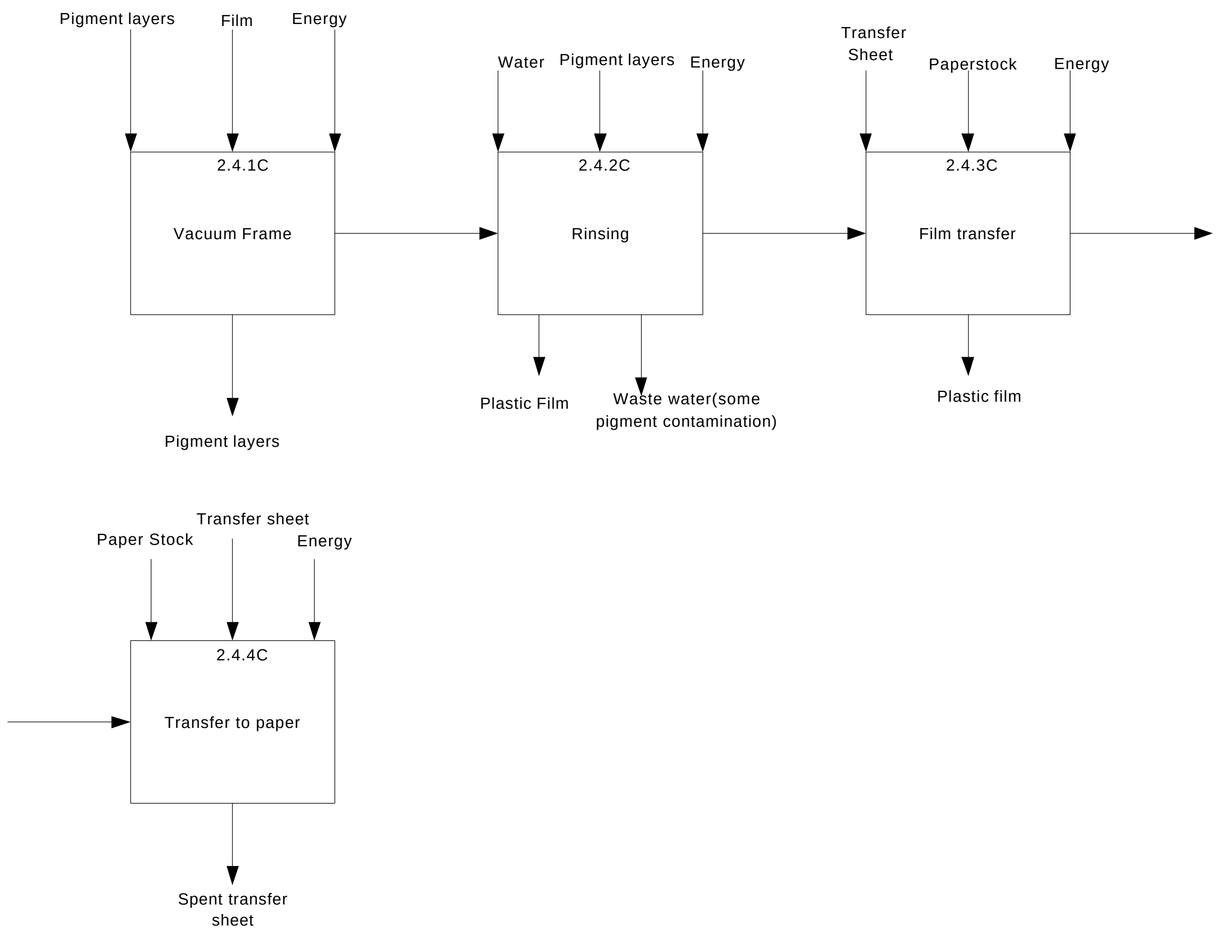
Process Map 2.4.1A: Color Key Process for Proofing



Process Map 2.4.1B: Blue Line

No narratives prepared for these processes.

Process Map 2.4 C: Water Proofing



<u>2.4 C Water Proof Development</u>

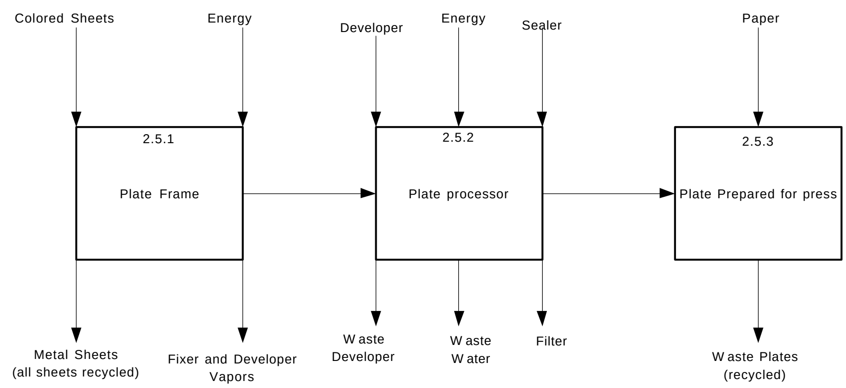
2.4.1C Film to Vacuum Compressor
The film goes through a vacuum compressor that will put the image onto colored sheets. This set requires the usage of colored sheets, vacuum oil and energy. The waste created in this step is colored sheets, spent vacuum oil, and fixer and developer vapors.

2.4.2C Water Proofing Machine
The colored sheet is put through a waterproofing machine that will separate the colors by water and create the actual image onto the sheet. This process requires the usage of water and energy and generates water waste.

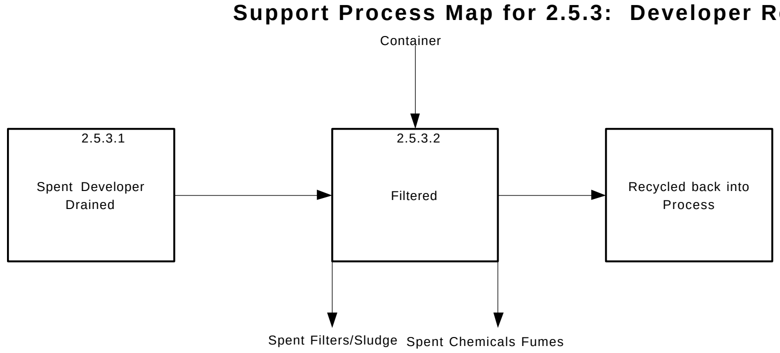
2.4.3 Transfer image to transfer Sheet
The water proofing machine transfers the image onto an adhesive transfer sheet. This process uses energy and generates adhesive transfer sheet waste. The sheets may be recycled.

2.4.4C Transfer Sheet Given to Customer
The transfer sheet has the desired image and is given to the customer for approval. If the customer approves, the image will be redone onto a plate. If the customer wants edits done to the image, the image will be edited and once again placed onto a transfer sheet.

Process Map 2.5: Prepress Plate Making



Support Process Map for 2.5.3: Developer Reclamation



Narratives on next page.

2.5.0 Plate Making

2.5.1 Film Taken to Vacuum Compressor
The film is taken to a vacuum compressor that will place the image onto a transfer metal sheet. Material use includes colored sheets and energy. Losses include metal sheets (although it may be recycled) and fumes from fixer and developer.

2.5.2 Plate Processing
The plate moves through the plate processor. The plate processor removes photo polymer by spraying developer on the plate. The plate is then scrubbed to remove the remaining photo polymer. The plate is coated with a thin layer of plastic. Material use includes developer, energy and coating plastic. Losses include spent developer, waste polymer, energy and plastic.

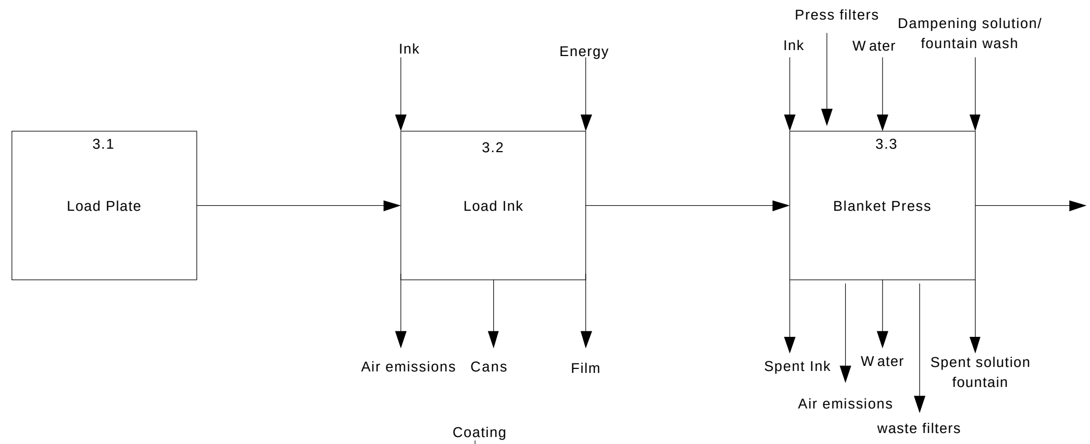
2.5.3 Image on Plate
The finished result is the image is now on the plate and ready to be printed. This step generates spent plate waste (may be recycled).

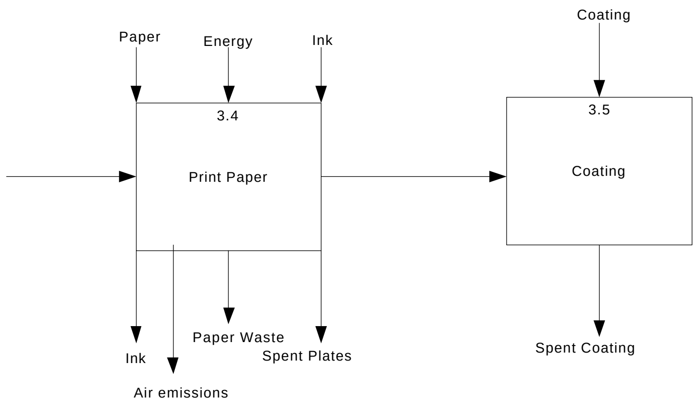
Support Process for 2.5.3: Developer Reclamation

2.3.5.1 Developer Reclamation Unit
The spent developer is reclaimed through a reclamation unit, which is a filtration unit. Filtered developer is recycled back into process.

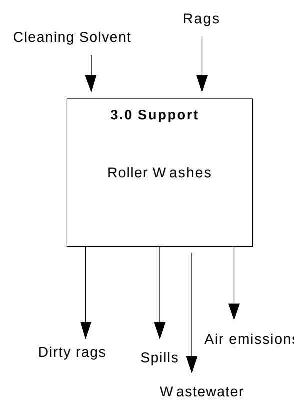
2.5.3.2 Chemicals to Waste Hauler
The waste materials from the reclamation unit are barreled and managed by a certified waste hauler.

Process Map 3.0: Printing Press Process





Support Process: Cleaning Printing Plates



<u>Process Map 3.0: Press Operations</u>

3.1 Load Plate

The plate is placed into the blanket rollers of the press.

3.2 Load Ink

This step requires the usage of ink, solvents to thin ink, Polyamide Resin, metal foil and energy. Losses include solvent vapors, ink, Polyamide Resin, and metal foil.

3.3 Blanket Press

The blanket rollers place the ink onto the plate. This process uses ink and dampening fountain solution. The waste generated includes spent ink and fountain solution. Fountain solution is discharged to sewer if it is non-hazardous waste.

3.4 Print

This step is where the color image is printed onto large sheet of paper. Once printed, the finished pile is taken to the back for folding and cutting. This step uses paper, energy and ink. The waste create include ink, paper waste, and spent plates. All paper, ink and plates may be recycled.

3.5 Apply Coating

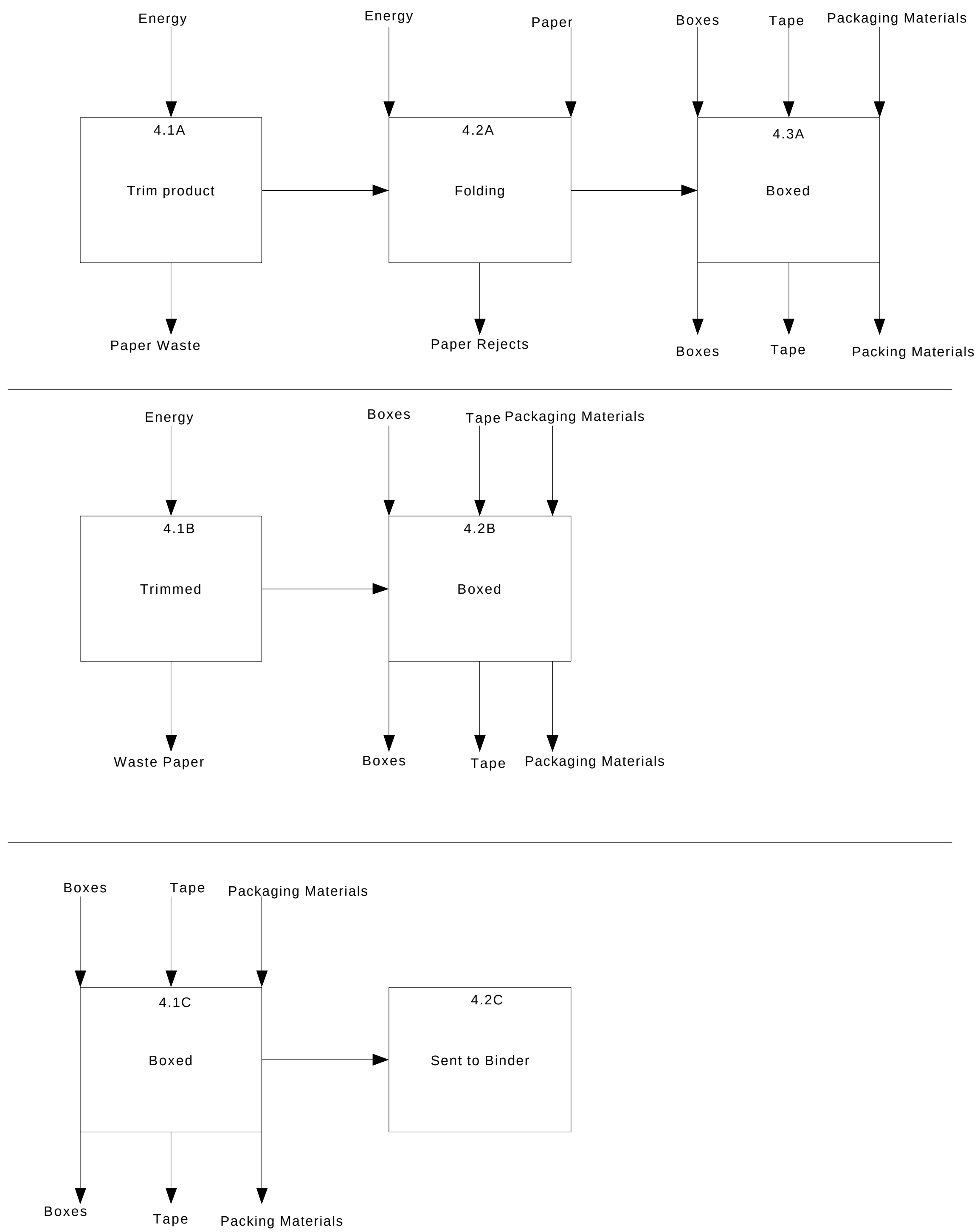
A final coating is applied upon request from the customer. Waste coating is generated through this process.

<u>Support Process 3.0 for Press Operation</u>

3.0 Roller Washes

Rollers require washing to remove ink. Solvent is typically used to clean rollers. Losses include red rags soaked in solvent, solvent vapors, spill clean-up materials. Fountain solution is discharged to sewer if it is not hazardous.

Process Map 4.0: Post-Press Operations



<u>Process Map 4.0: Post-Press Operations</u>

4.1 Product Folded

The product is trimmed and then a folding machine folds the finished product. All waste paper may be recycled. Process also uses energy.

4.2 Product Cutting

Paper is cut to size depending on job specifications. This step requires energy to run the machine. Paper waste is created in this step and may be recycled.

4.3 Finished Process is Boxed and Shipped

The finished product is boxed and shipped to either the customer or to a bindery company for binding, and cutting. This process requires the usage of boxes, tape, and packaging materials. This step generates boxes, tape, and packaging material waste.

Printing Regulatory Guidance, Pollution Prevention Information and other Resources

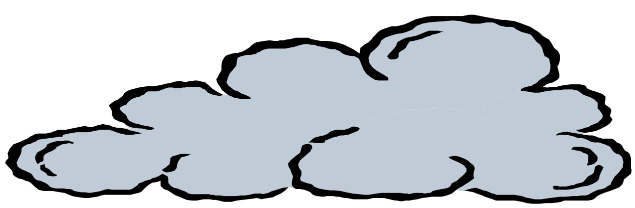
Understanding Solvents: Common Uses and Chemical Composition

Eliminate - Reduce - Reuse - Recycle - Exchange

Solvents are used to create a fluid environment in which reactions or processes can be run efficiently and effectively. Solvents influence pH and temperature factors that affect the binding mechanisms of soiling agents. The following paragraphs are intended to serve as an introduction to the **chemical composition**, **general activity mechanisms**, and **common uses** of various types of solvents.

Petroleum-Based

This group refers to a class of solvents that are used as **general-purpose cleaners**. Most petroleum-based solvents consist of a hydrocarbon "backbone" to which chemical functional groups and oxygen groups have been added. In these solvents, the inorganic functional groups are responsible for the activity of the solvent. The exception to this rule is a subclass of petroleum-based solvents called aromatic and aliphatic hydrocarbon solvents, which contain multiple bond arrangements and/or are bonded into ring confirmations. In these solvents, it is the carbon confirmation and arrangement of double and triple bonds between neighboring carbon atoms that give the solvent its activity.



Industry has chosen the petroleum-based solvents with low molecular weight, which have **high volatility**. The high volatility and reactivity of these solvents allows **maximum removal of soils** and contaminants, creating compatibility with varied work surfaces and subsequent process requirements while simplifying process and technique, thereby **minimizing costs**. Furthermore, because many soiling agents are organic compounds, ex.) grease, motor oil, waxes, and most lubricants, they are miscible in organic petroleum-based solvents, allowing for **quicker, more effective clean up**.

Due to their **high volatility**, total containment of petroleum-based solvents during application and waste storage is nearly impossible. The **atmospheric escape** of these solvents, many of which are classified as Volatile Organic Compounds (VOC's), has been shown to contribute to **stratospheric ozone depletion, air pollution through smog formation, and soil and groundwater contamination**.

Types of Petroleum-Based Solvents:

Halogenated petroleum-based solvents:

These solvents consist of the **highly reactive** functional groups chlorine, fluorine, or bromine. These halogens share the same number of electrons available to participate in chemical reactions. For this reason, the chemical reactivity of these solvents is less dependent on which halogen atom comprises a functional group than on how many functional groups are attached to the hydrocarbon "backbone," a number referred to as the **degree of halogenation**. A solvent with a high degree of halogenation has a **high volatility** and **strong cleaning properties**.

Higher energy levels in the bonds make the molecule more reactive, which can cause it to escape from the liquid phase into the gas phase and enter the atmosphere. The popularity of halogenated solvents arose from their **superior contaminant** and **soil expulsion properties**, **low flammability**, **compatibility with work surfaces** and process equipment, and **relatively low cost**.

Alternatives that Reduce Risk:

Though it is often advisable to seek non-halogenated alternative solvents because halogenated compounds are hazardous to human and environmental health, several new halogenated alternatives have been developed with short atmospheric lifetimes.

- **n-Propyl Bromide:**
  Many commercial "green" solvents have replaced their chlorinated solvents with n-butyl bromide because it is a nonflammable VOC with a 10-11 day atmospheric lifetime, giving it a **low Ozone Depletion Potential**. However, despite a low bio-accumulation potential, n-butyl bromide solvents are **non-biodegradable**, and in large volumes have the potential to penetrate soil and **contaminate groundwater**. Furthermore, they may **harm** some work surfaces, especially aluminum surfaces.

High-volatility oxygenated solvents:

In these solvents, the halogen functional group is replaced by an oxygen group such as a hydroxide group, such as alcohols; an ethyl group, such as ethers and esters; or a carbonyl group, such as ketones, aldehydes, and carboxylic acids. The hydroxide group has a similar chemistry to the halogen groups with one important exception: most of the oxygenated solvents are **highly flammable** and therefore **restricted** to applications such as ambient temperature immersion and manual wipe.

Oxygenated solvents are also prone to undergo reduction/oxidization (redox) reactions, which is the addition or elimination of double bonds or oxygen atoms. Although redox reactions in these solvents rarely result in more **toxic compounds**, the resulting solvent is **less effective** and **more flammable** under atmospheric conditions. For this reason, a warning not to mix with oxidizing agents often accompanies the oxygenated and aromatic and aliphatic hydrocarbon solvents.

Alternatives that Reduce Risk:

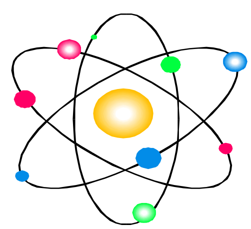
- **Acetone:**
  Excluded from the U.S. EPA's definition of VOC's due to its insignificant reactivity in the presence of sunlight, Acetone is a nonetheless a **highly volatile organic solvent**. Acetone is suitable as a drying agent and for ambient immersion or manual cleaning applications of soils such as greases, waxes, and inks. Due to its **high flammability**, safety cautions must be implemented during handling as well as during recycling. Although Acetone need not be reported under SARA 113, it is on the RCRA list of **hazardous wastes**, and must be **incinerated** for disposal.

- **Alcohols (with perflourocarbons):**
  Alcohols, mainly isopropanol, methanol, and ethanol, are excellent cleaning solvents for certain soils. The hydroxide functional group allows the alcohol to exhibit some of the same properties as water, while the hydrocarbon "backbone" allows the alcohol to dissolve low-molecular-weight oils. Alcohol solvents are often **biodegradable and water-soluble**. Alcohols are also **flammable VOC's and** as a result can only be used directly in manual and cold immersion applications, although their greatest efficacy occurs in heated or boiling liquid applications.

  This obstacle can be overcome by placing a perfluorocarbon vapor "blanket" above the heated cleaning system. This vapor "blanket" shields the solvent from atmospheric oxygen that causes combustion. Perfluorocarbons are **nonflammable** and have **low toxicity**, but are **costly** and have **high global warming potential**. Though they are immiscible in alcohol and easily separable and reusable, the capital and operational costs of perfluorocarbon systems are fairly high and prohibitive when other methods are available. Perfluorocarbons, which can be employed as solvents alone, have greatest potential in cleaning equipment that uses fluorinated lubricants or polymeric and elastomeric materials that are easily corroded by other solvents.

- **Glycol Ethers/ Ethyl Lactate:**

  Because glycol ethers **emulsify well and separate easily**, they are prime candidates for the organic components of semi-aqueous solvents. They are also being substituted for both harmful halogenated hydrocarbon and high-volatility oxygenated solvents in capacities ranging from **dry cleaning to degreasing**. Often azeotropic blends and additives such as isoparaffinic hydrocarbons are supplemented in to increase the solvent's efficacy rating, work surface compatibility, and/ or decrease the solvents flammability. However, glycol ethers are **highly flammable VOC's**.



  Commercially important glycol ethers have been separated into **two categories**: the E-series, or ethylene glycol ethers, and P-series, or propylene glycol ethers. Because they have been linked to **miscarriages**, SARA 113 and OSHA heavily regulate the E-series. Due to these concerns, alternatives are being researched.

- **n- Methylpyrrolidone (NMP):**

  NMP is a **combustible VOC** listed under the SARA 113 Title III. Despite this listing, NMP is **very useful** in removing high-molecular-weight greases and carbon deposits as well as coatings (polyurethane, ink, and resin), enamels, and many plastics. It can be employed in both immersion and ultrasonic processes. Since many oils are only soluble in NMP above 145 F°, oil soils can be easily separated and the **solvent reclaimed** by lowering the solvent temperature. Furthermore, NMP is **biodegradable** and can also be reclaimed through separation and subsequent vacuum distillation.

Aromatic and aliphatic hydrocarbon solvents:

These solvents are also referred to as unsaturated hydrocarbons. Due to their flammability concerns and redox potential, aromatic and aliphatic hydrocarbon solvents share the advantages and disadvantages of the oxygenated solvents.

Alternatives that Reduce Risk

- **Terpenes:**

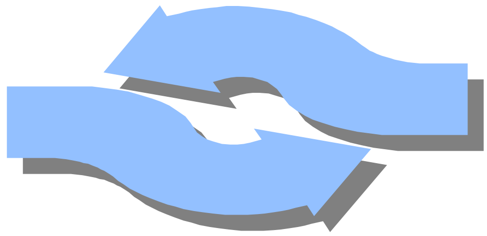
  Derived from natural sources such as citrus fruit and pine trees, terpenes are **biodegradable** and are **useful** in semi-aqueous solutions (from which they can often be **separated and reused**). Terpenes are **flammable VOC's** and very **strong cleaners**, removing resin, fingerprints, and high-molecular-weight greases. They can be used in ambient immersion and ultrasonic applications, though they may be too strong for some work surfaces.

