United States
Environmental Protection
Agency

Pollution Prevention Office
Washington, DC 20460

October 1989

EPA

Pollution Prevention News

Inside:

Your comments and letters are welcome!
Please write:
Pollution Prevention News
U.S. EPA
401 M Street SW (PM-219)
Washington, DC 20460

Editorial Staff
Priscilla Flattery, *Editor*
Gilah Langner

Editor's Corner

Since all good deeds begin at home, we want to let you know of our own progress at EPA in recycling and pollution prevention. We looked into the Agency's use of paper and we found good news and bad news. The good news is that since June of this year, EPA is no longer buying virgin paper (except for high-speed copiers and form bond). And, an estimated 90 to 95 percent of EPA's printing procurements through the Government Printing Office (GPO) are now using recycled paper.

In this, EPA is merely meeting its own minimum regulatory guidelines as issued by the Office of Solid Waste. OSW's guidelines specify minimum percentage requirements of recovered material in various types of paper. For example, OSW guidelines recommend a minimum 50 percent waste paper content for offset printing paper. Based on these standards, the Joint Committee on Printing (JCP) specifies acceptable paper stocks that federal agencies may use. JCP has recently added minimum waste paper content to its specifications. In its latest quarterly paper buy, JCP/GPO purchased 6 million pounds of paper for GPO printing with a minimum of 50% waste paper content.

Here's where the not-so-good news comes in. Once JCP establishes specifications for particular types of paper, a government agency cannot require a contractor to exceed the standard. Thus, in making its printing requests, EPA cannot stipulate that the printer use 80% or 100% recycled paper, even if such paper is available in the market for the same cost. EPA can only specify that each print job use a minimum of 50% recovered material.

There's more bad news. It is unclear whether other federal agencies are as far along as EPA in switching over to recycled paper. Still, although progress is slow, it seems to be happening. As Randall Bacon, lead printing specialist with EPA's Printing Office, says, "We had to learn what [recycled paper] was all about. And we had to teach GPO, and they in turn had to educate the JCP. We've gone through that learning curve now."

Next month, we'll report on EPA's in-house recycling efforts.

Forum

CFC Phase-Out: A Pollution Prevention Priority

by Bill Walsh, Greenpeace USA and Lucinda Sikes, U.S. Public Interest Research Group

It would be too optimistic to see a silver lining in the crisis of stratospheric ozone depletion, but the imminent phase-out of ozone depleting chemicals such as CFCs and methyl chloroform does hold outstanding potential to be the nation's premier pollution prevention initiative. No later than the year 2000, virtually all U.S. production of the solvent CFC-113 and possibly methyl chloroform is expected to cease in order to prevent further deterioration of the stratospheric ozone layer.

Many environmentalists worry that the phase-out of ozone depleting chemicals could result in an industry backslide into highly toxic chlorinated solvents. In an April *Federal Register* notice, EPA warned users of CFC-113 and methyl chloroform that the Agency "does not want producers and users to replace [them] with solvents which are also considered ozone depleters or probable human carcinogens [e.g.,

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Reports from EPA Offices

EPA Region 10

by C. Claire Rowlett
Waste Reduction Coordinator,
U.S. EPA, Region 10

Region 10's hazardous waste minimization program has worked with the Office of Solid Waste since 1987 to promote waste minimization program development. Until recently, regional activities have focused on a few major areas of program development: facilitating state program development; developing an ongoing EPA/state workgroup effort; promoting pollution prevention as a key component in Northwest efforts to assess waste management "needs," and improving the basic data with which to assess waste minimization potential.

The Region has helped promote state program development in several ways, including working with the states and EPA headquarters to develop a technical assistance funding base. As part of the first round of state technical assistance grants, the states of Idaho and Alaska were able to secure funding from EPA Headquarters. Region 10 helped the states develop and present a successful regional RCRA Integrated Training and Technical Assistance (RITTA) proposal which included a pilot project to provide technical assistance to targeted industries in the Pacific Northwest.