- **Petroleum Distillates:**

  Produced from crude oil cracking, petroleum distillates are also **flammable VOC's** used to remove high-molecular-weight greases, tar, and waxes in immersion or manual applications. This class of solvents includes mineral and white spirits, naphtha, kerosene, and Stoddard solvent, which **vary in cost and toxicity**. Petroleum distillates are able to penetrate and clean porous surfaces, and **evaporative losses can be minimized** through the use of a parraffinic hydrocarbon additive. Furthermore, they can serve in some semi-aqueous solutions, from which they can be **easily reclaimed** through separation or distillation techniques.

Aqueous Solvents

Aqueous solvents are a category consisting mainly of **water and dissolved inorganic water soluble components** such as surfactants, chelating agents, emulsifiers, sequestering agents, and corrosion inhibitors. Water is a polar compound, meaning that a portion of the water molecule, the oxygen atom, has a greater affinity for the



molecule's bonding electrons, and hence has a slight negative charge. As a result, the remaining portions of the molecule, the hydrogen atoms, have a slight positive charge. Due to this charge separation within their constituent molecules, aqueous solvents are held together by intermolecular forces in which the negatively charged oxygen atom of one water molecule creates a weak bond to the positively charged hydrogen atom of another water molecule. These intermolecular attractions, referred to as hydrogen bonding, in conjunction with its basicity/ acidity allow the **solvent to "attack" any soil** that contains charged portions.

Aqueous solvents are generally **superior to organic solvent methods**. Due to the **benign nature of water**, aqueous solvents are **less hazardous to both human and environmental health** than their organic counterparts. Aqueous solvents are **often corrosive or harmful** to work surfaces, and are often **ineffective** with porous surfaces or soils. Furthermore, due to their immiscibility with organic contaminants, aqueous solvents must be **repeatedly applied** to common organic soiling agents to achieve effective removal. Often the process requires high pressure or ultrasonic technology. Therefore, in weighing the environmental factors involved in replacing organic solvents with aqueous solvents, the **increased volume of wastewater** streams must be considered. When utilizing aqueous solvents, it is tempting to dispose of the waste solution down the drain; however, the **local water authorities** should always be consulted about proper waste disposal.

Types of Aqueous Solvents:

Alkaline aqueous solvents:

Alkaline aqueous solvents have a pH greater than 7. Adding base to an aqueous solution creates an alkaline solvent, which contains negatively charged ions. These negatively charged particles disrupt the polar bonds binding the contaminants to the work surface, as well as obstruct the intermolecular bonds holding the contaminant together, thereby **dissolving the contaminant**. Due to the **corrosive** nature of these ions, inhibitors must be added to protect metallic work surfaces, especially aluminum surfaces. With the right additives and process optimization, alkaline solvents can be utilized with all types of liquid cleansing processes. With thorough **filtration and rinsing**, very high levels of cleanliness can be achieved, although the process may become **water intensive**. Alkaline aqueous solvents are **widely applicable**, **low waste**, and **cost effective**.

Neutral Aqueous solvents:

Having a pH of approximately 7, neutral aqueous solvents are mixtures of water and above-mentioned process specific additives. **Weaker than alkaline solvents**, neutral solvents are **effective** at removing light oils, salts, particles, and soils that are easily removed. For these contaminants, the **dissolving properties** of hydrogen bonding are sufficient to break up and remove the soil. Due to their weaker activity, neutral solvents are **less widely applicable** and are most effective in spray and ultrasonic applications, especially in degreasing processes.

Acidic Aqueous solutions:

Acidic aqueous solutions have a pH less than 7 and may be comprised of mineral acids, chromic acids, or organic acids that are miscible in water due to their acidic properties. Acids have free floating positive charge, making them **excellent** at removing scale, rust, and oxidizing agents from metals. The positive portions of the acid surround and **dissolve** the aberrant negatively charged metal region. Some metal/ acid combinations cause hydrogen embrittlement on the surface of the metal. This can be significantly reduced or eliminated by changing acids or heat treating the metal before the cleansing treatment. Because acidic aqueous solvents are less adaptable to general cleaning processes, they are **less common** as cleaning solvents.

Semi-Aqueous

Two different types of semi-aqueous solvent procedures are commonly used. The first involves a solvent in which hydrocarbon/ surfactant cleaners are emulsified in water, meaning that the hydrocarbon/ surfactant exists as droplets suspended in the aqueous support. This arrangement combines the **more effective** contaminant dissolution and high-molecular-weight soil removal characteristics of petroleum-based solvents, with the **increased environmental safety** of aqueous methods.

The other semi-aqueous method entails an initial concentrated hydrocarbon application followed by an aqueous rinse cycle. Again, this method utilizes the **effectiveness of organic solvents** while **lessening the environmental impact** of the overall process by reducing the amount of organic solvent employed. The application techniques for both semi-aqueous methods are similar to those used in aqueous methods, though **flammability**, phase separation, and **odor problems** can arise with the mixing of the solvent types, making equipment design an important consideration.

Super Critical

Supercritical fluids are common gasses such as carbon dioxide under **extreme pressure** and **temperature**. Under these conditions, the fluid no longer exhibits the characteristics of a liquid or a gas, but rather has properties conducive to **high soil dissolution**. The high temperature of a critical fluid confers a high energy level to the individual molecules, which under atmospheric pressure would cause the molecules to increase molecular vibrations and velocity, causing the fluid to expand.

However, because critical fluids are also under high pressure, the high-energy molecules are not able to expand and must exist in a tightly packed, high-energy configuration. It is this dense, high-energy arrangement that gives critical fluids their high soil dissolution properties. This current technology combines application **flexibility** with **low cost**. However, it requires **large capital investment** to design and maintain a system capable of safely withstanding such high temperatures and pressures. **More testing** must be completed to understand the effects on sensitive work surfaces.

GENERAL REGULATORY GUIDANCE FOR NEW MEXICO SMALL BUSINESSES

The purpose of this document is to assist small businesses in New Mexico in trying to understand the environmental regulatory requirements associated with doing business. It is not intended to be a substitute for actual regulations. Businesses are responsible for operating in full compliance of the law (regulations). Each bureau in the New Mexico Environment Department (NMED) has staff available that can help in understanding what is expected of a business from a regulatory point of view.

The Pollution Prevention (P2) Program in NMED will periodically issue specific guidance materials as an attachment to this document for certain businesses. These will be designed to provide additional information to a specific business. For information call the NMED Pollution Prevention Program staff at 505-827-0677 or the Technical Resource Center in Albuquerque at 505-843-4251.

AIR EMISSION REGULATIONS:

The EPA, in an attempt to control air pollution through regulations, has created a set of rules with many acronyms. Since businesses can come across these acronyms in many publications, they are listed below:

NESHAP: National Emission Standards for Hazardous Air Pollutants
NAAQS: National Ambient Air Quality Standards
HAP: Hazardous Air Pollutants
TAP: Toxic Air Pollutants
OEL: Occupational Exposure Limits
VOC: Volatile Organic Compounds
MSDS: Material Safety Data Sheet
CTG: Control Techniques Guidelines
MACT: Maximum Achievable Control Technology
BACT: Best Available Control Technology
GACT: Generally Available Control Technology
RACT: Reasonably Available Control Technology

Much of the national strategy for controlling air pollution centers around the NAAQS. These standards set limits for the concentration in the ambient (outdoor) air of the six most common air pollutants: ozone, carbon monoxide, particulate matter, sulfur dioxide, nitrogen dioxide, and lead.

The EPA has established industry based regulatory requirements for the most serious air pollutants, such as HAPs. In many cases the EPA has also established Control Techniques Guidelines that require industries to use certain technologies, such as MACTs.

Any business that has the potential of releasing pollutants to the ambient (outdoor) air, such as VOCs, HAPs, or Criteria Pollutants, may be subject to the Air Quality Regulations depending on the amount of pollutants being released. These pollutants are used to determine if a facility is a major or minor source of air pollution and whether or not a business will need an Air Quality Permit. A major source is determined as a function of the amount of HAPs or Criteria Pollutants a business has the potential to emit. For HAPs it is 10 tons per year of any single HAP or 25 tons per year of the total HAPs. For the Criteria Pollutant it is 100 tons per year of any criteria pollutant. In addition, the State of New Mexico has added TAPs as a category to be regulated.

Some businesses that would normally be considered a major source can be classified as a minor source by changing the way that they conduct business. Businesses classified as a major source have significant regulatory requirements such as annual fees; maintaining progress reports, records, and a compliance schedule; monitoring emission limits as well as the possible requirement to have specific control technology installed (MACT, GACT, or RACT). All major sources are required to obtain a Title V Permit. It is generally desirable for a business not to be classified as a major source. An EPA document "Potential to Emit, A Guide for Small Businesses" (EPA-456/B-98-003) is available from the EPA and it may aid in understanding Air Quality Regulations.

The State of New Mexico, in addition to HAPs and Criteria Pollutants, has also generated regulations on Toxic Air Pollutants (TAPs) with OELs. These limit businesses from allowing TAPs to be emitted to the outside air around their building. OSHA regulates the same kinds of exposure limits inside of a building.

Due to the complexities of Air Quality Regulations, the harm air emissions cause to the environment, and in many cases the high costs associated with "end of the pipe" control technology, it is in the best interest of any business to evaluate operations with the ultimate goal of eliminating all air pollutants as much as possible.

The Air Quality Regulations that apply to you're the business will mostly be determined by what the business does. The best way to find out what air quality regulations apply is to contact the New Mexico Environment Department (NMED) Small Business Assistance Program (SBAP) at 1-800-810-7227. Businesses that are located in Bernalillo County are locally regulated with respect to air emissions. For assistance, call the City of Albuquerque/Bernalillo Air Quality Assistance Program (AQAP) at 505-768-1964.

HAZARDOUS WASTE REGULATIONS:

Any business that generates waste that is classified as "listed" or "characteristic" in RCRA must deal with this waste as outlined in the New Mexico Hazardous Waste Regulations. The EPA has generated a list of chemicals that are considered hazardous. They have also stated that certain materials that exhibit a hazardous characteristic (ignitibility, corrosivity, reactivity, or toxicity) should be considered hazardous. To determine which products contain hazardous material, contact either the EPA or the New Mexico Hazardous Waste Bureau. In some cases this information will be contained on the Material Safety Data Sheet (MSDS) that came with the product.

It is important to understand that any product that contains “listed” or “characteristic” material is only regulated by the hazardous waste regulations when it becomes a waste. Examples include: when the product is no longer to be used for its intended purpose and is to be gotten rid of, the shelf life of the product has expired, the product leaks from a piece of equipment, or the product is accidentally spilled. It is also important to note that any product to be discarded that contains one or more hazardous materials is also hazardous waste. Examples are: hazardous waste mixed with solid waste, rags to clean up spilled hazardous materials, or wastewater from a process that used a hazardous material.

All businesses that generate hazardous waste are classified based on the quantities of hazardous waste they generate monthly. The three classifications are:

1. Conditionally Exempt Small Quantity Generator (CESQG): generates less than 220 pounds or 100 kilograms of hazardous waste per month. A CESQG cannot accumulate more than 2,200 pounds or 1,000 kilograms of combined hazardous waste at any one time. Usually this amounts to about one-half of a 55-gallon drum. CESQG’s may dispose of their hazardous waste by mixing it with a solid waste, assuming there are no free liquids in the waste, and taking it to a permitted municipal solid waste (MSW) landfill. Please verify that the MSW landfill will accept the mixed waste.

2. Small Quantity Generator (SQG): generates between 220 pounds and 2,200 pounds or 100 kilograms and 1,000 kilograms of hazardous waste per month. No more than 13,200 pounds or 6,000 kilograms may be stored on site any longer than 180 days and must be disposed of at a facility permitted to recycle, treat, store, or dispose of hazardous waste.

3. Large Quantity Generator (LQG): generates more than 2,200 pounds or 1,000 kilograms of hazardous waste per month. Hazardous waste with no weight limit may be accumulated for no more than 90 days unless permitted by the State.

Each classification has different record keeping, manifesting, and reporting requirements. Since a business’ classification is based on a monthly generation, it is possible to move from one classification to another on a regular basis. All generators of hazardous waste are required to register with the Hazardous Waste Bureau and pay a generator fee based on the classification.

The Hazardous Waste Bureau has an established outreach program that can assist any business in determining their classification and the regulatory requirements that go with it. Contact the Bureau at 505-827-1511.

It is important for any business generating hazardous waste to understand that RCRA has established a “cradle to grave” responsibility for the generator of said waste. This means that if the hazardous waste the business generates contaminates soil, surface water, or ground water in any manner until it is properly disposed of, the business will be held responsible for the clean up of the contamination. The cost of clean up could be substantial. It is therefore imperative for any business to make sure that trained employees handle the hazardous material properly to avoid accidental spills, that the facility only uses permitted haulers, that the waste goes to a RCRA permitted facility, that the waste is properly stored, and that hazardous waste is never disposed of at the facility. It is also advisable to seal the floor of the facility if hazardous materials in a liquid form are used in the operation.

The best way for any business to avoid the costs of contamination clean up is to eliminate the use of hazardous materials in the operation. A complete understanding of how a business conducts its processes is required to determine the best way to eliminate or at least reduce the amount of hazardous waste being generated. A Pollution Prevention Program has been established at the New Mexico Environment Department to assist businesses in evaluating their processes. The number to call at NMED is 505-827-0677 or you can call the Technical Resource Center in Albuquerque at 505-843-4251.

The New Mexico Environment Department has a 24-hour emergency reporting number that can be called in case of an incident dealing with hazardous material. The number is 505-827-9329.

WASTEWATER REGULATIONS:

Any business that generates wastewater that contaminates surface water or ground water can be held responsible for the cost of clean up. If the contaminant is a RCRA “listed” or “characteristic” waste above the concentration value allowed, then the wastewater is by definition a hazardous waste and must be dealt with under New Mexico Hazardous Waste Regulations. Placing hazardous wastewater directly onto or into the ground is strictly prohibited. Since the cost of cleaning up either surface water or ground water can be substantial, it is in the best interest of any business to eliminate, minimize, and/or control its wastewater.

If non-hazardous wastewater is being discharged so that it can move directly or indirectly into ground water (e.g. septic system, dry sump, etc.), a business is required to file a “Notice of Intent to Discharge” with the New Mexico Ground Water Bureau in accordance with the NM Water Quality Act. The Bureau will then determine if the business requires a Discharge Permit. In some cases the business may be required to request a NPDES Permit from the EPA if the discharge is to surface water.

If non-hazardous wastewater is being placed into a sewerage system, a business is required to notify the local Publicly Owned Treatment Works (POTW) of the nature and concentrations of the contaminants in the wastewater. Attached is a listing of the New Mexico Publicly Owned Treatment Works. Wastewater that has been determined to be hazardous is prohibited from being placed in any sewerage system.

Business need to be aware that even though wastewater going into the sewerage systems is allowed by the POTW, this does not necessarily relieve the potential contamination liability. A good example is a leaking sewer pipe containing hazardous constituents below RCRA levels generated by your business. Over time the wastewater seeps into the ground water and the concentrations exceed State or Federal water quality standards. If the contamination source can be traced back to your business, you could be liable for the cost of clean up. Most businesses will find that the costs associated with proper handling of the wastewater are far cheaper than the cost of cleaning up ground water.

Another potential source of contamination is through the foundation of a building. If a business handles hazardous material as a regular part of doing business and a spill occurs that seeps through cracks in the floor, it will eventually reach ground water. This spill can be detected through monitoring of the ground water. Assuming that it can be traced back to your business, you could then be held responsible for the cost of clean up.

Any business that generates wastewater from sources other than lavatories, or cafeterias should evaluate ways in which the wastewater can be eliminated, reduced, recycled, reused, or handled in such a fashion that the risk of liability for contaminating surface water or ground water is virtually zero. This should include dealing with hazardous waste and all wastewater in a proper fashion, sealing cracks in floors, training of employees, and possible treatment of their wastewater before it leaves their premises.

If you have any questions you can contact the Ground Water Bureau at 505-827-2965 and the Surface Water Bureau at 505-827-0187.

OSHA REGULATIONS:

Every business is required to provide a safe and healthy working environment for its employees. The Occupational Health and Safety Bureau (OHSB) is responsible for making sure businesses are in compliance with OSHA regulations. OSHA regulates permissible exposure limits (PEL's) for employees exposed to certain air contaminants in the workplace. The Bureau conducts regular inspections of facilities and evaluates the establishment for safety and health compliance. The OSHB has a consulting program to assist facilities to be in compliance with OSHA regulations. The service is free of charge to New Mexico small businesses. Attached is a copy of "Frequently Asked Questions" about the program, a copy of "General Health & Safety Issues," as well as a poster to display at your facility. The OSHB can be contacted at 505-827-4230.

UNDERGROUND STORAGE TANK REGULATIONS:

Any business that stores a regulated substance in an underground storage tank that is not directly connected to some sort of processing operation may or may not be regulated by the Underground Storage Tank Bureau (USTB). If the substance is a hazardous waste, it is regulated under RCRA. Since there are a variety of circumstances whereby UST regulations have jurisdiction, it is best to contact the USTB directly for guidance. They can be contacted at 505-827-0188.

SOLID WASTE REGULATIONS:

The Solid Waste Bureau (SWB) deals primarily with regulating solid waste facilities (non-hazardous waste landfills, transfer stations, and recycling facilities) and illegal dumping. The only responsibility for a small business is to see that their non-hazardous waste is either sent to a recycler or to a permitted landfill by a registered solid waste hauler. For information, the SWB can be contacted at 505-827-0197.

SPECIFIC REGULATORY GUIDANCE FOR LITHOGRAPHIC PRINTERS

This briefing paper is intended to be attached to the “General Regulatory Guidance for New Mexico Small Businesses” to provide additional regulatory information specifically for “Lithographic Printers”. It is not intended to be a substitute for actual regulations. If you have questions concerning your regulatory responsibilities, you are encouraged to contact the appropriate bureau.

AIR EMISSION REGULATIONS:

To establish if your business is a major or minor source you will need to calculate the amount of ink, cleaning solvent, blanket wash solvent, and fountain solution you will use per year and their contribution to VOC and HAP emissions. This is best done in conjunction with the Small Business Assistance Program staff. They can be contacted at 1-800-810-7227 or the City of Albuquerque Air Quality Assistance Program at 505-768-1964 if your business is located in Bernalillo County.

HAZARDOUS WASTE REGULATIONS:

Attached to this briefing paper is a document entitled “Fact Sheet for Printers” that can assist you in being compliant with Hazardous Waste Regulations. Characteristic wastes unique to the printing industry are as follows:

- Ignitability: Chemical products such as blanket and roller washes, cleanup solvents, isopropyl alcohol, and inks. Contaminated shop towels being thrown out for disposal.
- Corrosivity: Plate and film processing chemicals, particularly etching chemicals. Acids, waste battery acid, and alkaline cleaners, depending on their pH.
- Reactivity: Waste Bleaches and oxidizers.
- Toxicity: Waste fixer, plate processing chemicals, ink, and cleanup solvents, and specific pesticides.

Many other chemicals are used that would contain “listed” constituents. Most of the “listed” wastes are in the “F” category, which are generally solvents. Typical examples are isopropyl alcohol, methanol, toluene, and trichloroethane, others are listed on the “Fact Sheet for Printers”. If in doubt, check with the Hazardous Waste Bureau.

WASTEWATER REGULATIONS:

The greatest potential problem is the silver in the films and fixer. Used fixer should either be sent to a recycler or treated on site by using a silver recovery system such as one with metallic replacement cartridges. Never discharge fixer to the sanitary sewer system without recovering silver and without permission from the Publicly Owned Treatment Works (POTW).

OSHA REGULATIONS:

Attached to this document is a checklist entitled “Printing Industry Health & Safety Checklist” that can assist you in being compliant with OSHA.

UNDERGROUND STORAGE TANK REGULATIONS:

There is nothing unique in the printing industry that isn’t already covered in the General Regulatory Guidelines.

SOLID WASTE REGULATIONS:

There is nothing unique in the printing industry that isn’t already covered in the General Regulatory Guidelines.

ADDITIONAL SOURCES OF INFORMATION:

An EPA document “Federal Environment Regulations Potentially Affecting the Commercial Printing Industry” (EPA744B-94-001) is available that can help you understand the federal regulations. Keep in mind that all state regulations are required to be at least as strict as the federal regulations. Some New Mexico state regulations, such as the Air Quality and Hazardous Waste Regulations, refer to the federal version in their implementation.

Pollution Prevention and Regulatory Compliance Contacts for New Mexico

STATE AGENCIES:

Green Zia Environmental Excellence Program

Pat Gallagher
NM Environment Department
Office of the Secretary
PO Box 26110
Santa Fe, NM 87502
505-827-0677
FAX: 505-827-2836
E-mail:
pat_Gallagher@nmenv.state.nm.us

Air Quality Bureau

Steve Dubyk
NM Environment Departrnent
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-2859
FAX: 505-827-0045
E-mail:
steve_dubyk@nmenv.state.nm.us

Hazardous Waste Bureau

Debby Brinkerhoff
NM Environment Department
2044 Galisteo
P.O. Box 26110
Santa Fe, NM 87502
505-827-1511
FAX: 505-827-1833
E-mail:
debby_brinkerhoff@nmenv.state.nm.us

Occupational Health & Safety Bureau

Debra McElroy
525 Camino de los Marquez, Suite 3
P.O. Box 26110
Santa Fe, NM 87502
505-827-4230
FAX: 505-827-4422
E-mail:
debra_mcelroy@nmenv.state.nm.us

Ground Water Quality Bureau

Industrial Waste Team Leader
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-2900
FAX: 505-827-2965

Solid Waste Bureau

Phillip Westen
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-0559
FAX: 505-827-2902
E-mail:
phillip_westen@nmenv.state.nm.us

Underground Storage Tank Bureau

Joyce Shearer, Ph.D.
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-476-3779
FAX: 505-827-0310
E-mail:
joyce_shearer@nmenv.state.nm.us

Please note that a list of all Public Owned Treatment Plants (sewage treatments plants) are listed for all of New Mexico on the following page. Waste Treatment Plant operators are important regulatory contacts for small businesses. Please refer to the list and contact your local plant operator for information specific to your community and business.

City of Albuquerque

Public Works Department

Bob Hogrefe
Southside Water Reclamation Plant
4210 Second Street, SW
Albuquerque, NM 87185
Ph: 873-7030
Fx: 873-7087
Rhogrefe@cabq.gov

Environmental Health Department

John Liberatore
EHD/APCD
P.O. Box 1293
Albuquerque, NM 87103
505-768-1964
FAX: 505-768-2617
E-mail: jliberatore@CABQ.gov

New Mexico State University

WERC P2 Center
1155 University Blvd., SE
Albuquerque, NM 87106
505-843-4251
E-mail: chrisc@werc.net

Online Resources:

US EPA Printing Compliance Assistance Center:www.pneac.org
US EPA: Design for the Environment: www.epa.gov/opprintr/dfe

Additional Sources of Information:

The New Mexico Environment Department's Hazardous and Radioactive Materials Bureau offers free on-site technical assistance for small businesses to help address small business hazardous waste issues. Please contact the Bureau at 505-827-1558 and ask for the Hazardous Waste On-Site Assistance Program for a consultation.

The City of Albuquerque Public Works Department has a guidebook on pollution prevention for the printing industry. Please contact Bob Hogrefe at 505- 873-7030 for a copy.

FACT SHEET ON CONTAMINATED RAGS AND WIPERS

This fact sheet is provided by the New Mexico Environment Department's Hazardous and Radioactive Materials Bureau (HRMB) to give regulatory guidance to those businesses that generate rags and wipers that may be contaminated with solvent, oil and other materials.

In order to make an official regulatory decision concerning the status of rags and wipers contaminated with possible hazardous constituents, HRMB sent a letter to the U.S. Environmental Protection Agency, Region 6, outlining HRMB's position and concerns. Upon receipt of this letter, and after subsequent conversations between HRMB and EPA staffs, EPA responded with a letter dated August 30, 1993. In this letter, EPA concurs with HRMB's position on how contaminated rags should be regulated.

Specifically, HRMB will regulate contaminated wipers as per the New Mexico Hazardous Waste Management Regulations (20 NMAC 4.1), which adopt by reference, with a few exceptions, 40 CFR Parts 260-270, in the following manner:

1. If a spent rag or wiper contains a listed hazardous waste or exhibits a hazardous waste characteristic (ignitable, corrosive, reactive, or toxic), then the wiper will be regulated as a hazardous waste. HRMB has not made in the past, and does not make at the present time, a distinction as to when a wiper becomes hazardous waste. Once the wiper is no longer being used, it must be handled as a hazardous waste if it meets the definition of hazardous waste. Therefore, unless the generator is a **C**onditionally **E**xempt **S**mall **Q**uantity **G**enerator (**CESQG**)(generating less than 220 lbs of hazardous waste per month), wipers meeting the definition of hazardous waste would have to be manifested to a facility having an EPA identification number.

   CESQG facilities are only required to dispose of the hazardous waste correctly. This means that wipers and rags that do not have free flowing liquids can go to the local landfill if the landfill will accept them. Contact the Solid Waste Bureau at 505-827-2938 or the local landfill for this determination.

2. Laundering of wipers is considered a form of reclamation since the spent material, i.e. the wiper containing the contaminants, has been used and as a result of contamination can no longer serve as a cleaning agent without first being laundered to remove the contaminants. Therefore, wipers that are stored on-site prior to shipment off-site or reclaiming on-site must be stored in compliance with 20 NMAC 4.1. This regulation requires that the wipers be stored in a closed container. The Occupational Safety and Health regulations require this container to be metal due to the possibility that spontaneous combustion might occur.

If the facility is a **S**mall **Q**uantity **G**enerator (**SQG**)(generating between 220 lbs and 2,200 lbs of hazardous waste per month) or a **L**arge **Q**uantity **G**enerator (**LQG**) (generating over 2,200 lbs of hazardous waste per month) the requirements regarding storage are much more complex with such conditions as an emergency communication device, container labeling, weekly inspection of storage area, portable fire extinguishers, and training for personnel, as well as much more.

3. In the case of contaminated wipers being shipped to a laundry for cleaning and reuse, other regulations such as the Clean Water Act, may apply to the wash water. Many municipalities have their own regulations regarding what can go down the drain, contact the local wastewater treatment officials. The hazardous waste regulations apply to the wipers only until they are actually placed into the laundry process. An off-site laundry accepting regulated wipers would have to obtain a hazardous waste storage permit unless it washes the wipers within 24 hours.

In a letter dated January 23, 1991 to Lance R. Miller, Division of Hazardous Waste Management, New Jersey Department of Environmental Protection, from Sylvia K. Lowrance, Director, Office of Solid Waste, EPA stated that "... the Regions and authorized States remain in the best position to determine the hazardous waste regulations' applicability in specific cases." HRMB will enforce the hazardous waste regulations as it deems necessary to protect human health and the environment in New Mexico.

The Hazardous Waste Technical Assistance Section is available to assist all businesses in complying with the regulations. Should you ask the Technical Assistance section to help evaluate your compliance, your business would receive six months amnesty from the Enforcement Section of the Hazardous and Radioactive Materials Bureau. Contact Technical Assistance at 505-827-1512 or 827-1558.

Pollution Prevention Tips:

- Use as little solvent as necessary to get the job done.
- Reuse the wipers as much as possible to reduce the number of wipers that are contaminated.
- Change to a non-hazardous or less hazardous solvent to reduce the number of requirements.
- Wring or drain rags and wipers into waste solvent or waste oil tank to reduce contaminants.
- Use drip pans to catch spills and eliminate the need to use rags or wipers.
- do not air dry contaminated rags or wipers.
- Do not launder or pre-wash the rags or wipers at your facility, residence or local laundromat.

New Mexico Occupational Health & Safety Bureau

New Mexico Environment Department
Santa Fe, New Mexico 87502

525 Camino de los Marquez - PO Box 26110
(505) 827-4230 Fax (505) 827-4422

Printing Industry Health & Safety Checklist

YES **NO**

Photo Developing Section

☐ ☐ Is an eyewash station available within close proximity?

☐ ☐ Do employees have somewhere to wash in the event of contact with the chemicals?

☐ ☐ Is PPE provided to the employees (i.e. safety glasses with side shields, gloves, etc.)?

☐ ☐ **If so,** have employees been trained on the proper use of PPE?

Press Section

☐ ☐ Are all pinch and nip points within the presses where employees work (cleaning or maintenance) covered or guarded?

☐ ☐ Has an assessment been made to ensure that employees are not overexposed to noise?

☐ ☐ **If no,** have steps been taken to avoid noise overexposure (i.e. noise sampling, PPE availability, or audiograms, etc.)?

☐ ☐ Are chemicals (i.e. wash, inks, etc.) properly stored and labeled?

☐ ☐ Is PPE, where needed, available to the employees (i.e. ear protection, gloves, safety glasses, etc.)?

☐ ☐ **If so,** have employees been trained on the proper use of the PPE?

Paper Binding and Cutting

☐ ☐ Are the points of operation guarded (i.e. cutting shares, folding, and binding sections)?

☐ ☐ Are pinch or nip points guarded within the machine?

YES **NO**

☐ ☐ Has an assessment been made to ensure that employees are not overexposed to noise?

☐ ☐ **If no,** have steps been taken to avoid noise overexposure (i.e. noise sampling, PPE availability, or audiograms, etc.)?

Maintenance Section

☐ ☐ Does the employer contract out repair and maintenance work to an outside company?

☐ ☐ **If no,** does the company have a written lock-out/tag-out program?

☐ ☐ Do procedures exist that detail the steps to isolating specific machines from all their energy sources (i.e. electrical, mechanical, pneumatic, chemical, gravity, etc.)?

☐ ☐ Are employees adequately trained on these procedures?

General Housekeeping

☐ ☐ Are isles and passageways free of clutter?

☐ ☐ If forklifts are used within the facility, are they battery powered?

☐ ☐ **If no,** have precautions been taken to avoid an employee's overexposure to carbon monoxide gas (CO)?

Note: If any of the above questions that are answered with "Yes", then the condition is probably adequate. If any of the above questions are answered "NO", then re-evaluate the situation, as a violation of the standards may exist. For assistance contact:

NEW MEXICO OCCUPATIONAL HEALTH & SAFETY BUREAU
CONSULTATION PROGRAM
505-827-4230

The Consultation Program provides safety and industrial hygiene surveys of workplaces, along with evaluation of, and assistance with the establishment of safety and health programs. The program is administered by the State but is operated separately from the Enforcement Program. The services are primarily targeted to smaller businesses, both public and private. The goal is to reduce workplace injuries and illnesses by helping businesses identify workplace hazards and find effective, economical solutions for eliminating or controlling them. The service is free and there are no penalties or fines, even if problems are found. Participation in this voluntary program has helped many New Mexico Businesses lower their costs associated with worker's compensation claims and increase their efficiency and productivity.

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General Health and Safety Issues

YES **NO**

☐ ☐ Do the employees wear respirators?

If so,

☐ ☐ Does the company have a written respiratory protection program?

☐ ☐ Are employees trained to properly wear, clean/maintain, and know in what situations the respirators are needed?

If not,

☐ ☐ Is the indoor air quality such that they are not needed?

☐ ☐ Is there a written Hazard Communication Program?

☐ ☐ Are MSD sheets available for all the hazardous chemicals in the workplace and are they updated regularly?

☐ ☐ Have employees received Hazard Communication training?

☐ ☐ Are there elevated storage/equipment lofts or platforms present?

If so,

☐ ☐ Are signs showing the weight capacity present?

☐ ☐ If the floors are more than 4 feet above a lower floor, are guardrails present?

☐ ☐ Are all exits marked with signs?

☐ ☐ Are exit doors free to access and are routes to these exits kept free of obstructions?

☐ ☐ Is there a procedure in place for obtaining medical treatment for injured employees?

☐ ☐ Are there first aid supplies readily available?

☐ ☐ Are there fire extinguishers on site?

☐ ☐ Are they charged and ready for use?

☐ ☐ Are employees required to use these extinguishers?

If yes,

☐ ☐ Is the path unobstructed?

<u>**YES**</u> <u>**NO**</u>

☐ ☐ Are they subjected to an annual inspection?

☐ ☐ Are employees trained to use them?

If not,

☐ ☐ Is there a written policy that requires employee evacuation?

☐ ☐ Does the company have an emergency action plan and fire prevention plan?

☐ ☐ Has the electrical system throughout the facility been assessed for situations where an employee may come into contact with an electrical current, or the electrical system is such that a fire hazard exists (i.e. bare conductors, faulty equipment, exposed electrical equipment where a flammable/explosive environment may exist)?

☐ ☐ Does the employer (if 10+ employees are employed) record occupational injuries and illnesses on the OSHA-200 log?

Note: If any of the above questions that are answered with "Yes", then the condition is probably adequate. If any of the above questions are answered "NO", then re-evaluate the situation, as a violation of the standards may exist. For assistance contact:

NEW MEXICO OCCUPATIONAL HEALTH & SAFETY BUREAU
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505-827-4230

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CONSULTATION/TECHNICAL SERVICES

FREQUENTLY ASKED QUESTIONS

What is the Consultation Service all about?

The Consultation program provides safety and industrial hygiene surveys of workplaces, along with evaluation of, and assistance with establishment of safety and health programs. Although the service was established by the same Act that created the Occupational Safety and Health Administration, and the associated enforcement/compliance agencies on the federal and state level, the Consultation Service does not issue fines or penalties. Since the same regulations are covered, the service allows the employer to benefit from the professional assistance, without fines being imposed.

What does your service cost and who is eligible?

The Occupational Health & Safety Bureau (OHSB) offers consultation services free of charge to New Mexico employers with 250 or less employees on location or 500 statewide. Limited services are available to larger companies. Consultation is offered only at the request of an employer.

What types of places do you visit?

The extent of the OSHA Act is to protect employees in all places of work. These include machine shops, hospitals, offices, chemical manufacturing plants etc. The consultation program is designed to assist employers (especially small employers) in complying with the requirements of OSHA regulations. We therefore, visit any place of employment that has employees.

Where does the Consultation Service get its funding?

The program receives funding from both the federal and the state government.

How long does the consultation process take?

Depending on the size of the company and the scope of the visit, a consultation may take anywhere from one or two hours to a full day. If exposure monitoring is requested or recommended, another day is often scheduled.

What kinds of things do you look at?

In order to evaluate the systems in place, sufficient information from the employer may be needed. This would include assessing existing safety and health programs, the OSHA 200 logs, accident investigation reports, and a walk-through of the facility to identify potential injury and illness hazards in the workplace.

Do we have to let you in all areas?

You, the employer makes that determination. If you requested a comprehensive survey, the consultant will look at all areas.

Can it be arranged for both the safety and the industrial hygiene visits to be conducted on the same day?

Visits are scheduled based on the caseload of the consultants. Where the caseloads permit such an arrangement can be made.

Do I (the employer) have to fix everything you find?

The employer is obligated to correct all serious hazards found by the consultant, within a reasonable time frame. Time extensions are granted for abatement of hazards when needed, if the employer is providing interim protection for employees.

How are hazards classified as “serious” & “other than serious”?

A serious violation results where there is substantial probability that death or serious physical harm could result. An other than serious violation is a hazard that has a direct relationship to job safety and health, but probably would not cause death or serious physical harm.

How much will it cost to correct/fix the hazards identified?

Usually, it is not prohibitively costly to correct hazards identified by our consultants. However, where cost becomes an overriding consideration or where the employer can show that engineering controls are not feasible the employer may seek a variance from OHSB. In this case the employer must show that a combination of work practices, administrative controls, and personal protective equipment will provide equal or better protection for the employees.

Do you come back to verify hazard correction?

For regular consultation visits, a statement of assurance of correction for each hazard is usually acceptable. For special program consultations (SHARP) a follow-up visit is usually conducted to verify correction of hazards.

How do we request an extension of time on corrections?

All extensions have to be requested in writing. The letter should include the reason for the extension, what has been done to date to correct hazards; and if corrections have not been made, the employer must state what interim measures have been taken to protect the employees.

What is the SHARP Program all about?

SHARP or Safety and Health Achievement Recognition Program is one of our special programs for companies wishing to go the extra mile to establish a fully functional overall safety and health program, in addition to the correction of hazards. SHARP is primarily a recognition program for exemplary companies, but an added incentive for SHARP participants is a one-year exemption from OHSB's general schedule inspections.

Does Sharp keep OHSB enforcement out in all cases?

No, At SHARP sites, OHSB will continue to make inspections in the following situations:
imminent danger;
fatality/catastrophe;
formal complaints;
referral from other government agencies; or
follow-up on previously cited violations.

Where can I get information on establishing written programs (i.e. blood borne pathogen, hazard communication, confined space, etc?

Many of the safety and health programs are available through the New Mexico Occupational Health & Safety Consultation Program. They are available upon request.

How do we know which elements of the safety and health program requirements need to be fixed, if it doesn't show up on your report to us?

It is addressed in the safety & health program management section of the report the employer receives. These issues are also discussed by the consultant with the employer.

Is it necessary to have a written certification of hazard assessment at work sites that do not require (PPE) Personal Protective Equipment for any task?

Yes, according to 1910.132(d)(2), the employer shall verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated.

Can you come to our company and conduct a class or safety meeting?

Onsite training and education by consultants will be based on available resources and the employers request. The training and education will be tailored to the nature of the hazards or potential hazards in each specific workplace. Training in specific areas is also available through private consultants and the New Mexico Workers Compensation Administration or your insurer.

Can the consultant come back for specific things such as checking new equipment or processes that we bring on line?

Yes, Visits for specific purposes can be requested, in addition to regular consultation visits.

May I call your office anytime to ask questions?

Consultants are available to answer questions between 7-5pm Monday-Friday

Can anyone gain access to my report?

No, our files are confidential and are destroyed after 3 years.

Will a consultation visit lead to an inspection by OSHA compliance? Will your findings be passed on them?

All information is kept confidential. OHSB compliance inspectors cannot discover where we have been and then inspect those companies. The only time enforcement is contacted, is if a company neglects to correct serious hazards beyond time extensions. Then we are obligated to refer those items to enforcement, but only after we have made every attempt to work with the company.

What determines when a compliance inspection is going to occur? How do they decide whom they are going to visit?

Factors that may trigger a compliance inspections include:
- **formal complaints by employees or their authorized agents;**
- **fatalities;**
- **catastrophe or major incidents;**
- **history of the company (previous OSHA activity);**
- **referral by other governmental agencies;**
- **general schedule inspections; or**
- **special emphasis programs**

Have you been or will you go to my competitor?

Our service extends to all eligible companies who request it. All information is kept confidential; therefore, no hazards, or processes that may be a trade secret, seen in your facility will be discussed in another place of business.

Where can I get a copy of the regulations?

The Government Printing Office (GPO) processes all sales and distribution of the CFR. For payment by credit card, call (202) 512-1800, M-F, 8am to 4 pm or fax your order to (202) 512-2250, 24 hours a day. For payment by check, write to the Superintendent of Documents, Attn: New Orders, PO Box 371954, Pittsburgh, PA 15250-7954. Regulations and other material are available on the Internet at www.osha.gov.

Quality Publications Links

A number of articles have been published that demonstrate how the Baldrige model and the Green Zia program can be used to measure environmental performance and drive environmental excellence.

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Click on the title below to view the article on the Web.

pdf 35k	Striving for Environmental Excellence with the Baldrige Model	Lessons Learned and the Baldrige Model for Environmental Excellence	pdf 30k
pdf 24k	How to Build Performance into an EMS Conformance Standard	How Do You Measure Environmental Performance?	pdf 110k
	How to Build Performance Into the Responsible Care® MSV Conformance Standard		HTML 40k

Green Zia Information

The Green Zia Program is a unique environmental excellence program in the State of New Mexico http://www.nmenv.state.nm.us/ EXIT EPA (Scroll down to "Special Programs"). It is a voluntary program designed to support and assist all New Mexico businesses to achieve environmental excellence through continuous improvement and effective energy management. The program encourages integration of environmental excellence into business operations and management practices through the establishment of a prevention-based environmental management system. The Governor of New Mexico makes recognitions and awards annually to organizations that successfully participate in the program. Even though your business may not be located in New Mexico, you can use this program as a means of self-evaluation. In this manner, you can start a performance-based environmental management system or use it to be more successful with your conformance-based environmental management system such as ISO 14001.

The Green Zia Criteria Document (2001)

Green Zia Application Writer's Workshop (2001)

Green Zia Examiners Training (2001)

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Baldrige Model Information

When it comes to measuring business excellence, most companies turn to the Baldrige model. This model grew out of the Malcolm Baldrige National Quality Award Program as administered by the U.S. Commerce Department's National Institute of Standards and Technology (NIST). This program has been called, "The single most influential document in the modern history of American business." The Baldrige model measures performance with a unit-less number on a 1000-point scale. For the past seven years, a hypothetical stock index made up of publicly traded U.S. companies that have received the Malcolm Baldrige Award has outperformed the Standard & Poor's 500 Index by almost 5 to 1. Currently about 60 countries and 44 of the 50 states have programs patterned after the 13-year old Baldrige program. Many other organizations - including the United Way, trade associations, government agencies and private companies - have created their own performance programs based on the Baldrige model. Whether they intend to apply for the award or not, thousands of organizations assess their performance against the Baldrige criteria. By doing so, these organizations improve their competitive advantage, productivity, and customer and employee satisfaction while achieving stronger financial performance and overall business results. Information on the program is available on the NIST Web site at http://www.quality.nist.gov. EXIT EPA
Several important documents from this site have been placed on this CD-ROM.

Getting Started: A Guide to Self Assessment and Action

Why Apply?

2001 Criteria for Performance Excellence

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P2 and the Quality Model

Chapter 7 of the Guide presents a quality model for developing a performance-based environmental management system (EMS). This type of EMS can also be used to implement a pollution prevention (P2) program. This section of the CD-ROM is designed to help introduce you to these sources of information. For convenience, this information is provided in three sections:

- **Publications on the Quality Model**
- **Information on the Green Zia Program (New Mexico)**
- **Background information on the Baldrige Program.**

Quality Model Publications - There are reprints on the use of the quality model for environmental performance. These articles are copyrighted and meant for your personal use. You will need to have your Internet connection activated to access these reprints from the CD-ROM.

Green Zia Information - The New Mexico Green Zia Program is a unique derivative of the Baldrige program designed to measure environmental performance. Program information is provided on the CD-ROM as well as links to other Internet sites with additional program information.

Background Information on Baldrige - The Malcolm Baldrige National Quality Award offers a proven means of enhancing business performance. There is much background information on the use of the Baldrige principles to help your organization develop and implement a prevention-oriented environmental performance program.

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Publications Links

Green Zia Information

Baldrige Info.

Reprints on P2 Tools

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A series of articles on the P2 Tools presented in *An Organizational Guide for Pollution Prevention* appears in the John Wiley and Sons journal, *Pollution Prevention Review*. These articles were written by Robert B. Pojasek, Ph.D., Pojasek & Associates.

Permissions Department
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pdf 44k Using the Systems ApproachTools	**pdf 625k** Process Mapping	Materials Accounting **pdf 525k**
Activity-Based Costing **pdf 545k**	**pdf 541k** Selecting P2 Opportunities	Root Cause Analysis **pdf 301k**
Finding P2 Alternatives **pdf 324k**	**pdf 538k** Prioritizing P2 Alternatives	**pdf 383k** Implementing P2 Alternatives

Sector Approaches to Using P2 Tools

The New Mexico Environmental Department (NMED) has prepared manuals for five industrial and commercial sectors to demonstrate how the tools can be used. These files are in .pdf format. The user should check the NMED web site for any additional information regarding the use of these tools.

EXIT EPA ?

Click on the title to view the Sector Manual.

Printing Industry	Wood Working	Dry Cleaning
Jewelry Manufacture		Auto Repair

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Information on the P2 Tools

Chapter 4 of the publication *An Organizational Guide to Pollution Prevention* mentions a number of tools that can be used in the P2 implementation strategies covered in Chapters 5-8 of the Guide. This section of the CD-ROM is designed to provide more information on these tools in three categories:

- **Reprints on each P2 tool**
- ***Nothing to Waste* Manual**
- **Sector Approaches to using the P2 tools**

Reprints – There is a reprint on the use of each of the P2 tools. These articles are copyrighted and meant for your personal use. You will need to have your Internet connection activated to access these reprints from the CD-ROM.

Nothing to Waste* Manual –** This manual was designed to teach the P2 tools to very small businesses. You may find it useful to help you learn the tools. A ***pdf version of this manual is on this CD-ROM. A link is also provided to a version on the Internet.

Sector Approaches – The Green Zia Program in New Mexico has used the P2 tools to develop sector approaches in the following industries: printing, dry cleaning, wood working, jewelry, and auto repair. These documents will provide you with an idea of what the tools look like in practice.

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Reprints on Each P2 Tool

Nothing to Waste Manual

Sector Approaches

Training Case Study

During the presentations of the *Guide* to the regional offices, exercises have been prepared using the printing industry as an example. For those seeking to train their staff on the use of the manual, the following sources may provide useful information on the printing industry: W W W ?

EPA Printing Web Site

P2Rx Printing Web Site EXIT EPA

Industry Printing Web Site EXIT EPA

Green Zia Environmental Excellence Program
New Mexico Environment Department
Office of the Secretary
PO Box 26110
Santa Fe, NM 87502
505-827-0677
pat_gallagher@nmenv.state.nm.us

Green Zia Environmental Excellence Program

Wood Working Shops

Guidance for improved environmental performance and pollution prevention in your wood working business

Acknowledgements

The material in this workbook is based on the Systems Approach to Pollution Prevention, developed by Dr. Robert Pojasek of Pojasek and Associates, and the Nothing to Waste Manual developed by US Environmental Protection Agency Region 1. Process maps were developed by the Green Zia Program at the New Mexico Environment Department.

This manual is printed on recycled paper. The manual printing and distribution is supported through funding provided by the US Environmental Protection Agency. Special thanks to Rob Lawrence, Eli Martinez and Joy Campbell of the US Environmental Protection Agency for their help in funding this project and in supporting pollution prevention in New Mexico.

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The Green Zia Environmental Excellence Program

Guidance materials for wood working shops

Introduction

This packet contains information on how to establish a pollution prevention program specifically for a wood working shop. The packet also contains waste management and regulatory guidance materials to help you assure that you are in compliance with environmental, health and safety regulations. Used together, this program can help you establish a pollution prevention program that will help you meet compliance and reduce waste. Use of the tools from start to finish helps you qualify for the Green Zia Environmental Excellence Program!

The Green Zia Environmental Excellence Program is a voluntary program designed to help New Mexico businesses achieve environmental excellence through pollution prevention programs, based on quality management principles. This program is administered by a partnership of state, local and federal agencies, academia, private industry and environmental advocacy groups. This packet has been specifically developed for a wood working shop and is designed to meet the needs of a small business.

The basic logic of the Green Zia Environmental Excellence Program is:

- Waste or pollution is the result of inefficiency;
- Reducing waste increases profits;
- Waste that is not created cannot pollute.

This guidance has been developed to help your company understand best management practices to help your company comply with environmental, health and safety regulations and to help your company reduce waste and associated liabilities.

It is important to remember that environmental health and safety regulations are triggered by the use of equipment and chemicals.   Better use of chemicals, use of safer chemicals and efficient operation of machinery can help reduce your regulatory burden…if you aren't using hazardous materials, then you have fewer regulations to be concerned with!

This program is based on first understanding work process and materials use and then improving work practices to reduce cost, waste and regulatory concerns.

Working through the Green Zia Environmental Excellence Program will result in a system that helps address environmental issues in cost effective ways, based on sound business practices. The system provides a framework for continuous improvement over time and contributes to a thorough understanding of environmental issues in your business.

What is Pollution Prevention?

Simply put, pollution prevention means not creating a waste in the first place. Pollution prevention is achieved by the efficient use of resources, including raw materials, energy, water and even time and distance. The goal is to produce a product or deliver a service as efficiently as possible, with the least amount of wasted materials and the least possible environmental impact.

The bottom line is that pollution prevention or improved efficiency can help businesses save money and help protect the environment at the same time.

What is Environmental Excellence?

Environmental excellence means moving beyond compliance with environmental, health and safety regulations by establishing an environmental management system that incorporates pollution prevention into core business practices.

A prevention-based environmental management system will:

- Help a business identify *all* the environmental compliance and health and safety concerns as well as costs associated with a waste generating process, and
- Use prevention approaches to reduce or eliminate the waste and reduce the associated costs.

In the Green Zia Environmental Excellence Program, attention is focused on the *process* that generates the waste, not the waste. Identifying and implementing process improvements will reduce waste and costs. This is a major shift from the traditional, reactionary approach that concentrates only on managing wastes or pollutants already created to an anticipatory approach that concentrates on prevention of wastes or pollutants to improve environmental and economic performance. This prevention-first environmental management system will identify cost effective ways to achieve "beyond compliance" status, creating a win-win situation between economics and environment.