Region 10's efforts have closely linked waste minimization and SARA 104(k) capacity assurance. Specific accomplishments of this linkage include: sponsorship of two major symposia highlighting the linkage of waste minimization to the need for additional capacity as well as the overall priority of prevention among Northwest decision-makers; establishment of a four-state gubernatorially-appointed regional policy group known as the Pacific Northwest Hazardous Waste Advisory Council; and development of an approach to future waste minimization potential as part of the states' capacity assurance efforts. The policy level efforts and activities have reinforced the central role of hazardous waste minimization in the waste management hierarchy. The Region 10 Hazardous Waste Division is committed to incorporating the Pollution Prevention Policy Statement into its Superfund and RCRA programs.

These activities have created a baseline of success and a base regional hazardous waste minimization program within Region 10. New directions and activities are recommended to build upon this base, increase EPA/state collaboration, and institutionalize pollution prevention within the hazardous waste program. For further information, contact Claire Rowlett at (206) 442-1099.

FORUM
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methylene chloride, perchloroethylene, and trichloroethylene]." (543 Fed. Reg. 15229) Now experts for industry and the government working under the auspices of the United Nations Environment Programme (UNEP) have concluded that safe alternatives will be available for virtually all current uses of these solvents.

Bad Precedent

Our past experience in regulating CFC usage illustrates why it is necessary to treat the impending phase-out as a prevention initiative. In 1978 the United States Congress prohibited the use of CFCs as an aerosol propellant. The legislation contained no regulation of prospective alternative propellants, and much of the aerosol industry substituted hydrocarbons such as pentane, propane and butane. These gases are now known to contribute to the formation of ozone smog and the greenhouse effect. In the Los Angeles area, household aerosol usage is estimated to be the 12th largest source of hydrocarbon emissions The South Coast Air Quality Management District has now proposed banning hydrocarbons as aerosol propellants as part of the regional anti-smog plan.

The failure to foresee the consequences of the 1978 regulation led to increased health risks, environmental damage, and strain on local governments and on the aerosol industry, which may now be forced to undertake a second unanticipated production change in 10 years. Treating the phase-out of ozone depleters as a priority in the pollution prevention program will help ensure that the phase-out reduces overall risks to human health and the environment, and avoids shifting risks among environmental media and human populations — the unintended consequences of many pollution control programs. It will also allow chemical users forced by the phase-out to change production processes, to find safe alternatives for the long term. This will help firms avoid the uncertainty of future occupational health or environmental regulations.

Encouraging News

Large industrial users of CFC-113 and methyl chloroform are reporting excellent results with economical alternatives that sharply reduce — and in some cases eliminate — the use of heavily regulated chemicals. UNEP reports that more than 75% of current CFC-113 and a similarly high ratio of methyl chloroform use could be replaced with "no clean" production technologies, aqueous cleaning, and terpene solutions. These alternatives are proving more cost effective than switching to chlorinated solvents and installing appropriate control systems. For example, AT&T has announced that it will replace virtually all of its CFC-113 cleaning processes with closed-loop terpene systems by the mid-1990s. Other examples include:

- General Dynamics reports great success in meeting a zero discharge goal through the use of closed-loop, aqueous cleaning systems for virtually all metal cleaning involved in aircraft production. Company experts predict that the systems will prove more cost effective and energy efficient than continued use of chlorinated solvents, and that they are equally applicable to other transportation industries. (For information, contact Steve Evanoff at (817) 777-3772.)
- Northern Telecom has determined that perhaps up to 85% of its products can be manufactured using low solids fluxes that do not require cleaning. The balance of the products can probably be manufactured using new technologies such as inner gas soldering. Northern Telecom is engaged in technology transfer activities with small and medium size companies in the electronics industry and in international technology transfer through a new industry cooperative on CFC solvents. (For more information, contact Art Fitzgerald at (416) 566-3048.)