The Green Zia Tools

The Green Zia Program provides tools to establish a basic prevention-based environmental management system. Management and employees walk through the tools as a team to gain a complete understanding of their operation. Examples have been worked out for the wood working business. We encourage you to customize the examples to your own operations. The packet includes a series of process maps (Tool 1) for some operational areas of the wood working business. Tools 2-6 are also explained and illustrated to help you develop your program. Use of these tools on a regular basis will help your company qualify for the Green Zia Environmental Excellence Program.

Green Zia Tools:

Knowledge of Process

Tool 1: Process Mapping: Illustrates the work steps materials pass through as they are transformed into your final product. Maps allow for the identification of all inputs and outputs such as water, chemicals, electricity or other materials from a process, helping you to understand wastes and their sources. Maps also help you understand regulated activities.

Full Cost Accounting

Tool 2: Activity-Based Costing: Identifies the true costs of wastes or losses and helps participants identify areas to target for pollution prevention, by assigning dollar values to these wastes and losses.

Pinpointing Problems

Tool 3: Root Cause Analysis: Creates a cause and effect diagram to highlight why and where the losses occur in the process. Understanding why and where the loss occurs will help participants focus on specific areas for improvement.

Creative Problem Solving

Tool 4: Brainwriting: Addresses problems by generating as many alternatives as possible to minimize loss.

Prioritization of Options

Tool 5: Bubble-up-bubble-down: Ranks alternatives to determine the optimal solution. Factors such as cost, ease of implementation and effectiveness are considered in evaluating and ranking the alternatives.

Ensuring Success

Tool 6: Action Plan: Details each step that needs to be taken to implement the alternative and reduce or eliminate the loss from the process.

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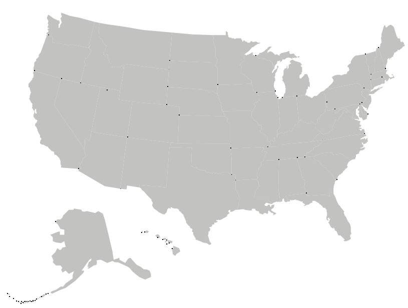
Tool #1: Process Mapping

To begin incorporating pollution prevention into your business, you must first get a full understanding of where wastes are being generated. This tutorial will discuss the advantages of using process maps to logically evaluate each step of your process.

Warm-up Exercise



Maps have been used throughout the ages for many purposes from helping sailors navigate the seas to providing a safe route for climbers hiking to the tallest peaks. You have probably drawn maps to your home or office so that someone could visit. It is important that the information on this map is complete and accurate or, as you may have found, your guest will get lost!

Take a minute now and think of a coffee shop or restaurant nearby that everyone in the group knows. Draw a map from the building you are currently in to this establishment - include traffic lights, landmarks, and any other important features along the way. Now compare maps with the other members of your group. Are they the same? If a person not familiar with the area were to use your map, would they have found their way?

Introduction

Are you aware of the amount of waste that your business generates? Could this waste be turned into profit? By considering methods of reducing wastes, recycling used and unused raw materials, and reusing lost material you could not only help the environment but also reduce your raw material and waste disposal costs.

This section discusses process mapping, a method of analyzing a process in order to catalogue all the materials used and lost in the process. With process mapping, you will systematically identify the series of steps materials pass through as they are transformed into the final product. Evaluating your process in this manner will allow you to recognize the opportunities to prevent losses and possibly streamline operations. Each loss identified during the process mapping is an opportunity to prevent that loss.

Create a team of employees to complete this exercise. During this exercise you will:

- Examine and revise the process maps and narratives in the packet to accurately reflect your operation.
- Fully understand the functionality of each step of a process.
- Identify the inputs and outputs/losses within the process.
- Communicate findings in a clear and concise manner to members of the team.

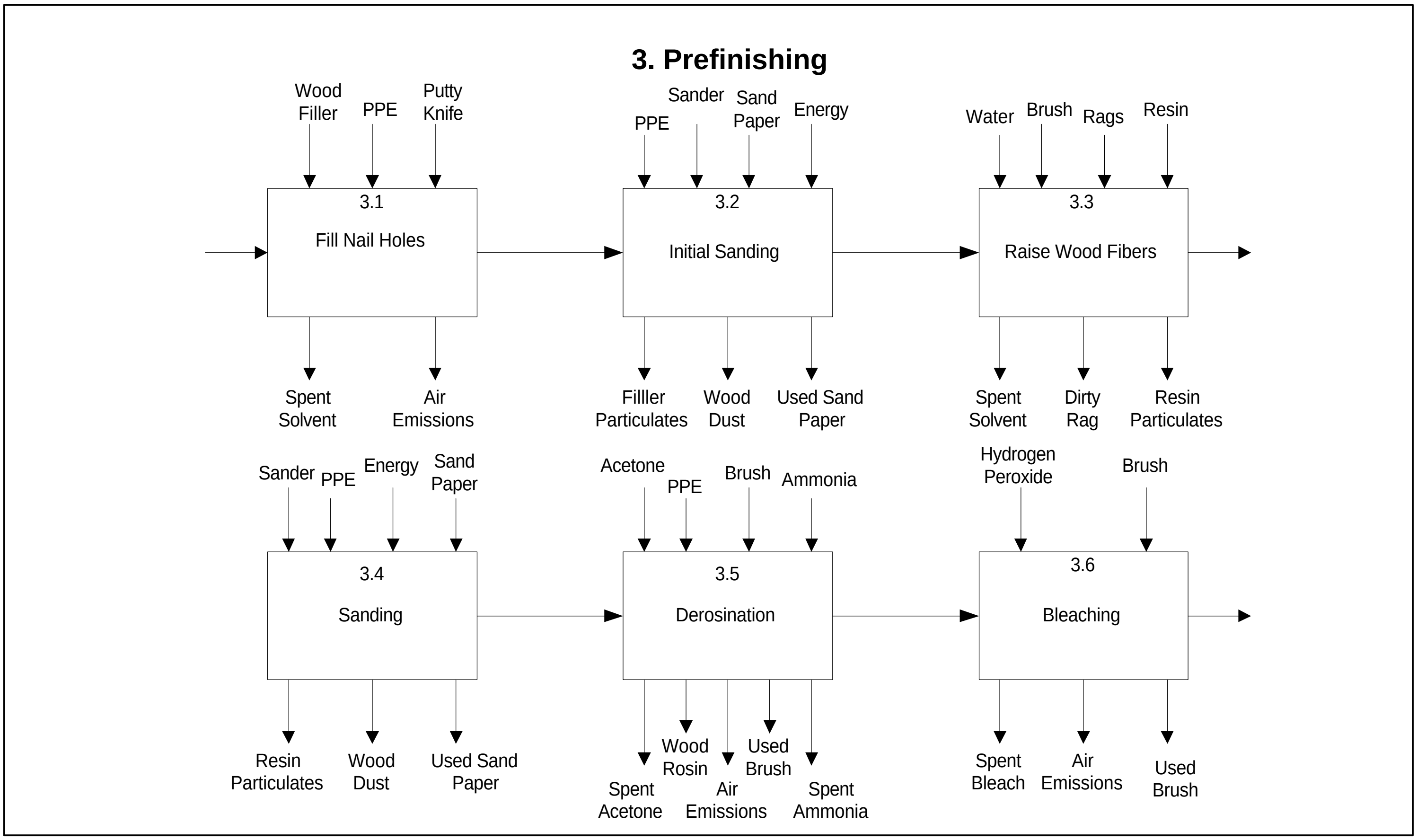
Process Mapping

A series of process maps have been developed for wood working operations and are included in this packet. You should customize these maps for your operation, since no two businesses are exactly alike. These maps become a reference for you to use for your pollution prevention program and can be updated to reflect changes as you improve your operations. These maps are also great for training new employees and other problem solving needs.

Large businesses and manufacturers use these tools to understand and improve their manufacturing processes. Small businesses can benefit by using these tools as well!

It is helpful to also prepare a narrative to go along with your process maps to explain the process in detail. We recommend that you include regulatory activities in the narratives as part of your environmental management system. Narratives are also included in this packet; please revise to reflect your business operations.

Example of a process map for Prefinishing:



Please review the process maps in the back of this booklet and make changes to reflect your operation.

Once you have reviewed and revised the process maps to your operation, move to the next section…Activity-Based Costing!

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Tool #2: Activity-Based Costing

Every waste or environmental loss costs you money. By determining the activities that cause waste, you can focus your pollution prevention efforts to minimize the cost to your business and protect the environment. This tutorial will introduce you to a method of evaluating your waste.

Warm-up Exercise

Your daughter approaches you one evening and says that she is planning to buy a car. With the $400 she has left over each month, after paying all of her bills, she is sure she will be able to afford the $220 monthly car payment.

What are the other costs of operating and maintaining a car that she is forgetting? Consider not only the annual costs, such as insurance, but also the intermittent (once in a while) costs. Can she really afford this car?

Introduction

Once you have determined the losses in your processes through your process maps, you can discover how these losses are affecting your "bottom line". How much does it cost you to discard 10% of your raw materials, or 2% of your finished products? Which activities have losses that most hurt the profitability of your company? This tool will help you look at the cost of the losses in your business and see how much these losses are costing you. The results may surprise you!

Which losses should you care about? The Pareto Principle suggests that 80% of the problems in a business come from 20% of machines, raw materials or operators. (The same is true for any facet of a business, for example, 80% of sales come from 20% of your customers, etc.) Once you have assigned costs to your activities, you can figure out which 20% of your activities are contributing to 80% of your costs. The Pareto Principle is very important in activity-based costing as it is used to focus on the most important areas for improvement in your pollution prevention program. Use of the Pareto Principle for the activity-based costing section will help you quickly identify areas of your business to focus your prevention efforts.

New Terms

Activity based costing (ABC) - An accounting method used to assign the cost of your losses to the activities that generate these losses. By assigning costs to activities, you will discover the activities should be targeted for prevention.

Environmental costs -The costs associated with the losses in your process.

Intermittent operations – Operations that occur once in a while.

Pareto principle - A principle that suggests that 80% of anything can be attributed to 20% of the factors involved. For example, 80% of your environmental costs can be attributed to 20% of your activities.

Activity-Based Costing

1. Make a list of all the activities in your operation. Be sure to include the activities from your process map as well as any intermittent operations (such as cleaning or maintaining equipment.).

   Regular activities:
   - Drying lumber
   - Machining lumber
   - Pre-Assembling
   - Prefinishing
   - Applying a coating
   - Finishing
   - Final assembly

   Intermittent activities:
   - Compressor maintenance
   - Spray gun cleaning

2. List all of the losses in your operation. Look on your process map and add any others that you think of.

3. Reviewing your process maps, identify the operations in your shop that generate most of your waste or pollution problems. For example, does using solvent-based materials for applications and cleaning cause most of your environmental problems? Does the 80/20 Rule apply? Focus your efforts for now on the areas of your operations that you do the most or that create the biggest environmental problem for you.

4. Use process maps to review material use and losses for your selected process or operation…you will use these maps as a guide to assign costs to these losses.

5. Identify which major costs or general ledger costs apply to the material use and losses on the process maps (utilities, chemical purchase costs, waste disposal costs, costs that are easy to get information on and that you typically consider when looking at your processes). Enter into Table 1. (See example provided)

6. Identify which other activities are related to the use of these materials that are not in the major costs (protective equipment such as gloves or, monitoring, record keeping, maintenance, compressors to run equipment, permits, fees to the state or city, storage space for chemicals, the cost of spill clean-up and reporting, etc). These activities are not usually considered when thinking about the cost of a process, yet the costs associated with them can be significant!

7. Write the activities in the first column of Table 2. Along the top list all the costs or services required for these activities. Add or delete categories as appropriate for your business. Put an "x" for every cell that applies.

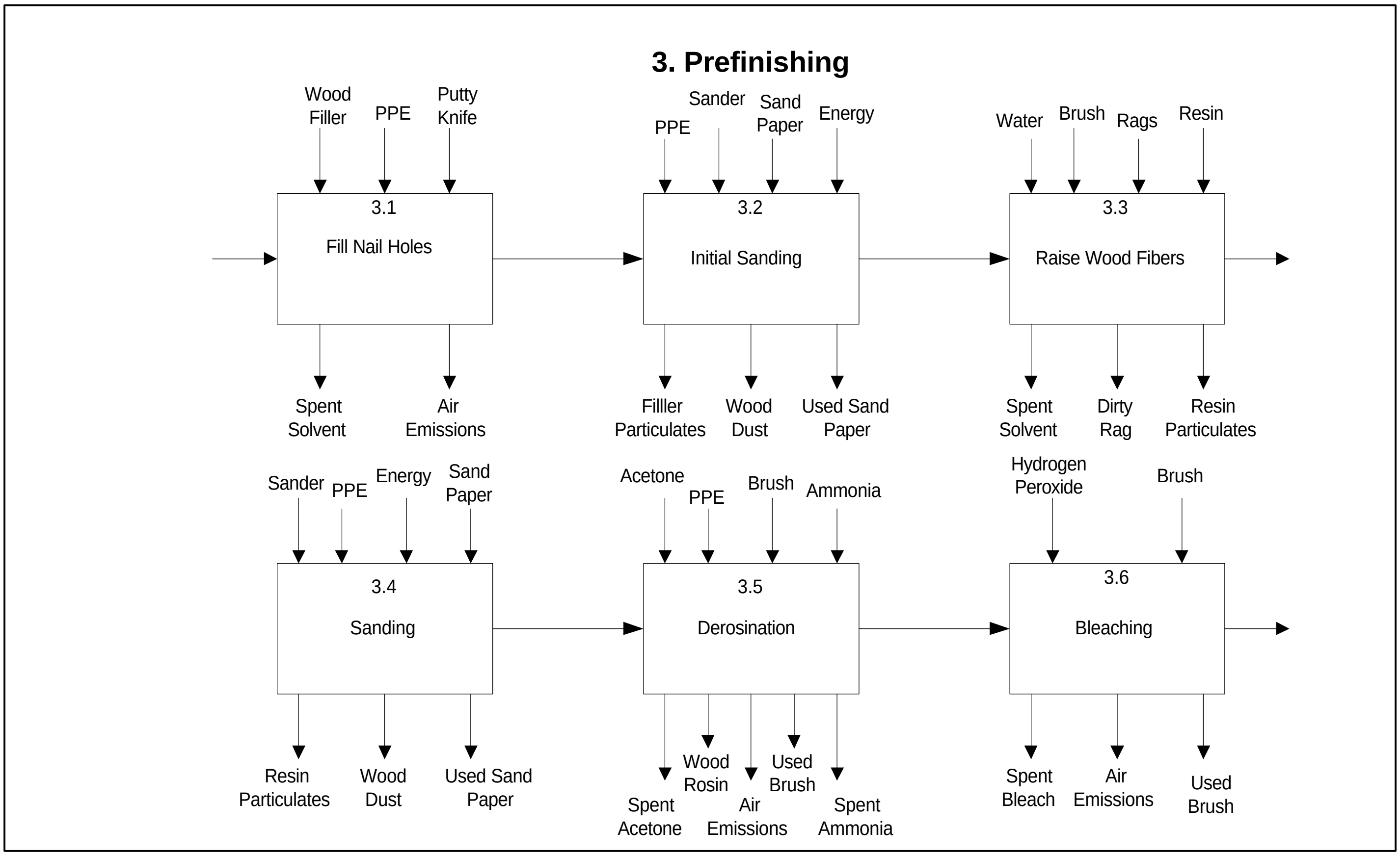
8. Count the total number of "x's" in Table 2. Then circle the x’s that represent what you estimate to be about the top 20% of the most expensive activities in your operation. Again, you are using the 80/20 rule: 20 percent of your activities will probably add up to about 80% of your total costs.

9. Then only estimate the cost of each of these top activities that you circled and write them in a new table. Cost estimates are allowable as you are using this method to prioritize your most expensive activities. You can refine costs once you have chosen a project to work on. (In the example, the top 20% of the cost categories chosen have the estimate beside them.) Add these numbers into Table 1 under the appropriate waste stream in the "Hidden costs" line.

10. Add the ledger costs and the hidden costs together to discover the true costs!

11. Create a Pareto Chart. Create a chart showing all these costs graphically. On the x-axis, place costs in dollars, on the y axis (horizontal), show the true costs of the wastes. This chart will help graphically show how all the costs stack up against each other. Does the 80/20 Rule apply here? Use this chart to identify the most expensive processes. This can be used to identify the first area for improvement! Which waste stream do you think you should focus on from this Pareto chart?

Activity-Based Costing Example



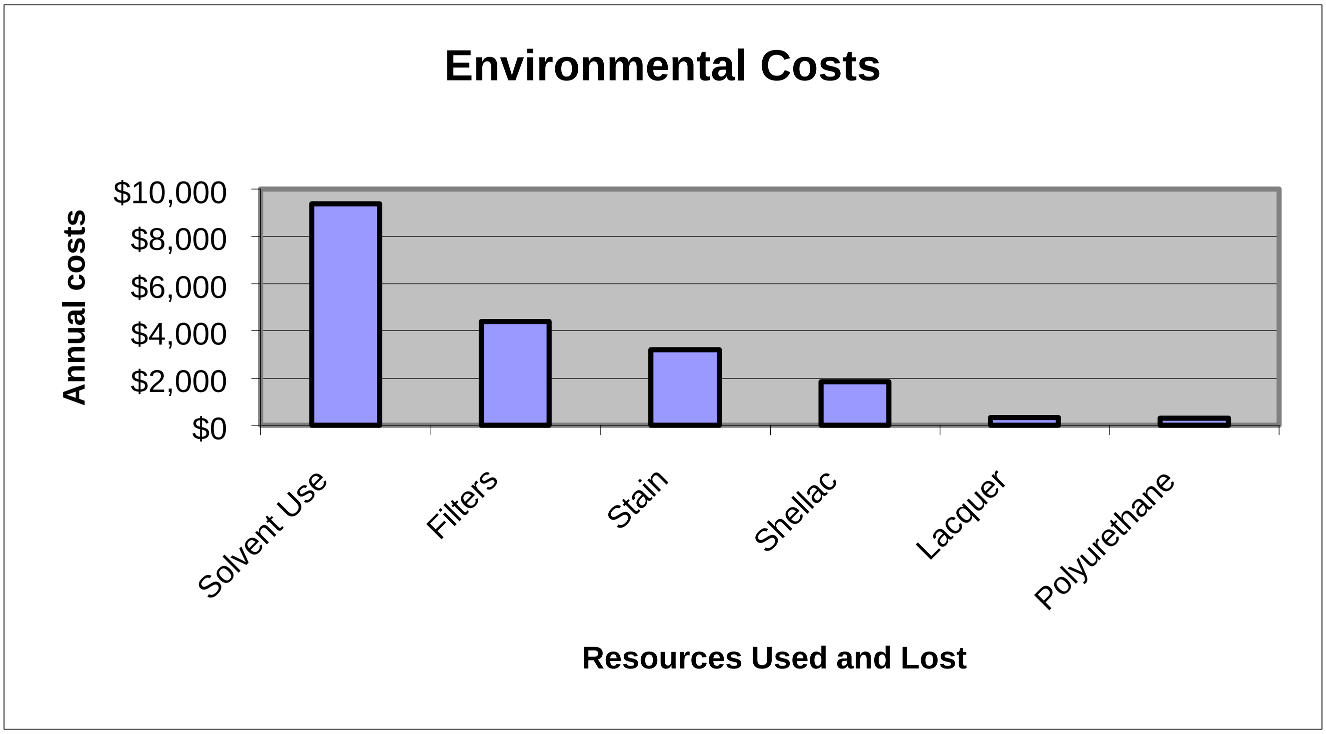
Activities	Materials and Losses
Drying lumber Machining lumber Pre-Assembling Pre-Finishing Applying a coating Finishing Final assembly Compressor maintenance Spray gun cleaning	Energy Adhesives *Solvents Acetone Personal Protection Gear Ammonia Bleach *Filters *Stain *Lacquer *Polyurethane *Shellac (*) Indicates most important waste streams and materials

Table 1. Activity-Based Costing Analysis (Per year)

Workstep							
Costs /Losses	Shellac	Stain	Lacquer	Solvent Use	Filters	Poly-Urethane	Total
Labor	$650	$1,300	$50	$2,000	$800	$100	$4,900
Raw material	$1,000	$1,500	$75	$5,000	$850	$50	$8,475
Disposal fees					$450		$450
Other ledger costs				$150			$150
Hidden Costs	**($200)**	**($400)**	**($200)**	**($2,250)**	**($2,300)**	**($150)**	**($5,100)**
Total	**$1,850**	**$3,200**	**$325**	**$9,400**	**$4,400**	**$300**	**$19,475**
%of Total	9.5	16.5	1.7	48.2	22.6	1.5	

Table 2. Hidden Cost Analysis (per year)

Shellac					
Activities/Cost Factors	Materials	Space	Utilities	Services	Labor
Storage	x	X ($150)	x		x
Recordkeeping				x	X ($50)
Total hidden costs for shellac					***($200)***
Stain					
Rags Laundry	x	x		X ($200)	x
Storage	x	X ($150)	x		x
Recordkeeping				x	X ($50)
Total hidden costs for stain					***($400)***
Lacquer					
Storage	x	X ($150)	x		x
Recordkeeping				x	X ($50)
Total hidden costs for lacquer					***($200)***
Solvent Use					
Recordkeeping				x	X ($50)
Permit fees	x			x	x
Monitoring	X ($200)				X ($800)
Storage	x	X ($300)	x		x
Reporting	x			x	($50)
Rags Laundry	x	x		X ($400)	
Vent Equip.	x	x	x	x	($450)
Total hidden costs for solvent use					***($2,250)***
Filters					
Disposal	x			x	X ($1,500)
Recordkeeping				x	X ($50)
Generator Fees					X ($750)
Total hidden costs for filters					***($2,300)***
Polyurethane					
Storage	x	X ($100)	x		x
Recordkeeping				x	X ($50)
Total hidden costs for polyurethane					***($150)***



Pareto Chart for Wood Working Shops: The Pareto Chart illustrates costs relative to each other and helps choose areas to target for pollution prevention activities. In this example, solvent use, the most expensive loss, will be the focus of the pollution prevention efforts in the following sections. Please note that the cost examples provided in this workbook are not from an actual case study but are used only to illustrate the use of the tools.

Now that we have completed the process mapping and activity-based costing, we have a sense of the relative environmental costs of our operations. Since solvent use is our target, we will use the following problem solving and decision-making tools to find a way to reduce solvent use, increase efficiency and save money.

Most of your work is done. These two tools can be revised as needed. Use these maps and information annually (or more often!) to keep improving your operation on an ongoing basis. Now that you have identified your most expensive wastes, you can now move towards solving problems and eliminating waste…the next tool is Root Cause Analysis!

Table 1. Activity-Based Costing Analysis (Per year)

Workstep							
Costs/Losses							Total
Labor							
Raw material							
Disposal fees							
Other ledger costs							
Hidden Costs							
Total							
%of Total							

Table 2. Hidden Cost Analysis (per year)

Activities/Cost Factors	Materials	Space	Utilities	Services	Labor
Waste Stream					
Monitoring					
Reporting					
Rags Laundry					
Disposal					
Vent.Equipt.					
Storage					
Recordkeeping					
Generator fees					
Total hidden costs for (waste stream)					
Waste Stream					
Monitoring					
Reporting					
Rags Laundry					
Disposal					
Vent. Equip.					
Storage					
Recordkeeping					
Generator fees					
Total hidden costs for (waste stream)					
Waste Stream					
Monitoring					
Reporting					
Rags Laundry					
Disposal					
Vent. Equip.					
Storage					
Recordkeeping					
Generator fees					
Total hidden costs for (waste stream)					

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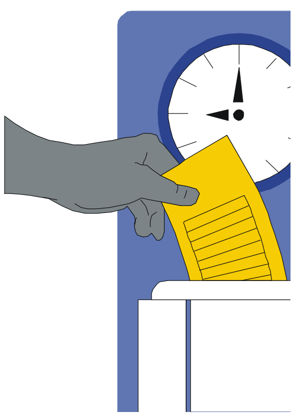
Tool #3: Root Cause Analysis

Now that you have recognized the activities in your process that are costly or expensive to your business, you can begin to focus your efforts on pollution prevention. This tool presents a method of detecting the underlying reason for an environmental loss so that the loss can be prevented.

Warm-up Exercise



Think of all of the times that you have been late for work and list the different reasons for your delay. Maybe your alarm clock did not go off, or perhaps your child was sick and you needed to arrange for a sitter. Did you spend too much time reading the newspaper or did you need to run to the store to pick up milk.

Arrange all these reasons in the categories listed below, or create an additional category. Some of the items on your list may be entered more than once.

Now consider the last time you were late for work. Why were you late? Circle the reason.

MACHINES	PEOPLE
broken alarm clock	sick child
METHODS	MATERIALS
reading the newspaper	out of milk

Introduction

In the last tool you determined the key losses responsible for the greatest amount of environmental costs. In order to try to prevent a loss, you must first understand why it is occurring. The underlying reason for a loss is also known as its "root cause". The root cause will answer the question: What *ultimately* caused the loss? Determining the root cause of an environmental loss is very similar to determining the root cause of being late for work

A cause and effect diagram is one method of determining the root cause for a loss. This tool provides a visual description of all possible causes for a specific loss. Once all the possible causes are depicted on the diagram, the most plausible cause or causes are identified. It is imperative that all persons involved in determining the root cause are in agreement. The next step is to write a "Dear Abby" letter summarizing the cause or causes for a loss will ensure that all participants see the problem in the same way.

During this exercise you will:

- Construct a cause and effect diagram with all potential causes for a loss.
- Discuss the most probable cause or causes.
- Write a Dear Abby letter describing the reason for the loss.

Root Cause Analysis

After participating in process mapping and activity based costing exercises, it was determined that the largest loss, solvent use, accounts for approximately 80% of all environmental costs in the wood working business. The next step is to discover the root cause of this loss.

To determine the root cause of a loss, you must ask “Why is the loss occurring?” One way of gathering information concerning the generation of a loss is called a cause and effect diagram, or fish bone diagram, since it resembles a fish bone. Major categories of possible causes for the loss are first defined and entered on the diagram as an offshoot from a main horizontal line. Next, all possible causes of the waste are assigned to a category and entered on the diagram. Once all the causes are defined, an agreement is made as to the most plausible reason for the loss.

Divide the causes into four major categories - Methods, Machines, Materials, and People - and then write down all the possible reasons why solvents could be lost from the process and assign them to a category. Begin the diagram and then write down some of the things that immediately come to mind. An example has been provided in Figure 2.

Since solvent use is related to the types of materials used for the finishing operations, the type of spraying operations used to apply the materials, and the requirement to clean to spraying equipment with solvent, several things may come to mind. The present spraying operation uses a high-pressure gun to atomize the material, which is susceptible to overspray, resulting in more finish waste and less transfer efficiency. This also means that the filter in the spray booth will collect more material requiring frequent replacement. Workplace conditions such as poor lighting may lead to poor application of materials to the furniture parts. Training of employees and a good work attitude are critical to efficient operations. All of these ideas should be entered under one of the four categories in the fishbone diagram: Machines, Methods, Materials and People in the example in Figure 2.

Now that all the possible causes of solvent use during wood working operations are categorized, it is time to determine the most probable cause. Go back to the diagram and circle the most probable causes. One of these should be the root cause**.** Then, working with employees as a team, discuss which one of these major causes is the root cause. To come to clear understanding of the root cause, we suggest that the team write a short "Dear Abby" letter describing their interpretation of the problem to ensure that each person sees the problem the same way. Once the letter is in place, the group becomes Abby and seeks to solve the problem. *(see Figure 3)*

Another method for determining the root cause of a problem is the "5 whys".

By asking the question "why?" five times, you may get to the root cause of a problem. An example of how the five whys works is as follows.

The Five Whys:

1. Why has the machine stopped forcing an interruption in production?
   A circuit breaker tripped due to an overload.
2. Why was there an overload?
   There was not enough lubrication for the bearings.
3. Why was there too little lubrication for the bearings?
   The pump was not pumping enough lubrication.
4. Why was there not enough lubricant being pumped?
   The pump shaft was vibrating because of abrasion
5. Why was there abrasion?
   There was no filter, which allowed chips of metal to get into the pump.

The solution is then to place a filter on the pump to capture metal chips.

Both tools can be used to find the root cause of the problem. For most problems to be permanently solved the root cause must be addressed. The fishbone diagram is a good visual tool that helps you understand all the areas that contribute to a problem. Understanding all the contributing factors will help facilitate problem solving. The Five Whys will also help you move past dealing with the symptoms of the problem to solving the real problem.

Examples of the fishbone diagram and a Dear Abby letter are included as well as a blank fishbone diagram for your use.

The next tool will present brainwriting - a method to generate ideas.

Figure 1: Prefinishing - Process Map

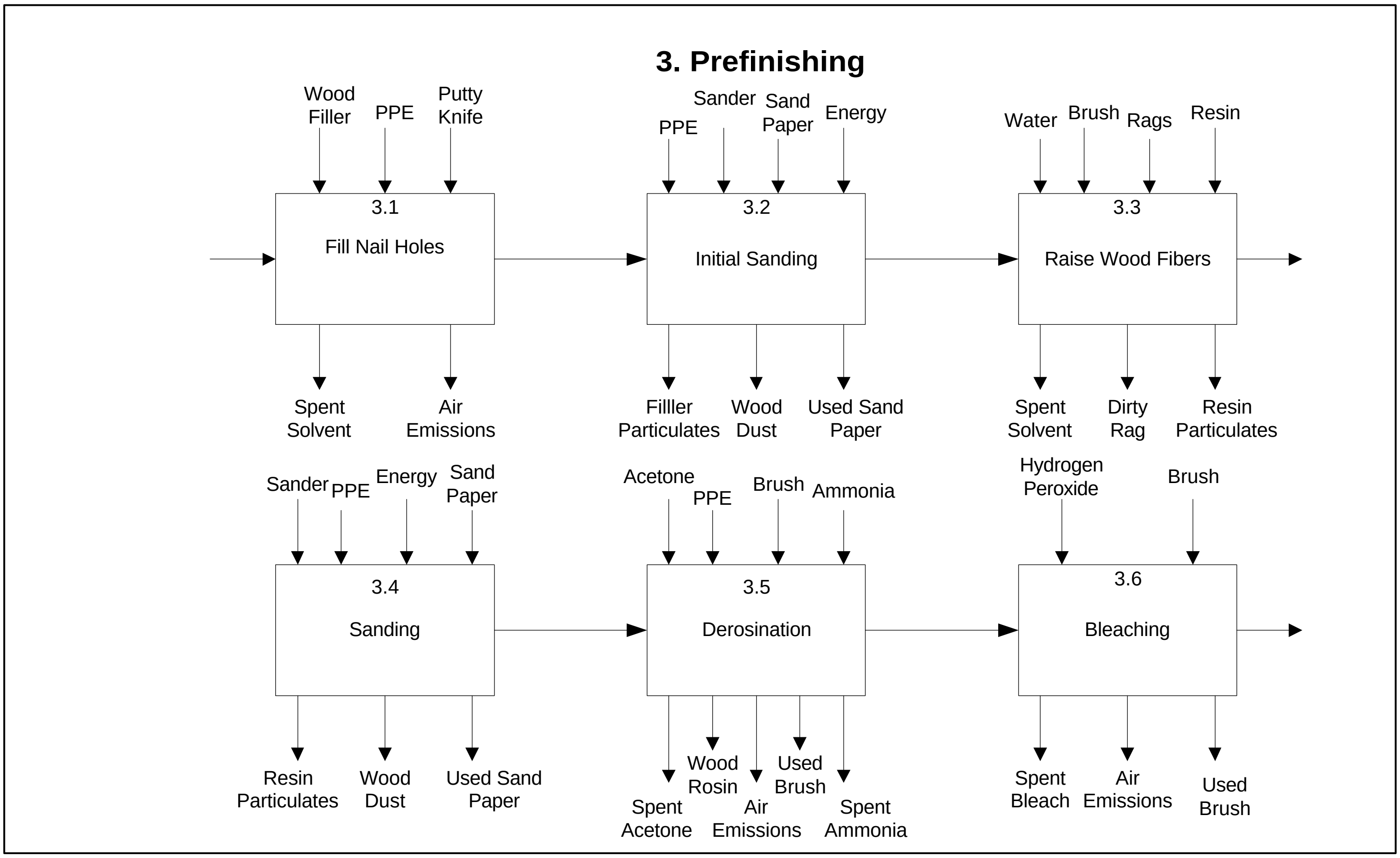


Figure 2: Cause and Effect Diagram

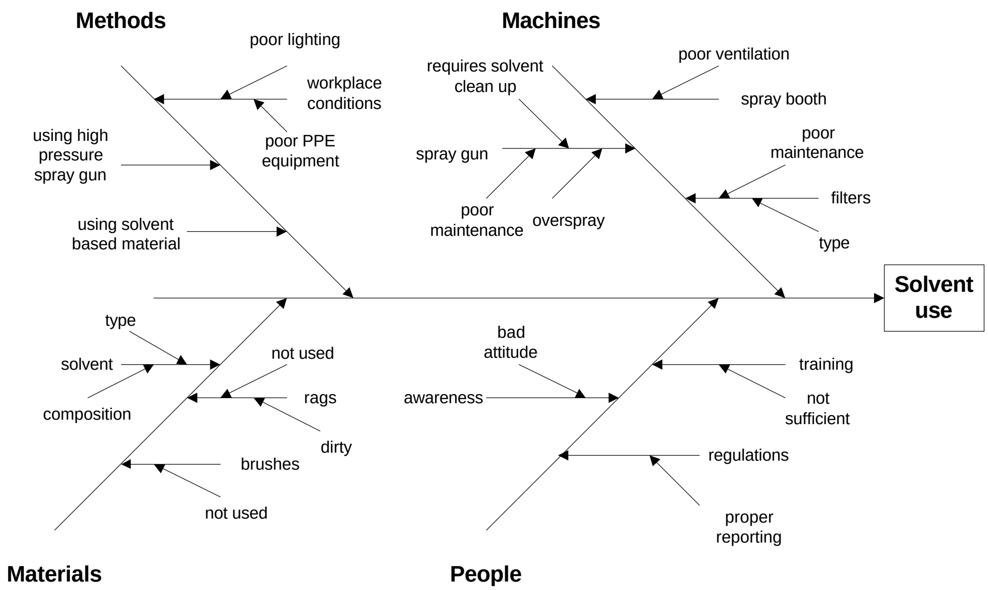


Figure 3: Dear Abby Letter

Dear Abby,

We run a small wood working shop. Use of solvent is our most expensive business issue. Solvents are highly regulated and we must comply with lots of regulations from air quality to hazardous waste to health and safety. Some wood working shops have had to pay lots of money for clean up of contaminated sites, which has put them out of business. These are issues that we wish to take seriously.

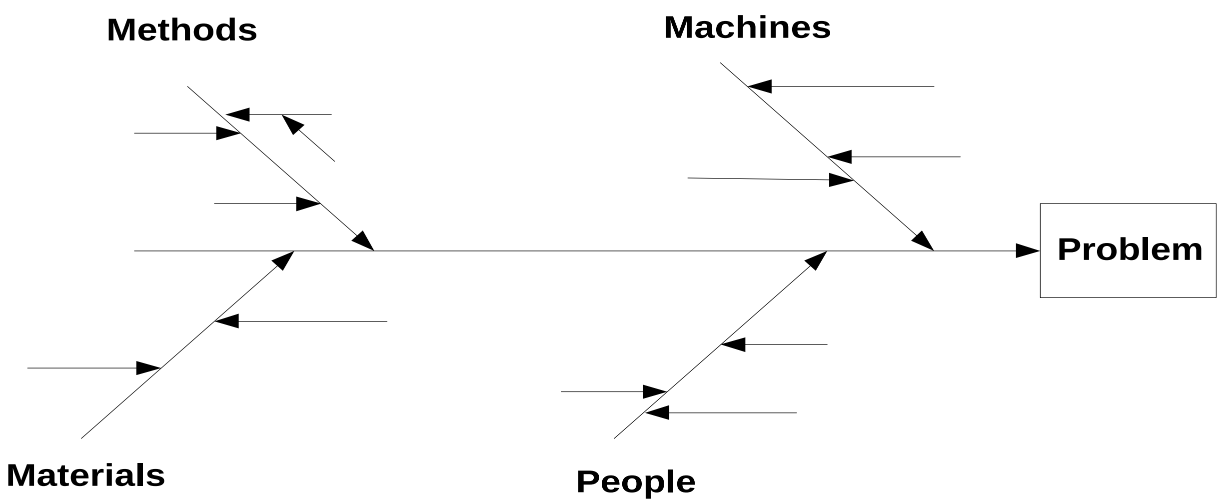
Our group did root cause analysis and we believe that our biggest problem is our high pressure spraying operation that causes a lot of overspray and wasteful use of finishing material. There is also the issue of making sure we are in compliance with regulations. However, as you know, changing equipment can be expensive and would probably require retraining of our employees.

Can you help us?

Signed,

Wood working in Santa Fe

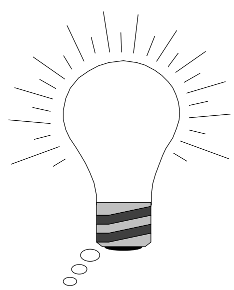
Figure 4: Root cause analysis: Fishbone Diagram



Tool #4: Brainwriting

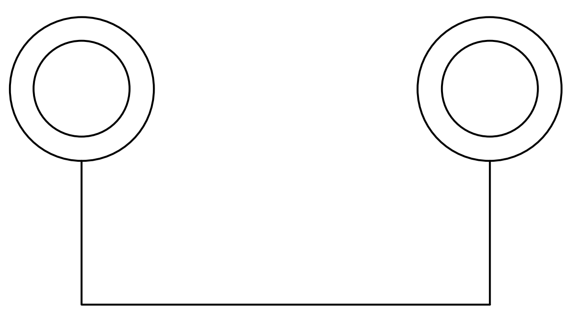
To address an opportunity effectively, it is important to recognize all alternatives. Very rarely is there one "right" way of preventing pollution. Instead, there are many different potential solutions. This tutorial presents a technique of listing many different alternatives for an opportunity.

Warm-up Exercise



You know the old adage “two heads are better than one”. This is especially true when trying to come up with new ideas. When you generate ideas in a group you will notice that each member of the group brings their unique set of experiences and strengths to the table.

Try the following exercise with your group. Look at the picture below (turn it on it's side and upside-down). What does it remind you of? Write down all the images that come to mind-even images that seem crazy should be included. Now go around the room, each person sharing one image with the group. One person should volunteer to keep a list of all the images. Repeat this step until every member of the group is out of images. How many images did the group come up with? How does this compare with the number of images you generated alone?



Introduction

In the last tool you evaluated all the probable causes of a loss and determined the underlying reason, or root cause. Once the root cause has been identified, you may be tempted to jump to a premature solution. When you address a loss without considering all the alternatives of prevention you may be overlooking the most appropriate option(s).

Looking for alternatives for pollution prevention by addressing its root cause is the next step towards addressing an opportunity. There are several tools available to help groups develop alternatives. You already explored one tool during the warm-up exercise. In this exercise you will explore another method-brainwriting. Brainwriting requires maximum interaction and creativity between group members. All possible alternatives, regardless of how far-fetched they appear, are considered by the group. Alternatives raised by the group may seem contradictory, or they may build on one another making them better. A comprehensive list of alternatives can then be compiled.

During this exercise you will:

- Conduct a brainwriting session.
- Develop a list of all possible alternatives for an opportunity for improvement.

Brainwriting

First you have completed your process map to see how you can optimize your processes and reduce losses. *(see Figure 1)* In the example provided, Activity-Based Costing helped to identify that 80% of the environmental costs associated with wood working was due to solvent use. Not only are solvents expensive, they are considered a hazardous waste and a hazardous air pollutant and they must be handled very carefully. Spills must be avoided to eliminate employee exposures and site contamination.

Root cause analysis determined that the greatest losses occurred due to employee handling practices. Employees control the wood working processes from the beginning to the end and also must deal with environmental, health and safety compliance issues.

The next step is to develop as many alternatives to solve the problem as possible. This is done through the process of brainwriting. Through brainwriting, staff works together to generate as many alternatives as possible regardless of how crazy they seem. In fact, to make it more interesting you can give a prize to the person that comes up with the craziest idea.

Make copies of the blank brainwriting sheet included at the end of this chapter. Make enough sheets so that each person on the brainwriting team has one per person with one blank sheet in the middle of the table. Place these sheets in the center of the table. Each person should take a sheet and write two alternatives on it and then place the sheet back in the center. Then take another sheet of paper and write two more alternatives on it. Every time someone picks up a sheet of paper, encourage them to read what others have written and try to make improvements to the alternatives listed. Someone could even say they think someone's idea is completely out in left field, if they try to make it better. Keep repeating this process until everyone runs out of ideas.

Now list all the alternatives that were discovered.

The alternatives on each sheet of paper should be read aloud and discussed. Many of the ideas may be the same and some may have small variations. The group should debate the small variations and eliminated the impossible alternatives. One comprehensive list should be developed-each idea only written once, although all variations of the same idea should be included.

Examples of brainwriting are provided below.

The next tool will present 'bubble-up-bubble-down'…a method for selecting the best option to prevent loss.

Figure 1: Wood Working Process Map

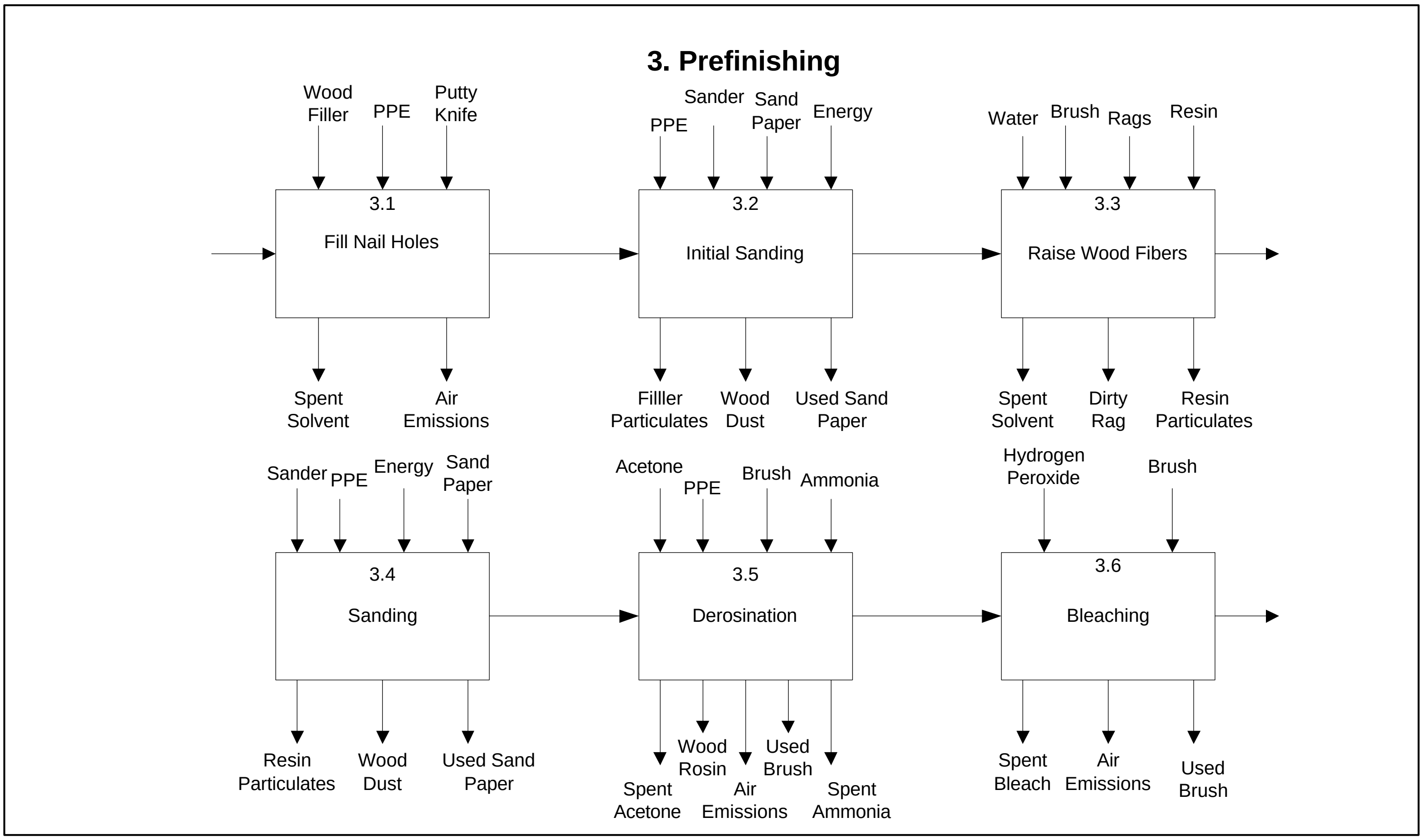


Figure 2: Sample of brainwriting

1. Use material that does not contain solvents to eliminate all environmental problems.	2. Train people to use the spray gun equipment better.
3. Pre-finish furniture parts with rags or brushes.	4. Use old solvent to pre-soak spray gun parts.
5. Convert to natural finishes.	6. Replace existing sprayer with new equipment that uses high-volume/low pressure.
7. Send furniture out to be finished.	8. Invest in better equipment.
9. Provide incentives for employees who reduce losses.	10. Create an employee problem-solving team to deal with waste of all kinds on a regular basis.

Figure 3: List of alternatives

1. Use material that does not contain solvents to eliminate all environmental problems.
2. Train people to use the spray gun equipment better.
3. Pre-finish furniture parts with rags or brushes
4. Start a "clean shop" program to train employees to keep work areas clean to prevent spills and waste.
5. Use old solvent to pre-soak spray gun parts
6. Begin an employee incentive program to reward best operating practices for operating a clean work area.
7. Replace existing sprayer with new equipment that uses high-volume/low pressure.
8. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.
9. Create an employee problem-solving team to deal with waste of all kinds on a regular basis.
10. Convert to natural finishes.
11. Train workers on pollution prevention and ways to reduce and reclaim spills.
12. Provide incentives for employees who reduce losses.
13. Invest in better equipment.
14. Send furniture out to be finished.

Figure 4: Brainwriting Sheet

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

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Tool #5: Bubble Up-Bubble Down

You have now generated a list of alternatives for preventing an environmental loss in your business. But how do you choose the best alternative? This tutorial presents one method of prioritizing alternatives to ensure that the most appropriate alternative is selected.

Warm-up Exercise

Most of us use lists from time to time to make sure that we don't forget to do the things that we need to get done. Without a shopping list, for example, we may return from the store without milk, the reason why we went in the first place. Certain limitations, like time or money, may cause us to drop things off our list. We often need to prioritize and make sure that the most important things get done.

Make a list of the things that you need to get done tomorrow (try to list at least ten things). List these items in the order that they come to mind. Now prioritize this list by putting the most important items on the top of the list and the least important items on the bottom. You should now have a “rank ordered” list. If you only have time to complete one of the items on your list, which would it be? You should have answered the item on the top of the list the most important item.

Introduction

A comprehensive list of pollution prevention alternatives was developed in the last tool using a technique called brainwriting. The alternatives generated during this tutorial can range from operational changes, such as employee training and improvements in operations, to technology changes, such as changing a solvent. The next step is to choose one alternative that is capable of being worked with successfully. Additionally, it is important to select the optimal solution for your business. To accomplish this, you must consider the *feasibility* of each alternative. Such factors as effectiveness, implementability, cost, and potential ramifications of each alternative should be discussed. Personal preferences and biased information should not enter into the decision-making process.

There are several tools available to aid a group in selecting an alternative and avoid bias. These tools allow a group to rank and prioritize alternatives using a systematic approach. When all the alternatives are listed, suggestions are made by the group to improve even the worst alternatives. At this point, many of the alternatives may be eliminated: every realistic alternative remains on the list. These remaining alternatives can then be sorted based on the factors presented above and any other factors that may affect a particular business. The method of selection presented in the exercise is the bubble-up-bubble-down. This tool uses a forced pair comparison to rank alternatives. Using this method you will be able to find the most effective solution to the selected loss.

During this exercise you will:

- Evaluate all alternatives.
- Use the bubble-up-bubble-down method to reach a decision on the best alternative.

Bubble-Up, Bubble-Down

Take the list of alternatives and compare the first two alternatives. Decide which of the two is the best and move this alternative to the top of the list. Go to the next, or third alternative and compare it to the second. If it is better than the second, move it up and compare it to the first, if not, leave it in the third position. Continue this process until all the alternatives are rank ordered. This process should go fairly quickly. Make sure you listen to everyone's opinions and objections. Again, factors to consider are cost, effectiveness and the ability to implement the alternative.

Bubble-up, Bubble-down should generate much discussion among employees on the best solutions. These discussions will help to increase buy-in to the alternatives. As a rule, employees never resist their own ideas.

An example of how the Bubble-Up Bubble-Down method was applied to the list of alternatives generated in the last tool are listed below.

Typically, the three or four alternatives that "bubbled-up" to the top of the list are the easiest and cheapest to implement, the "low-hanging fruit". The alternatives in the middle may require more research or study to see if they are feasible. The ideas at the bottom of the list may require major equipment changes or capital investments. It is important to keep the entire list on file as part of your continuous environmental improvement program.

The next step is to develop an action plan. Action planning is essential to assure that ideas are implemented!

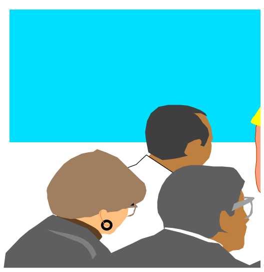
Figure 1: List of alternatives prioritized using Bubble-Up, Bubble-Down

1. Replace existing sprayer with new equipment that uses high-volume/low pressure.
2. Train people to use the spray gun equipment better.
3. Invest in better equipment.
4. Use material that does not contain solvents to eliminate all environmental problems.
5. Pre-finish furniture parts with rags or brushes
6. Use old solvent to pre-soak spray gun parts
7. Begin an employee incentive program to reward best operating practices for operating a clean work area.
8. Pay employees small bonus for keeping good environmental records including hazardous waste and air quality records.
9. Create an employee problem-solving team to deal with waste of all kinds on a regular basis.
10. Convert to natural finishes.
11. Train workers on pollution prevention and ways to reduce and reclaim spills.
12. Start a “clean shop” program to train employees to keep work areas clean to prevent spills and waste.
13. Provide incentives for employees who reduce losses.
14. Send furniture out to be finished.

Tool #6: Action Planning

Being able to successfully manage a project is important when trying to accomplish a task, especially when you are under a deadline. You need to set up a schedule, ensure that you have the necessary resources, and assign the right person to each part of the job. In this tutorial you will create an "action plan" for the implementation of an alternative to prevent pollution.

Warm-up Exercise



Your group has been assigned the task of making chocolate chip cookies. The cookies need to be ready in one hour and the cooking time is twelve minutes. Pick a person to manage this project. The manager must then assign the ten tasks listed below to individuals in the group.

You will need to know how much time is required for each task, what tasks need to be accomplished before others, what resources (i.e. bowls, flour etc.) are required, and what the most efficient way of organizing these tasks (and remember the clock is ticking). Create a schedule.

<u>Making chocolate-chip cookies:</u>

Mix dry ingredients
Mix wet ingredients
Put the batter on the pan and put pan into the oven
Combining wet and dry ingredients
Turn on the oven
Taste cookies
Wash tools and utensils
Grease pan
Take cookies out of the oven

Developing an Action Plan

Before you begin to implement your alternative you should complete this questionnaire. It will ensure that you are being thorough in your planning and have considered all the important issues that may arise such as the resources that are needed and the problems that could may occur. *(see Figure 2)*

Things to consider in developing an action plan are resources needed, both financial and human resources; the need for pilot testing or bench scale testing; information sources from he outside such as trade associations, vendors and suppliers and the Environment Department. Other issues such as employee support and maintaining product or service quality should be considered. A list of questions that should be considered during action planning is as follows:

Action Planning Questionnaire

1. What is the overall objective and ideal situation?
2. What steps are needed to get there from here?
3. What actions need to be done?
4. Who will be responsible for each action?
5. What is the best sequence of action?
6. How long will each step take and when should it be done?
7. How can we be sure that earlier steps will be done in time for later steps that depend on them?
8. What training is required to ensure that all staff have sufficient know-how to execute each step in the plan?
9. What standards do you want to set?
10. What volume or quality is desirable?
11. What resources are needed and how will you get them?
12. How will you measure results?
13. How will you follow up each step and who will do it?
14. What checkpoints and milestones should be established?
15. What are the make/break vital steps and how can you ensure they succeed?
16. What could go wrong and how will you get around it?
17. Who will this plan affect and how will it affect them?
18. How can the plan be adjusted without jeopardizing its results for the best response and impact?
19. How will you communicate the plant to generate support?

Now put all this information in an Action Plan Form. Most of the information you need should come from your answers to the questionnaire. The specific task, or step, to be accomplished is written in the first column under “Action.” In the following column list the person who is responsible for completing this task. A performance standard should then be provided. This standard is a way of establishing how well a task needs to be performed. Under “monitoring technique” enter a measurable goal or target used to track the plan's implementation. A firm deadline should then be set, and finally, indicate the resources that are needed to perform each task. This form will help you organize your thoughts, keep track of all the actions that need to be completed, and ensure that the proper quality is being maintained.

Use the form provided to track implementation of the project and to measure its success. A sample action planning form is included at the end of this section.

Overall Target: Employee Incentive Program					
Action	Responsible person	Performance standard	Monitoring technique	Completion deadline	Resources needed
1. Investigate sources of equipment	Tom	List of vendors	Discuss list with Dick the owner	Jan 15	Team of Tom, Dick and Harry
2. Bring in equipment for review	Tom	Approved list of vendors by Dick	Dick allocates time for employees	Feb 1	Shop employees
3. Employees try out equipment and write up results	Harry	How good does the equipment clean parts	Time to clean parts	March 1	Shop employees
4. Have team review results and select vendor	Harry	Compare against existing equipment	Time, quality and cost	April 15	Team of Tom, Dick and Harry
5. Purchase equipment	Dick	Delivery schedule	Dick allocates funds	April 30	Capital funds
6. Train employees on how to use new equipment	Harry	Time and quality of cleaning parts	Costs of new equipment versus old	June1	Employees time

Congratulations!!! You have completed the Pollution Prevention Training. Now it is time to put these tools to work and remember pollution prevention is an ongoing process. If you continue to implement pollution prevention in your business, you will increase the efficiency of your process while helping the environment. Simply revisiting your process maps and Pareto Chart once a year and using the tools to continue to make improvements will make a big difference in your operation. Ongoing use of these tools will help you to participate in the Green Zia Environmental Excellence Program.

Here are a few suggestions to make pollution prevention continue to work for you:

- ***Return to the Nothing to Waste activities and concepts as you make business decisions.***

- ***Schedule regular pollution prevention reviews of your business.***

Remember: Pollution Prevention saves resources, saves money, and prevents accidents!

Overall Target					
Action	Responsible person	Performance Standard	Monitoring Technique	Completion Deadline	Resources Needed
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

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Process Maps for Wood Working Shops

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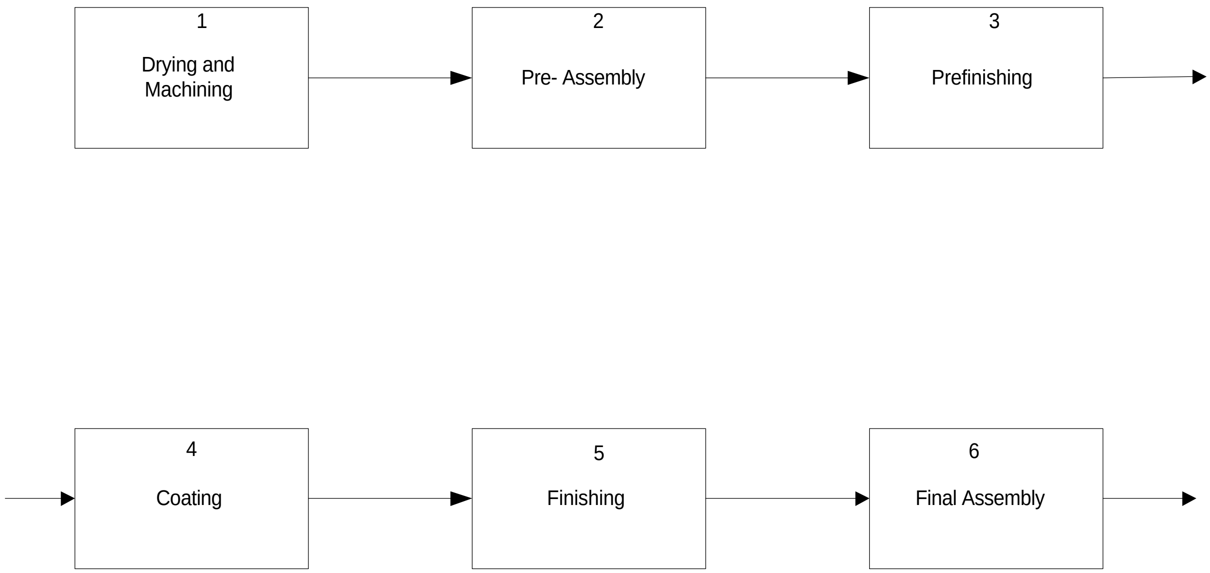
General Process Map for Furniture Manufacturing



Wood Working Shop Process Maps

Map 1.0: Drying and Machining

1.1 Drying kiln

Raw lumber generally has a high moisture content and must be dried before it can be used in furniture. The lumber is usually dried in a kiln using wood waste as the fuel source.

1.2 Cut lumber to size

After the wood is dried, it is sawed into a shape of the approximate dimensions of the individual furniture pieces. Power saws are generally used such as table saws, circular saws, band saws, scroll saws, and radial arm saws.

1.3 Size flat surfaces

The cut pieces of wood are then planed to make two surfaces parallel, flat, and the final dimensions of the furniture pieces. Both power and hand planner are used.

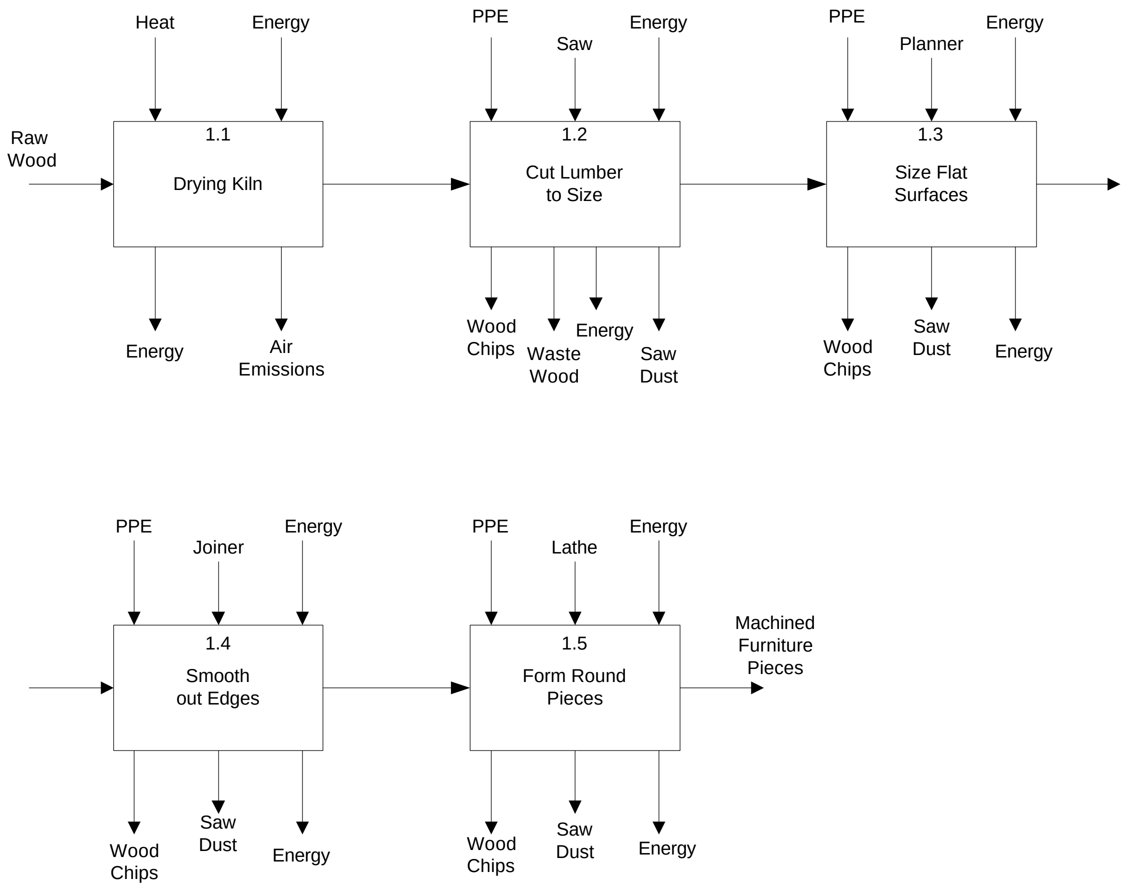
1.4 Smooth out edges

The wood is then sent through a joiner to square up the edges and make them the final dimensions of the furniture pieces. This is generally done using a power joiner.

1.5 Form round pieces

Some of the pieces of furniture are required to be round such as table legs. This is done on a power lathe.

1. Drying and Machining



Map 2.0: Pre-Assembly

2.1 Place wood pieces in jig

Generally furniture is made up of sub-assemblies that are easier to handle and apply finishes to. These sub-assemblies are made up from the wood pieces machined in the previous steps. They are generally placed in some sort of a jig or merely clamped in place.

2.2 Glue pieces together

Many of the subassemblies are glued together using adhesives containing solvents.

2.3 Nail pieces together

Sometimes the subassemblies also require nailing. In some cases nailing is used instead of glue. A power nailer is generally used.

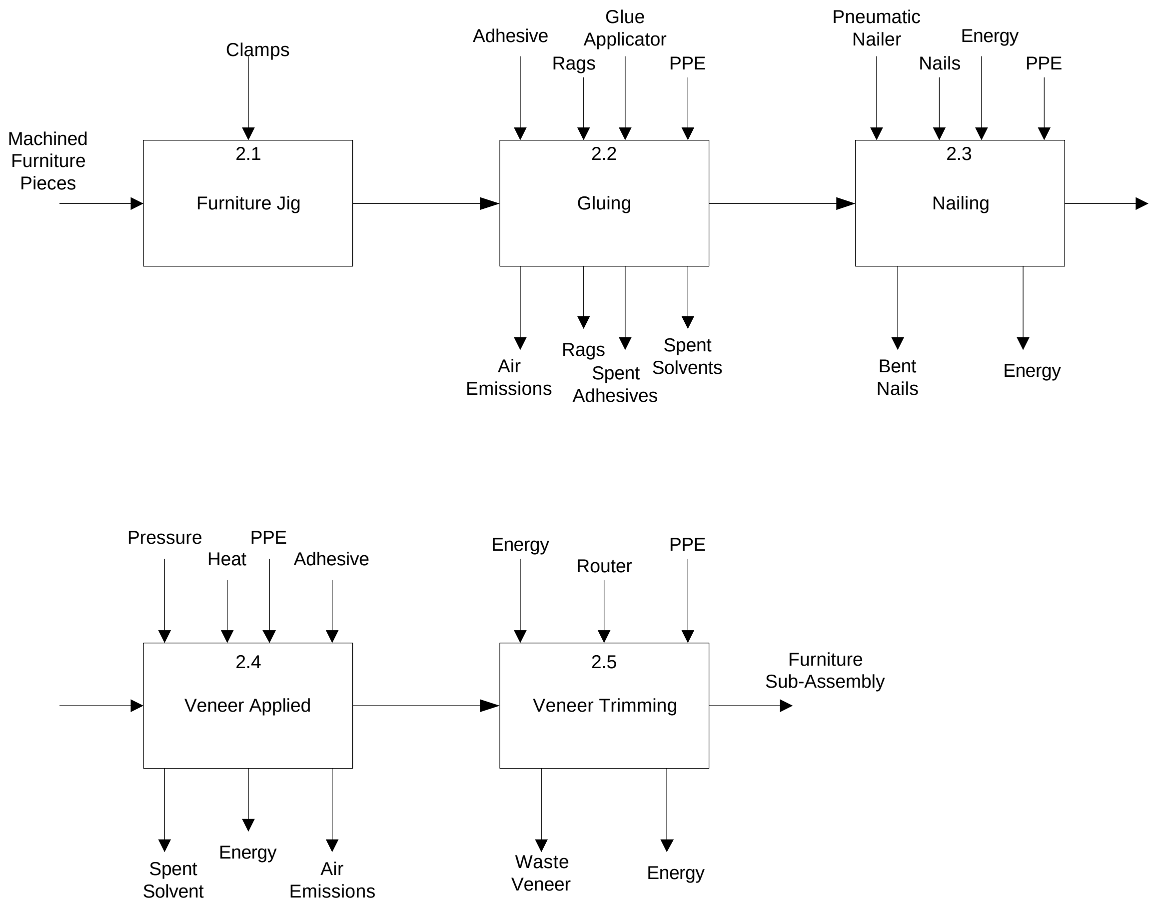
2.4 Apply veneer

A veneer is sometimes applied to some of the surfaces. This is done using an adhesive that contains solvents. Heat and pressure may also be applied.

2.5 Trim veneer

Usually the veneer is slightly larger than the surface it was applied to. This requires trimming to insure a perfect fit. A power router is generally used.

2. Pre-Assembly



Map 3.0: Pre-Finishing

3.1 Fill nail holes

If nails were used in the pre-assembly they are countersunk using a punch. A wood putty that generally contains a solvent is then used to fill in the nail holes.

3.2 Initial sanding

The surfaces of the furniture pieces are then sanded after the putty has dried. This can be done using either a hand or power sander such as a disk, belt, or roller sanding machine.

3.3 Raise wood fibers

To get an even smoother surface the furniture piece is sprayed, sponged, or dipped with water to cause the fibers of the wood to swell and raise. After the surface is dried, a solution of resin is applied and allowed to dry, causing the raised fibers to become more brittle.

3.4 Sanding

The raised fibers are then sanded down to form a particularly smooth surface. This can be done using either a hand or power sander.

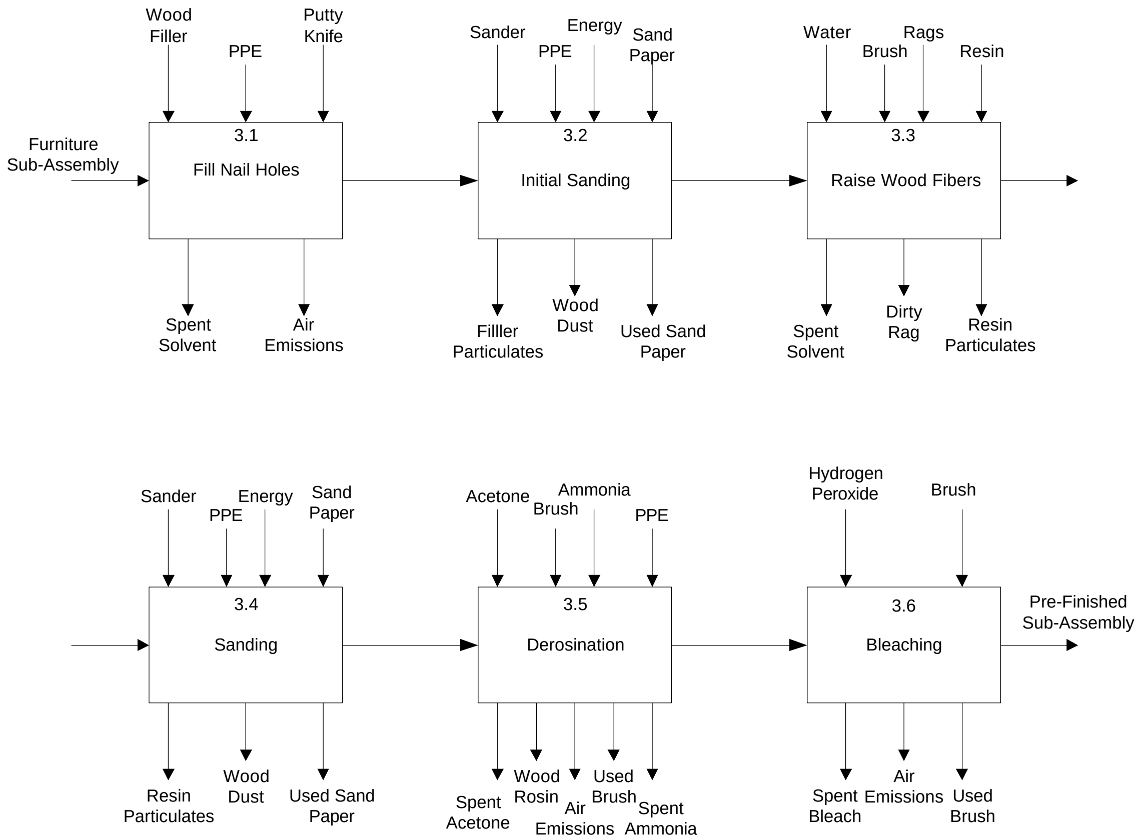
3.5 Derosination

Because certain types of wood contain rosin, which can interfere with the effectiveness of certain finishes, a process known as derosination may be employed. This is accomplished by applying a mixture of acetone and ammonia. This is generally applied by brush.

3.6 Bleaching

Once the unwanted rosin is removed from the wood, bleaching is done to lighten the color of the wood when the natural color is darker than the stain or finish to be applied. The process entails spraying, sponging, or dipping the wood into a bleaching agent, such as hydrogen peroxide.

3. Pre-Finishing



Map 4.0: Coating

4.1 Place furniture pieces in spray booth

Most coatings are applied by spraying.

4.2 Apply coating

The most common method of spraying used, is a spray gun powered by compressed air with high pressure to atomize the coating material. Most of the stains used contain solvents. The operators are required to wear protective personal equipment (PPE) such as masks.
nnnnnn

4.3 Light sanding

After the piece has been allowed to dry it is lightly sanded either by hand or with a power sander. The piece may then be put back into the spray booth for an additional coating. Steps 4.2 and 4.3 are repeated as many times as necessary to obtain the desired appearance.

4.4 Wash coating

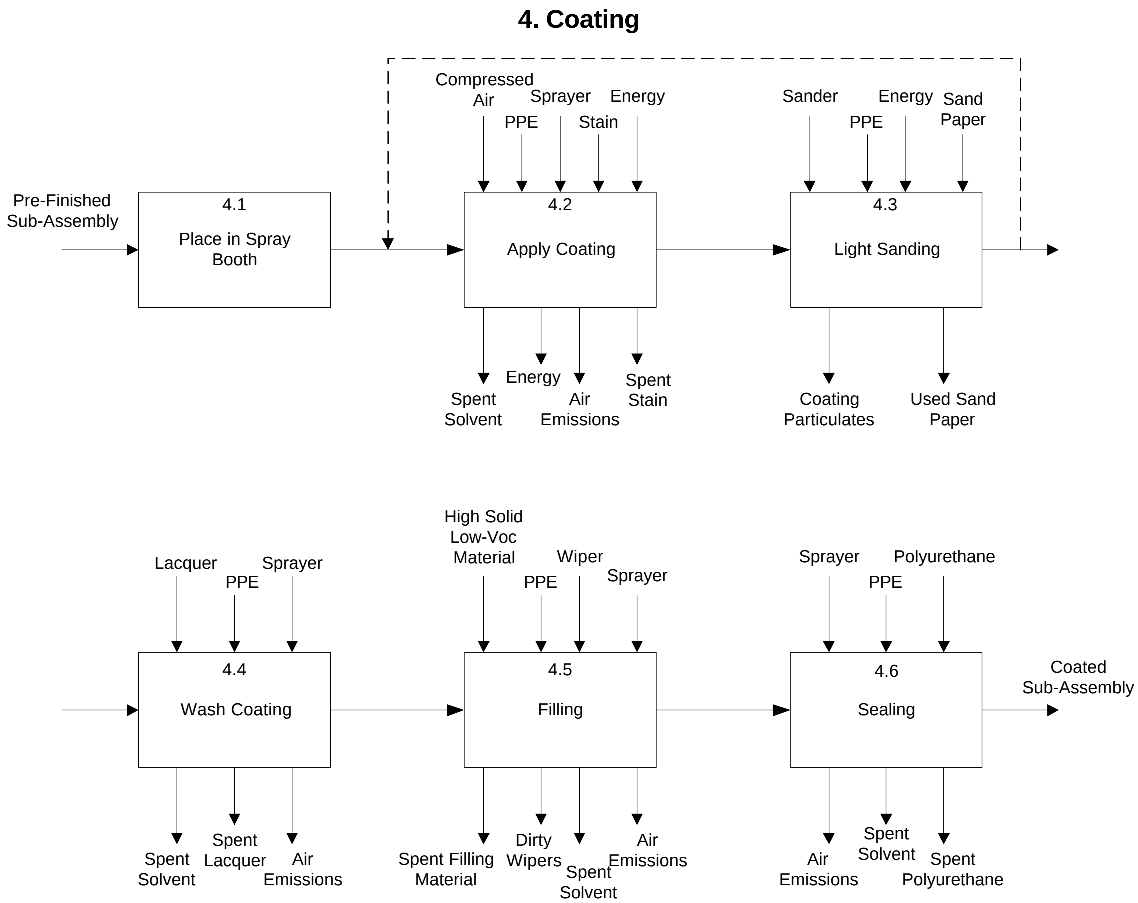
After staining, a washcoat, consisting of 2 to 13 percent solids by volume, is applied to the furniture piece. Washcoating is used to aid in adhesion, assist in filling or color uniformity, and partially seal the wood from subsequent staining operations. Nitrocellulose-based lacquers containing solvents are generally used and are sprayed on.

4.5 Filling

Fillers are applied to the wood surface to produce a smooth, uniform surface for later stages in the finishing process. Fillers usually range in solids contents from 10 percent to 45 percent by volume in a solvent base. Fillers are usually spray applied, then wiped into the wood.

4.6 Sealing

Sealing consists of applying one or many coats of sealer. The primary purposes of sealers are to provide adhesion, make sanding more effective, to seal the wood, and establish a foundation for final finishing. Solids contents of sealers, such as polyurethane, typically range from 10 to 30 percent by volume in a solvent base. Sealers are usually sprayed on.



Map 5.0: Finishing

5.1 Light sanding

After the sealer has been allowed to dry the furniture piece is lightly sanded either by hand or with a power sander.

5.2 Apply topcoat

After the furniture piece has been coated, a topcoat, such as varnish or shellac, is applied in one of the final stages of the finishing process. Top coats provide a clear coat whose function is to protect the color coats, enhance the beauty of the furniture, and provide a durable finish. Typical solids contents range from 13 to 30 percent by volume in a solvent base. Topcoats are usually sprayed on.

5.3 Light sanding

After the piece has been allowed to dry it is lightly sanded either by hand or with a power sander.

5.4 Apply second topcoat

A second topcoat is usually applied in the same fashion as outlined in step 5.2.

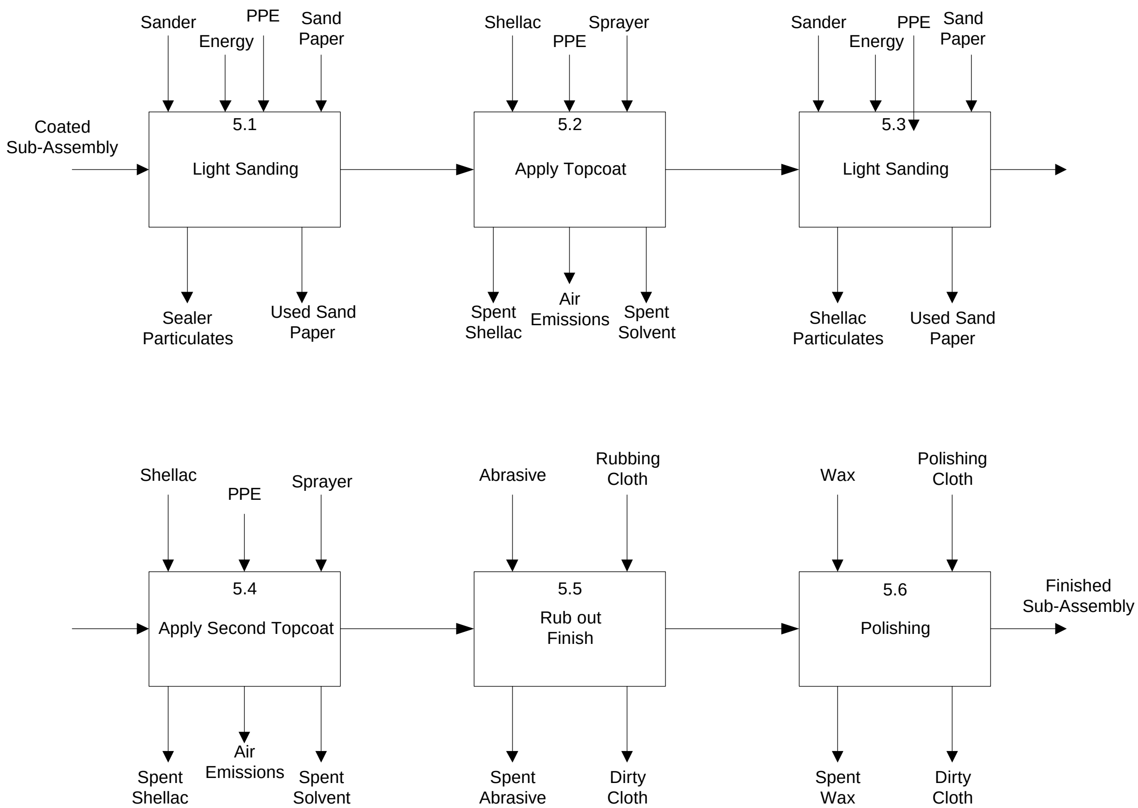
5.5 Rub out finish

Rubbing consists of the application of an abrasive in conjunction with a lubricant to level the topcoat.

5.6 Polishing

Polishing consists of the application of soft abrasives or possibly only waxy ingredients to increase the gloss. This is the final process finishing step.

5. Finishing


Sander
PPE
Energy
Sand Paper
Coated Sub-Assembly
5.1
Light Sanding
Sealer Particulates
Used Sand Paper
Shellac
Sprayer
PPE
5.2
Apply Topcoat
Spent Shellac
Air Emissions
Spent Solvent
Sander
PPE
Energy
Sand Paper
5.3
Light Sanding
Shellac Particulates
Used Sand Paper
Shellac
PPE
Sprayer
5.4
Apply Second Topcoat
Spent Shellac
Air Emissions
Spent Solvent
Abrasive
Rubbing Cloth
5.5
Rub out Finish
Spent Abrasive
Dirty Cloth
Wax
Polishing Cloth
5.6
Polishing
Finished Sub-Assembly
Spent Wax
Dirty Cloth

Map 6.0: Final Assembly

6.1 Place furniture sub-assemblies in jig

The sub-assemblies are generally held together in some sort of a jig or merely clamped in place.

6.2 Connect sub-assemblies together

The sub-assemblies can be connected together using adhesives containing solvents, or nailed together using a power nailer, or screwed together using wood screws, or bolted together using bolts and nuts, or any combination of the above. As an example the process map 6.2, shows the sub-assemblies being glued together.

6.3 Inspect final product

The furniture is inspected for any damage, imperfections, or missing pieces.

6.4 Repair any problems

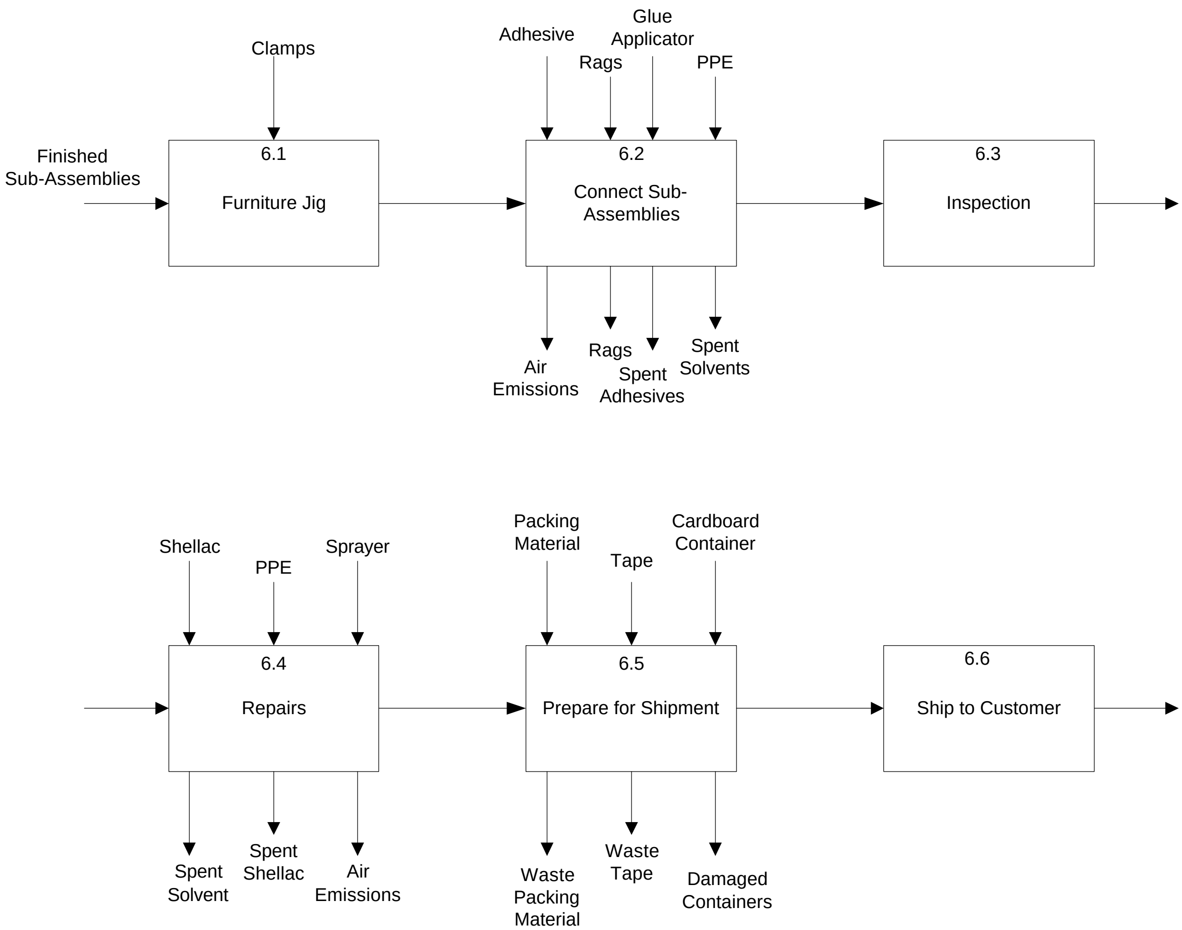
This can included a variety of tasks such as filling in holes, refinishing an area of the furniture, or replacing damaged sub-assemblies. As an example the process map 6.4, shows the furniture having an additional coating of shellac. The furniture would most likely then be rubbed out and polished as shown in steps 5.5 and 5.6.

6.5 Prepare for shipment

Generally furniture is packed in a cardboard container with some sort of material to protect it from damage during shipment.

6.6 Ship to customer

6. Final Assembly



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Wood Working Shops Regulatory and Pollution Prevention Guidance and Other Resources

GENERAL REGULATORY GUIDANCE FOR NEW MEXICO SMALL BUSINESSES

The purpose of this briefing paper is to assist small businesses in New Mexico in trying to understand the environmental regulatory requirements associated with doing business by giving a general overview. It is not intended to be a substitute for actual regulations. Businesses are responsible for operating their business in full compliance of the law (regulations). Each bureau in the New Mexico Environment Department (NMED) have staff available that can help you directly in understanding what is expected of your business from a regulatory point of view. It is in your best interest to contact the appropriate bureau if you have questions.

Periodically the Pollution Prevention (P2) Program in NMED will issue specific guidance briefing papers as an attachment to this document for certain businesses. These will be designed to provide additional information to a specific business. For information call the NMED Pollution Prevention Program staff at 505-827-0677 or the Technical Resource Center in Albuquerque at 505-843-4251.

AIR EMISSION REGULATIONS:

The EPA, in an attempt to control air pollution through regulations, has created a set of rules with many acronyms. Since businesses can come across these acronyms in many publications, they are listed below:

NESHAP:	National Emission Standards for Hazardous Air Pollutants
NAAQS:	National Ambient Air Quality Standards
HAP:	Hazardous Air Pollutants
TAP:	Toxic Air Pollutants
OEL:	Occupational Exposure Limits
VOC:	Volatile Organic Compounds
MSDS:	Material Safety Data Sheet
CTG:	Control Techniques Guidelines
MACT:	Maximum Achievable Control Technology
BACT:	Best Available Control Technology
GACT:	Generally Available Control Technology
RACT:	Reasonably Available Control Technology

Much of the national strategy for controlling air pollution centers around the NAAQS. These standards set limits for the concentration in the ambient (outdoor) air of the six most common air pollutants: Ozone, Carbon Monoxide, Particulate Matter, Sulfur Dioxide, Nitrogen Dioxide, and Lead.

The EPA has established industry based regulatory requirements for the most serious air pollutants, such as HAPs. In many cases the EPA has also established Control Techniques Guidelines that require industries to use certain technologies, such as MACTs.

Any business that has the potential of releasing pollutants to the ambient (outdoor) air, such as VOCs, HAPs, or Criteria Pollutants may be subject to the Air Quality Regulations depending on the amount of pollutants being released. These pollutants are used to determine if a facility is a major or minor source of air pollution and whether or not a business will need an Air Quality Permit. A major source is determined as a function of the amount of HAPs or Criteria Pollutants a business has the potential to emit. For HAPs it is 10 tons per year of any single HAP or 25 tons per year of the total HAPs. For the Criteria Pollutant it is 100 tons per year of any criteria pollutant. In addition the State of New Mexico has added TAPs as a category to be regulated. Some businesses that would normally be considered a major source can be classified as a minor source by changing the way they conduct their business. Businesses classified as a major source have significant regulatory requirements such as annual fees, maintaining progress reports, records, and a compliance schedule, monitoring emission limits, as well as the possible requirement to have specific control technology installed (MACT, GACT, or RACT). All major sources are required to obtain a Title V Permit. It is generally desirable for a business not to be classified as a major source. An EPA document "Potential to Emit, A Guide for Small Businesses" (EPA-456/B-98-003) is available from the EPA and it may help you to understand Air Quality Regulations.

The State of New Mexico, in addition to HAPs and Criteria Pollutants, has also generated regulations on Toxic Air Pollutants (TAPs) with OELs. These basically limit businesses from allowing TAPs to be emitted to the outside air around their building. OSHA regulates the same kinds of exposure limits inside of a building.

Due to the complexities of Air Quality Regulations, the harm air emissions cause to the environment, and in many cases the high costs associated with "end of the pipe" control technology, it is in the best interest of any business to evaluate their operations with the ultimate goal of eliminating all air pollutants as much as possible.

What all this means is, with few exceptions, the Air Quality Regulations that apply to your business will mostly be determined by what your business does. The best way to find out what air quality regulations apply to your business is to contact the New Mexico Environment Department (NMED) Small Business Assistance Program (SBAP) at 1-800-810-7227. Businesses that are located in Bernalillo County are locally regulated with respect to air emissions. For assistance you need to call the City of Albuquerque/Bernalillo Air Quality Assistance Program (AQAP) at 505-768-1964.

HAZARDOUS WASTE REGULATIONS:

Any business that generates waste that is classified as "listed" or "characteristic" in RCRA must deal with this waste as outlined in the New Mexico Hazardous Waste Regulations. The EPA has generated a list of chemicals that are considered hazardous. They have also stated that certain materials that exhibit a hazardous characteristic (ignitibility, corrosivity, reactivity, or toxicity) should be considered hazardous. To determine which products used in your business contain hazardous material, contact either the EPA or the New Mexico Hazardous Waste Bureau. In some cases this information will be contained on the Material Safety Data Sheet (MSDS) that came with the product.

It is important to understand that any product that contains "listed" or "characteristic" material is only regulated by the hazardous waste regulations when it becomes a waste. Examples are when the product is no longer to be used for its intended purpose and is to be gotten rid of, the shelf life of the product has expired, the product leaks from a piece of equipment, or the product is accidentally spilled. It is also important to note that any product to be discarded that contains one or more hazardous materials is also hazardous waste. Examples are hazardous waste mixed with solid waste, rags to clean up spilled hazardous materials, or wastewater from a process that used a hazardous material.

All businesses that generate hazardous waste are classified based on the quantities of hazardous waste they generate monthly. The three classifications are:

1. Conditionally Exempt Small Quantity Generator (CESQG): generates less than 220 pounds or 100 kilograms of hazardous waste per month. A CESQG cannot accumulate more than 2,200 pounds or 1,000 kilograms of their combined hazardous waste at any one time. Usually this amounts to about one-half of a 55-gallon drum. CESQG's may dispose of their hazardous waste by mixing it with a solid waste, assuming there are no free liquids in the waste, and taking it to a permitted municipal solid waste (MSW) landfill. You need to verify that the MSW landfill will accept the mixed waste.

2. Small Quantity Generator (SQG): generates between 220 pounds and 2,200 pounds or 100 kilograms and 1,000 kilograms of hazardous waste per month. No more than 13,200 pounds or 6,000 kilograms may be stored on site any longer than 180 days and must be disposed of at a facility permitted to recycle, treat, store, or dispose of hazardous waste.

3. Large Quantity Generator (LQG): generates more than 2,200 pounds or 1,000 kilograms of hazardous waste per month. Hazardous waste with no weight limit may be accumulated for no more than 90 days unless permitted by the State.

Each classification has different record keeping, manifesting, and reporting requirements. Since a businesses' classification is based on a monthly generation, it is possible to move from one classification to another on a regular basis. All generators of hazardous waste are required to register with the Hazardous Waste Bureau and pay a generator fee based on their classification.

The Hazardous Waste Bureau has an established outreach program that can assist any business in determining their classification and the regulatory requirements that go with it. You may contact the Bureau at 505-827-1511.

It is important for any business generating hazardous waste to understand that RCRA has established a "cradle to grave" responsibility for the generator of said waste. In effect this means that if the hazardous waste the business generates contaminates soil, surface water, or ground water in any manner until it is properly disposed of, the business will be held responsible for the clean up of the contamination. The cost of clean up could be substantial. It is therefore imperative for any business to make sure trained employees handle their hazardous material properly to avoid accidental spills, to only use permitted haulers, to make sure their waste goes to a RCRA permitted facility, to properly store their hazardous waste, and never dispose of their hazardous waste at their facility. It is also advisable to seal the floor of the facility if you use a hazardous material in a liquid form in your operation.

The best way for any business to avoid the costs of contamination clean up is to eliminate the use of hazardous materials in their operation. A complete understanding of how a business conducts its processes is required to determine the best way to eliminate or at least reduce the amount of hazardous waste being generated. A Pollution Prevention Program has been established at the New Mexico Environment Department to assist businesses in evaluating their processes. The number to call at NMED is 505-827-0677 or you can call the Technical Resource Center in Albuquerque at 505-843-4251.

The New Mexico Environment Department has a 24-hour emergency reporting number that can be called in case of an incident dealing with hazardous material. The number is 505-827-9329.

WASTEWATER REGULATIONS:

Any business that generates wastewater that contaminates surface water or ground water can be held responsible for the cost of cleanup. If the contaminant is a RCRA “listed” or “characteristic” waste above the concentration value allowed, then the wastewater is by definition a hazardous waste and must be dealt with under New Mexico Hazardous Waste Regulations. Placing hazardous wastewater directly onto or into the ground is strictly prohibited. Since the cost of cleaning up either surface water or ground water can be substantial, it is in the best interest of any business to eliminate, minimize, and/or control its wastewater.

If non-hazardous wastewater is being discharged so that it can move directly or indirectly into ground water (e.g. septic system, dry sump, etc.) a business is required to file a “Notice of Intent to Discharge” with the New Mexico Ground Water Bureau in accordance with the NM Water Quality Act. The Bureau will then determine if the business requires a Discharge Permit. In some cases the business may be required to request a NPDES Permit from the EPA if the discharge is to surface water.

If non-hazardous wastewater is being place into a sewerage system a business is required to notify the local Publicly Owned Treatment Works (POTW) the nature and concentrations of the contaminants in the wastewater. Attached is a listing of the New Mexico Publicly Owned Treatment Works. Wastewater that has been determined to be hazardous is prohibited from being placed in any sewerage system.

Business need to be aware that even though their wastewater going into the sewerage systems is allowed by the POTW, this does not necessarily relieve them of potential contamination liability. A good example is the case in which a sewer pipe leaks and the wastewater contains hazardous constituents, below RCRA levels, that were generated by your business. Over time the wastewater seeps into the ground water and the concentrations exceed State or Federal water quality standards. If the contamination source can be traced back to your business, you could be liable for the cost of cleanup. Most businesses will find that the costs associated with proper handling of their wastewater are far cheaper than the cost of cleaning up ground water. Prevention is an inexpensive insurance policy.

Another potential source of contamination is through the foundation of your building. An example would be where a business handles hazardous material as a regular part of doing business and a spill occurs that seeps through cracks in the floor. Eventually it reaches ground water and is detected through monitoring of the ground water. Assuming it can be traced back to your business, you could then be held responsible for the cost of clean up.

Any business that generates wastewater from sources other than lavatories, cafeterias, etc., should evaluate ways in which the wastewater can be eliminated, reduced, recycled, reused or handled in such a fashion that the risk of liability for contaminating surface water or ground water is virtually zero. This should include dealing with hazardous waste and all wastewater in a proper fashion, sealing cracks in floors, training of employees, and possible treatment of their wastewater before it leaves their premises.

If you have any questions you can contact the Ground Water Bureau at 505-827-2965 and the Surface Water Bureau at 505-827-0187.

OSHA REGULATIONS:

Every business is required to provide a safe and healthy working environment for its employees. The Occupational Health and Safety Bureau (OHSB) is responsible for making sure businesses are in compliance with OSHA regulations. OSHA regulates permissible exposure limits (PEL's) for employees exposed to certain air contaminants in the workplace. The Bureau conducts regular inspections of facilities and evaluates the establishment for safety and health compliance. The OSHB has a consulting program to assist facilities to be in compliance with OSHA regulations. The service is free of charge to New Mexico small businesses. Attached is a copy of "Frequently Asked Questions" about the program, a copy of "General Health & Safety Issues", as well as a poster you are encouraged to display at your facility. They can be contacted at 505-827-4230.

UNDERGROUND STORAGE TANK REGULATIONS:

Any business that stores a regulated substance in an underground storage tank that is not directly connected to some sort of processing operation may or may not be regulated by the Underground Storage Tank Bureau (USTB). If the substance is a hazardous waste, it is regulated under RCRA and you would need to contact the Hazardous Waste Bureau. Since there are a variety of circumstances whereby UST regulations have jurisdiction, it is best to contact the USTB directly for guidance. They can be contacted at 505-827-0188.

SOLID WASTE REGULATIONS:

The Solid Waste Bureau (SWB) deals primarily with regulating solid waste facilities (non-hazardous waste landfills, transfer stations, and recycling facilities) and illegal dumping. The only responsibility for a small business is to see that their non-hazardous waste is either sent to a recycler or to a permitted landfill by a registered solid waste hauler. For information the SWB can be contacted at 505-827-0197.

SPECIFIC REGULATORY GUIDANCE FOR WOOD FINISHING SHOPS

This briefing paper is intended to be attached to the "General Regulatory Guidance for New Mexico Small Businesses" to provide additional regulatory information specifically to "Wood Finishing Shops". It is not intended to be a substitute for actual regulations. If you have questions concerning your regulatory responsibilities, you are encouraged to contact the appropriate bureau.

AIR EMISSION REGULATIONS:

Attached is a letter from the Environment Department explaining the finalized regulation from the EPA, which limits emissions of hazardous air pollutants (HAPs) from wood furniture manufacturing operations. Also attached is a copy of the "Initial Notification Report" as well as a copy of the "Monthly Recordkeeping Worksheet" and a "Rolling 12 Month Recordkeeping Worksheet" that will help you in maintaining the necessary records. If you have any questions you can contact the NMED Small Business Assistance Program at 1-800-810-7227 or the City of Albuquerque Air Quality Assistance Program at 505-768-1964 if your business is located in Bernalillo County.

HAZARDOUS WASTE REGULATIONS:

The most common hazardous waste comes from solvent-based products used in stripping wood (methylene chloride, xylene, acetone, ethyl acetate, and toluene), coating wood (lacquers, stains, paints, and thinners), and cleaning spray guns (solvents and thinners). Paint booth filters may also be hazardous depending on what's in the paint (such as chromium, nickel, or lead). Other wastes to consider are absorbents used to soak up leaks or spills, shop rags, and aerosol cans. If you have questions please contact the NMED Hazardous Waste Bureau at 505-827-1511.

WASTEWATER REGULATIONS:

There is nothing unique in wood finishing shops that isn't already covered in the General Regulatory
Guidelines.

OSHA REGULATIONS:

Attached to this briefing paper is a document entitled "Woodworking Shops" that can assist you in being compliant with OSHA.

UNDERGROUND STORAGE TANK REGULATIONS:

There is nothing unique in wood finishing shops that isn't already covered in the General Regulatory Guidelines.

SOLID WASTE REGULATIONS:

There is nothing unique in wood finishing shops that isn't already covered in the General Regulatory Guidelines.

Pollution Prevention and Regulatory Compliance Contacts for New Mexico

STATE AGENCIES:

Green Zia Environmental Excellence Program

Pat Gallagher
NM Environment Department
Office of the Secretary
PO Box 26110
Santa Fe, NM 87502
505-827-0677
FAX: 505-827-2836
E-mail:
pat_Gallagher@nmenv.state.nm.us

Air Quality Bureau

Steve Dubyk
NM Environment Departrnent
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-2859
FAX: 505-827-0045
E-mail:
steve_dubyk@nmenv.state.nm.us

Hazardous Waste Bureau

Debby Brinkerhoff
NM Environment Department
2044 Galisteo
P.O. Box 26110
Santa Fe, NM 87502
505-827-1511
FAX: 505-827-1833
E-mail:
debby_brinkerhoff@nmenv.state.nm.us

Occupational Health & Safety Bureau

Debra McElroy
525 Camino de los Marquez, Suite 3
P.O. Box 26110
Santa Fe, NM 87502
505-827-4230
FAX: 505-827-4422
E-mail:
debra_mcelroy@nmenv.state.nm.us

Ground Water Quality Bureau

Industrial Waste Team Leader
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-2900
FAX: 505-827-2965

Solid Waste Bureau

Phillip Westen
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-827-0559
FAX: 505-827-2902
E-mail:
phillip_westen@nmenv.state.nm.us

Underground Storage Tank Bureau

Joyce Shearer, Ph.D.
NM Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
505-476-3779
FAX: 505-827-0310
E-mail:
joyce_shearer@nmenv.state.nm.us

City of Albuquerque

Public Works Department

Bob Hogrefe
Southside Water Reclamation Plant
4210 Second Street, SW
Albuquerque, NM 87185
Ph: 873-7030
Fx: 873-7087
Rhogrefe@cabq.gov

Environmental Health Department

John Liberatore
EHD/APCD
P.O. Box 1293
Albuquerque, NM 87103
505-768-1964
FAX: 505-768-2617
E-mail: jliberatore@CABQ.gov

New Mexico State University

WERC P2 Center
1155 University Blvd., SE
Albuquerque, NM 87106
505-843-4251
E-mail: chrisc@werc.net

State of New Mexico Wastewater Treatment Facility Contacts

POTW FACILITY	PHONE NO.	CONTACT PERSON
ALAMOGORDO, CITY OF	(505)439-5643 (505) 437-4530	Jose Miramontes
ALBUQUERQUE, CITY OF	(505)873-7040	Charles Bowman, WW Utilities Div. Director
ANTHONY W & SD	(505)882-3922	Pat Banegas
ARTESIA, CITY OF	(505)746-2122	Ernest Thompson, Mayor
AZTEC, CITY OF	(505)334-8664	Gary Spickelmier
BELEN, CITY OF	(505)864-6081	Robert Rimorin
BERNALILLO, TOWN OF	(505)867-2307	Nick Tobey
BLOOMFIELD, CITY OF	(505)632-8474	Casimiro Ruybalid
CANNON AIR FORCE BASE		Lynn Steinle
CAPITAN, VILLAGE OF	(505)354-2247	Terry Cox
CARLSBAD, CITY OF	(505)887-5412	Gilbert Ybarbo
CARRIZOZO, TOWN OF	(505)354-2247	Steve Sale
CHAMA, VILLAGE OF	(505)756-2184	Tony Gonzales, Mayor
CIMARRON, VILLAGE OF	(505)376-2232	Lino Paiz
CLAYTON, TOWN OF		
CLOUDCROFT, VILLAGE OF	(505)682-2411	David Venable, Mayor
CLOVIS, CITY OF	(505)769-7865	Robert Challender
CONCHAS STATE PARK	(505)868-2900	Leo Wilson
CUBA, VILLAGE OF	(505)289-3864	Faustino Gallegos
DEMING, CITY OF	(505)546-8848	Louis Jenkins, Public Works Director
DEPARTMENT OF ENERGY, LANL AND U OF CA	(505)665-7855	Charles Barnett
DES MOINES, VILLAGE OF		
DEXTER, TOWN OF	(505)734-5482	Joe Alvarez
EAGLE NEST, VILLAGE OF		
ECO Resources #3	(505)891-1223	Donald Thymes
ECO Resources # 2	(505)891-1223	Donald Thymes
ESPANOLA, CITY OF	(505)753-4740	Frank Naranjo
ESTANCIA, TOWN OF	(505)384-2302	
EUNICE, CITY OF	(505)394-2576	Willie Luster
FARMINGTON, CITY OF	(505)599-1315	Tom Wethington, WW Director
FORT SUMNER, VILLAGE OF	(505)355-2401	John McMillan, Mayor
GALLUP, CITY OF	(505)863-1210	Ray Espinoza
GRANTS, CITY OF	(505)287-7927	Willie Alire, City Manger
HAGERMAN, TOWN OF	(505)752-3201	Robert Romero
HATCH, VILLAGE OF	(505)267-3021	Clifford Browning
HOBBS, CITY OF	(505)397-9315	James Tulk
HOLLOMAN AIR FORCE BASE	(505)479-7080	Meryle F. Stueve, TSgt, USAF

JAL, CITY OF	(505)395-2222	Fred Seifts
JEMEZ SPRINGS, CITY OF	(505)829-3540	David Sanchez, Mayor
KIRTLAND AIR FORCE BASE HQ AFSWC/CC		
LAGUNA, PUEBLO OF		Frank Analla
LAS CRUCES, CITY OF	(505)528-3599	Gilbert Morales
LAS VEGAS, CITY OF	(505)454-1401	Andrew R. Jaramillo
LOGAN, VILLAGE OF	(505)487-2239	Julian Cordova
LORDSBURG, CITY OF	(505)524-8273	Alex De La Garza
LOS ALAMOS, BAYO PLANT	(505)662-8147	Paul Pizzoli, Utilities Director
LOS LUNAS, VILLAGE OF	(505)865-9689	Louis Huning, Mayor
LOVING, VILLAGE OF		
LOVINGTON, CITY OF	(505)396-2884	Bob Carter
MAGDALENA, VILLAGE OF	(505)854-2261	Vida M. Trujillo
MAXWELL, VILLAGE OF	(505)375-2752	Leroy Quintana, Mayor
MELROSE, VILLAGE OF	(505)253-4274	Bobby Bennett, Mayor
MORA MUTUAL DOMESTIC WATER & SEWER. WKS.	(505)387-5401	Manuel B. Alcon President
MORIARTY, CITY OF	(505)832-6257	Rosendo Saiz
MOUNTAINAIR, TOWN OF	(505)847-2321	Debra Kelly
ORGAN WATER AND SEWER ASSOCIATION	(503)825-5423	Charles Jefferson
PECOS, VILLAGE OF	(505)757-6591	Joseph Cyde Baca, Mayor
PORTALES, CITY OF	(505)359-3152	Thomas Howell
QUESTA, VILLAGE OF	(505)586-0694	Mike Cordova
RAMAH DOMESTIC UTILITIES	(505)722-4366	Ron Morsbach
RATON, CITY OF	(505)445-2292	Mike Baca
RED RIVER, TOWN OF	(505)754-2277	Jake Pierce, City Administrator
RESERVE, VILLAGE OF	(505)533-6581	Lonnie Graham
ROSWELL, CITY OF	(505)624-6700	Roger Cooper, PE, Dir of Public Works
ROY, VILLAGE OF	(505)485-2204	Alex Deschamps
RUIDOSO-RUIDOSO DOWNS REGIONAL WWTP	(505)258-4014	Gary Jackson, Village Manager
SAN JON, VILLAGE OF	(505)576-2922	Chris Molyneaux
SANTA FE, CITY OF	(505)984-6509	Qustandi Kassisieh
SANTA ROSA, CITY OF	(505)472-3331	Gerald Anaya,Water & Sewer Superintendent
SANTA TERESA SERVICES COMPANY	(505)589-0906	Charles Crowder
SILVER CITY, TOWN OF	(505)388-4981	Stan Snider
SOCORRO, CITY OF	(505)835-0240	Pat Salome, City Clerk
SPRINGER, TOWN OF		
SUNLAND PARK, CITY OF	(505)589-1979	Mark Boling
TAOS, TOWN OF	(505)758-8401	Mark Swan, Supervisor
TATUM, TOWN OF	(505)392-7412	F. L. (Roy) Miller
TEXICO, TOWN OF	(505)482-3314	Mathew Meeks

THOREAU WATER AND SANITATION	(505)862-7136	Vidal Brown
TRUTH OR CONSEQUENCES, CITY OF	(505)894-7331	Quentin Drunzer, City Manager
TUCUMCARI, CITY OF	(505)461-3451	Bernadette Moya, City Manager
TULAROSA, VILLAGE OF	(505)585-2771	Margaret Gonzales, Village Clerk
TWINING, W & SD	(505)776-8845	Joe Harvey
VAUGHN, TOWN OF	(505)392-1266	F.L. Miller - Con. Engineer
WAGON MOUND, VILLAGE OF	(505)666-2408	Alfred Romero Mayor

INITIAL NOTIFICATION REPORT

Applicable Rule: 40 CFR 63, Subpart JJ - National Emission Standards for Wood Furniture Manufacturing Operations

Notification reports are due to EPA Region 6 by September 3, 1996.

1. Print or type the following information for each plant in which Wood Furniture Manufacturing Operations are performed:

Owner/Operator/Title ____

Street Address ____________________________ Quad ____ Phone (___)

City_________________________State_________________________Zip Code
Plant Name____Phone (___)
Plant Contact/Title
Plant Street Address (if different than above)
Quad
City________________________State_______________________Zip
Code____________

2. Briefly describe the wood furniture manufacturing process used at your facility:

3. Estimate of annual use of coatings, adhesives, cleaning, and washoff materials:

_gallons

4. a. If #3 is less than 3000 gallons, then you may be exempt from this regulation. This form, along with materials usage recordkeeping can serve as the required documentation of your exemption.

Exempt

b. If #3 is more than 3000 gallons, please indicate (x) your anticipated compliance approach for meeting the requirements of this regulation:

Compliant Coatings______ Averaging

Control Device_________ Combination

INITIAL NOTIFICATION REPORT (continued)

5. Certification by responsible official.

A Responsible Official can be:

* The President, Vice-President, Secretary, or Treasurer of the Company that owns the Plant

* The Owner of the Plant

* The Plant Engineer or Supervisor

* A Government Official if the Plant is owned by the Federal, State, City , or County Government; or

* A ranking military officer if the Plant is located on a military base

I, the undersigned, certify the information contained in this report to be accurate and true to the best of my knowledge.

_______________________________________ ______________________

(Signature of Responsible Official) (Date)

____

(Print or Type Name) (Title)

6. Mail this form to:

NMED Air Quality Bureau
Small Business Assistance Program
PO Box 26110
Santa Fe, New Mexico 87502

If you have any questions filling out this form, please contact the Small Business Assistance Program (SBAP) at 1-800-810-7227.

State of New Mexico
ENVIRONMENT DEPARTMENT
Harold Runnels Building
1190 St. Francis Drive, P.O. Drawer 26110
Santa Fe, New Mexico 87502-0110

GARY E. JOHNSON
Governor

MARK E. WEIDLER
Secretary

To: Wood Furniture Manufacturers

March 1996

On December 7, 1995, the United States Environmental Protection Agency (USEPA) finalized a regulation which limits emissions of hazardous air pollutants (HAPs) from wood furniture manufacturing operations. These HAPs are regulated because they have the potential to cause health problems. The USEPA estimates that with this regulation Americans will reduce toxic air emissions by 33,000 tons annually. Of the HAPs listed by USEPA; toluene, xylene, methanol, methyl ethyl ketone, methyl isobutyl ketone and formaldehyde are the most commonly used chemicals in wood surface coating and gluing operations.

The new regulation:

- ♦ Applies to many new and existing manufacturers of wood furniture or wood furniture components. See the other side of this page to determine if the regulation applies to your business.

- ♦ **Allows exemptions**. Small manufacturers using less than 250 gallons per month or less than 3000 gallons per rolling 12 month period of all of finishing materials, adhesives, cleaning solvents, and wash-off solvents combined, can be exempted from this regulation, if they can document their materials usage. In order to begin documenting any exemption, please complete the enclosed “Initial Notification Report Form” and send it back to the Small Business Assistance Program (SBAP). We are constructing a list of exempted wood furniture manufacturers and will be informing the Environment Department Air Quality Bureau Enforcement Section and the USEPA of your exemption status. Enclosed is a “Monthly Recordkeeping Worksheet” and a “Rolling 12 Month Recordkeeping Worksheet” that will help you maintain the necessary records to help your business document any eligible exemptions. Along with monthly recordkeeping, your business should maintain all purchase receipts of finishing materials, adhesives and solvents.

- ♦ Requires all wood furniture manufacturers which are not exempt to send an “Initial Notification Report Form” to EPA Region 6 by **September 3, 1996**. Additional reporting and work practice requirements also apply. A copy of the initial notification report form is enclosed. Please send the form to the SBAP by September 3, 1996 and we will fax it to EPA.

This informational package has been assembled by the SBAP, of the New Mexico Environment Department Air Quality Bureau, to help businesses comply with this new regulation. The primary purpose of the SBAP is to assist small businesses which are or will be subject to requirements under the Clean Air Act or New Mexico Air Quality Regulations. The goal of the SBAP is to help businesses comply with federal and state air quality regulations through education and technical assistance, not enforcement. Services are free. Please see the enclosed brochure. If you have any questions or would like to use our services please contact the SBAP at 1-800-810-7227.

40 CFR Part 60
Subpart JJ - National Emissions Standards for
Wood Furniture Manufacturing Operations

I. **Who does this new regulation apply to?**

This regulation applies to businesses operating under any of the following standard industrial classification codes.

SIC	***Description***
2434	Wood Kitchen Cabinets (Includes Vanities, Bathroom & Other)
2511	Wood Household Furniture, Not Upholstered (Includes Garden)
2512	Wood Household Furniture, Upholstered
2517	Wood TV, Radio, Phono, and Sewing Machine Cabinets
2519	Household Furniture Not Elsewhere Classified (Includes Willow, Wicker, Reed)
2521	Wood Office Furniture
2531	Public Building and Related Furniture
2541	Wood Office and Store Fixtures, Partitions, Shelving, and Lockers
2599	Furniture and Fixtures, Not Elsewhere Classified
5712	Furniture Stores Manufacturing Custom Cabinets

II. **What is required?**

A. The following businesses are required to submit an initial notification report form (enclosed) to USEPA Region 6 by September 3, 1996 in accordance with 40 CFR § 63.806:

1. Businesses using more than 250 gallons per month, for every month, or more than 3000 gallons per rolling 12 month period of finishing materials, adhesives, cleaning solvents, and wash-off solvents combined; **and**

2. Businesses using more than 5 tons of a single HAP or more than 12.5 tons of HAPs combined per rolling 12 month period.

B. For businesses meeting the criteria in A 1. or A 2., air permitting, reporting, and work practice standards requirements will also apply.

C. For those businesses that are smaller than those described in A 1. or A 2., records of monthly material usage must be kept for five years.

Note: You may be able to reduce HAP emissions, while maintaining current production, with the use of pollution prevention techniques or by using compliant coatings. Such prevention options may also help your business reduce its materials usage costs. Please contact the Small Business Assistance Program at 1-800-810-7227 (in Bernallilo County call 505-768-1964) if you would like to use our services or receive more information.

November 15, 1995

FACT SHEET

FINAL AIR TOXICS REGULATION FOR WOOD FURNITURE MANUFACTURING OPERATIONS

<u>TODAY'S ACTION...</u>

- The Environmental Protection Agency (EPA) is today issuing a final rule to reduce air toxics emissions from wood furniture manufacturing operations. Wood furniture manufacturing facilities, including cabinet shops and residential and industrial furniture makers, emit air toxics during finishing, gluing, and cleaning operations.

- The EPA final rule is the result of successful partnerships among major stakeholders; the rule was developed largely through a regulatory negotiation with representatives from the furniture manufacturing industry (including small business), the coatings industry, environmental groups, and State and local air pollution agencies.

- The final regulation demonstrates the EPA commitment to making pollution prevention an integral part of regulatory actions whenever possible; the control requirements outlined in the rule are based solely on pollution prevention options instead of end-of-pipe controls.

<u>WHAT ARE THE HEALTH AND ENVIRONMENTAL BENEFITS?</u>

- The EPA final rule will reduce emissions of air toxics, such as toluene, xylene, methanol, and formaldehyde, by 33,000 tons annually, representing a 60 percent reduction from current levels. Exposure to these and other air toxics associated with wood furniture manufacturing can cause adverse health effects, including eye, nose, throat, and skin irritation; damage to the heart, liver, and kidneys; and reproductive effects.

<u>BACKGROUND</u>

- Under the Clean Air Act (CAA) Amendments of 1990, the EPA is required to regulate emissions of 189 listed toxic air pollutants. On July 16, 1992, the EPA published a list of source categories that emit one or more of these air toxics. For listed categories of "major" sources (those that emit or have the potential to emit 10 tons/year or more of a listed pollutant, or 25 tons or more of a combination of pollutants), the CAA requires the EPA to develop standards that will require the application of very stringent controls known as maximum achievable control technology.

- On July 16, 1992, the EPA published a list of industry groups (known as "source categories") to be regulated, which included major sources of wood furniture manufacturing operations.

WHO WILL BE AFFECTED BY THE FINAL REGULATION?

- The EPA final rule applies to about 750 wood furniture manufacturing facilities nationwide.

WHAT ARE THE MAIN COMPONENTS OF THE EPA FINAL RULE?

- The EPA final rule is based on two requirements--emissions limits and work practice standards. The final rule provides flexibility to industry by offering a choice of four different compliance options.

- The final rule limits the amount of hazardous air pollutants (HAP) that can be contained in the coatings used for finishing, gluing, and cleaning operations. The emissions limits can be met through using a variety of coatings that contain lower quantities of HAP.

- The work practice standards will reduce waste and evaporation of HAP. Good housekeeping measures such as keeping containers of materials closed, periodic training of operators who use solvent and/or coatings, and performing periodic inspections to locate and repair leaking equipment are required by the work practice provisions. In addition, the rule requires use of spray equipment which is believed to be more efficient in applying coatings. The work practice standards also require accounting for the quantity of solvent used for cleaning and washoff, the number of times each piece of equipment is washed off, and the reason for the washoff. These practices will focus attention on quality control issues that will result in the minimization of HAP and volatile organic compound emissions.

- The EPA's final rule outlines the monitoring, recordkeeping, and reporting requirements.

HOW MUCH WILL THE RULE COST?

- The total industry-wide capital investment is estimated to be $7.0 million. The total nationwide annual cost is estimated to be about $15 million.

FOR MORE INFORMATION...

Anyone with a computer and a modem can download the rule from the CAA Amendments bulletin board of the EPA electronic Technology Transfer Network by calling (919) 541-5742 (look under "Recently Signed Rules"). For further information about how to access the board, call (919) 541-5384. For further information about the rule, contact Paul Almodovar of the EPA Office of Air Quality Planning and Standards at (919) 541-0283.

Pollution Prevention in Wood Finishing: Solvent

Eliminate - Reduce - Reuse - Recycle - Exchange

Quality vs.

An

In the wood furniture finishing industry, the largest source of environmental pollution and risk to workers' health is the **evaporation of organic solvents** used throughout the finishing process.

Due to the common use of spray techniques with low (~ 25%) transfer efficiency and flash drying techniques, almost 100% of the toxic solvents used to apply the coating chemicals evaporate into the surroundings. Furthermore, toxic particles resulting from over-spray and contaminated rags are often regulated as RCRA waste and must be disposed of properly, which is a **costly process**.

The **quality and market value** of a piece of furniture is directly tied to the finished surface and look. Higher quality pieces must undergo a greater number of coatings and subsequent drying processes in order to achieve a desired finish. This leads to greater volumes of solvent vapors and over-spray particles.

It is important to remember when considering the opportunity for pollution prevention, that it is the finished product that determines the piece's worth, not the procedure used to attain that product. In evaluating a process change, do not dismiss an idea that has not been used in the past. **Pollution prevention** within the wood finishing industry often involves changing the processes. This fact-sheet is meant to provide a resource on the hazards associated with solvents commonly employed in wood finishing processes, as well as a guideline for **pollution prevention opportunities** and technologies currently employed and available to the industry.

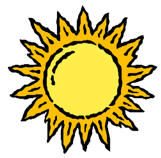
Sol

The top 10 solvents released into the atmosphere during various wood furniture finishing processes, in order of release volume, are **toluene**, **methanol**, **xylene**, **methyl ethyl ketone**, **acetone**, **N-butyl alcohol**, **1,1,1-trichloroethane (TCE)**, and **dichloroethane**. Most of these chemicals are volatile organic compounds (VOC's), highly flammable, and pose significant **human health risks**.

- Toluene is an aromatic, petroleum-based solvent that upon environmental release volatilizes in the lower atmosphere, reacting with other atmospheric components and sunlight to form ground-level ozone, the main component of smog and other air pollutants. Human inhalation or ingestion of toluene can result in headaches, weakness, memory loss, and may also affect kidney and liver functions.

- Methanol, a highly flammable alcohol, is readily absorbed by human gastrointestinal and respiratory tracts, where it is converted to formaldehyde and formic acid, making it toxic even in moderate doses. High doses can damage the central nervous system and cause blindness. Prolonged exposure can cause liver and blood damage. Environmentally, methanol evaporates into the atmosphere and reacts to form formaldehyde, contributing to the formation of various air pollutants and rain contamination.

- Xylene contributes to ground-level ozone formation and groundwater contamination due to its moderate soil



mobility. The human body rapidly absorbs xylene through skin contact, inhalation or ingestion. High-level, short-term exposure can cause skin, eye, nose, and throat irritation as well as impaired lung and memory function and potential changes in the liver and kidneys. Both long-term prolonged exposure and short-term high-level exposure can cause headaches, dizziness, and loss of muscle coordination.

- Methyl Ethyl Ketone (MEK) is a flammable liquid that after even moderate exposure can cause symptoms ranging from headaches, dizziness, and nausea to numbness in the fingers and nose and eventually unconsciousness. Repeated moderate to high-level exposure may damage the liver or kidneys. Vapors are irritating to the nose, skin, and throat, and may cause damage to the eyes. MEK released to the environment will evaporate into the lower atmosphere where it contributes to the formation of air pollutants.

- Acetone is both a volatile and flammable organic compound. In the lower atmosphere it can contribute to ozone formation. It is also irritating to the eyes, nose, and throat, and in large quantities can cause headaches, unsteadiness, drowsiness, vomiting, and respiratory depression.

- 1,1,1-trichloroethane (TCE), which degrades slowly in the lower atmosphere, can return to earth via rain. Once introduced into groundwater and soil it degrades very slowly, contaminating resources. Repeated contact with TCE may cause serious skin cracking and infection, as well as eye and respiratory irritation. High concentrations cause reversible liver and kidney dysfunction, central nervous system and respiratory depression, stupor, coma, and death. Lower concentration levels produce light-headedness, impaired coordination, drowsiness, convulsions, and throat irritation.

Pollution Prevention

When examining the opportunities to **reduce waste**, it is important to identify to needs and requirements of the target market. For mass-produced, lower-end furniture, such as some office and home furniture, there are several processes that utilize water-borne or hybrid water-borne coatings, which greatly reduce solvent vapors, though they make it harder to repair irregularities in the coating. If it is determined that all coatings are necessary to produce the desired appearance, there are still many **pollution prevention** and **cost reduction opportunities** which are possible.

- Operational Improvements:

√ Make production planning and scheduling changes. For example, identify blemishes before adding coatings.

√ Reduce the frequency of equipment cleaning to reduce the amount of solvent needed. Stain all products of one color at a time, or designating a certain spray configuration to a prevalent color. Schedule the production line so lighter batches are stained before progressively darker colors.

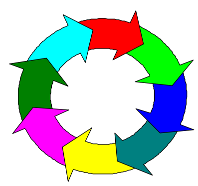
- Increased Transfer Efficiency:

Transfer efficiency is the percentage of coating particles that adhere to the furniture surface. In coating procedures such as brushing, wiping, rolling, and dipping, this efficiency is nearly 100%. These processes are they are fairly uncommon because they are labor and capital intensive. High-pressure spraying techniques are more common but less transfer efficient. There are several technologies available which can increase the transfer efficiency while still affording the ease of the spray gun system.

√ Use airless and air-assisted airless systems. These nearly double the transfer efficiency.

√ Explore the use of electrostatic spray systems, which spray negatively charged coatings at the positively charged wood.

√ Try high-volume low pressure spray systems (HVLP), which have higher transfer efficiencies than even the airless systems and increase the accuracy and speed.



- Alternative to the Spray Process:

√ Use ultraviolet (UV) - curable coatings that can be configured to add color or raise grain. However, only use this for non-flat pieces.

- Increasing Exhaust Filtration Capacity:

√ Retrofit a filtration device to existing spray booths in order to increase the capture of solvent vapors.

√ Use a biofiltration system made from organic matter. This system "digests" the organic solvent vapors and makes them harmless.

√ Reuse or clean paper or plastic filters.

- Increase Commitment to Pollution Prevention

√ Develop a policy a post it in a prominent location. Involve employees and hold training sessions.

√ Give employees incentives for good pollution prevention ideas.

- √ Organize a reference manual for staff that explains waste reduction and management procedures.
- √ Use inventory control to save money on duplicate purchases and to screen hazardous waste.
- √ Reuse and recycle everything you can. Provide clearly labeled bins and implement incentive programs.

Pollution Prevention can $ave You Money and