In their effort to meet a crisis that has its roots in the failure to plan effectively, many users of ozone-depleting chemicals are correctly concluding that reduced chemical use, not emissions control, is the future of industrial manufacturing. EPA should integrate this tremendous effort into the pollution prevention program. It is a model of effective long term planning.

Special Pull-Out Section

Waste Minimization in Metal Parts Cleaning Operations

EPA's Pollution Prevention Office is pleased to present a special pull-out section summarizing key information contained in a new 40-page technical publication, "Waste Minimization in Metal Parts Cleaning Operations," developed by EPA's Office of Solid Waste. (For ordering information, see the last page of this section.)

Parts cleaning is an important process for a large variety of organizations that manufacture, repair, and maintain parts and equipment. From large metal fabrication plants to in-house maintenance shops of industrial facilities, parts cleaning operations are essential to doing business.

Solvents and other chemicals used in parts cleaning often result in significant air emissions, wastewater discharges, and the generation of hazardous wastes. Waste minimization offers the opportunity to reduce emissions and discharges of toxic pollutants into the environment. Waste minimization also offers real potential for reducing manufacturing costs and thus can successfully compete with other investments in plant improvement.

While the science of parts cleaning is very complex, the aim of cleaning is relatively simple — to remove contamination (i.e., soil) from the surface of the parts being cleaned in order to avoid the generation of rejects during subsequent use or processing steps. Removal of soils can be achieved by means of detergency, solvency, chemical reaction, or mechanical action. Table 1 below lists some of the many cleaning methods or applications available.

Table 1. Summary of Cleaning Methods

Wiping

Wire brushing

Grinding or machining

Sandblasting or abrasive blasting

Shot blasting

Liquid blasting (hydroblast)

Hydroblast with abrasives

Cryogenic paint stripping

Blasting with softer material, e.g., plastic bead blasting

Physical distortion

Molten salt bath

Wipe on, wipe off

Immersion

Circulation of cleaner

Air sparging (aqueous cleaners only)

Spray cleaning

Tumbling in barrels

Ultrasonic cleaning

Steam cleaning or stripping

Vapor degreasing (solvents only)

Electrocleaning (aqueous cleaners only)

Flame or hot air impingement

Centrifugal wheel

Printed on Recycled Paper

A Strategy for Minimizing Wastes in Parts Cleaning

The recommended strategy for minimizing wastes in parts cleaning operations is to systematically follow this sequence of steps:

1. **Avoid the need to clean parts** — By controlling the factors that contribute to surface contamination of the parts, you may be able to reduce or eliminate the need for cleaning altogether. For example, protective coatings of grease or paint (which require solvents for removal) can be replaced with peel coatings or shrink-wrapping of items with polymeric sheeting. Moisture leading to rust can be reduced by more thorough drying or indoor storage.

Ion exchange metal recovery units are used to remove heavy metals from aqueous residues generated by electroplating, metal-finishing, electronic manufacturing, and metal-refining processes.

2. **Select the least hazardous medium for cleaning** — Proceed down this list from least hazardous to most hazardous:

   - water or air
   - abrasive media with water or air as carrier
   - aqueous detergent solutions
   - alkaline solutions
   - acids
   - solvents

3. **Maximize cleaning efficiency** — Use the least amount of cleaning medium possible to achieve an acceptable level of cleanliness.

4. **Maximize recycling and reuse** — Segregate cleaning wastes for recycling and reuse whenever such wastes cannot be eliminated from the process; consider on-site or off-site recycling.

A high-efficiency vapor degreaser removes lubricants and oil substances in this metal parts cleaning operation. This totally enclosed system, which collects solvent vapors and recycles them back to the cleaning operation, also reduces potential solvent air emissions.

Using Solvents

Although organic solvents have excellent cleaning properties, many of them are toxic, flammable, able to diffuse rapidly into the environment, and highly persistent. Solvents should be used only when no other cleaner is suitable for the job. If you can't eliminate the need for the cleaning, here are some alternatives to consider:

Using substitutes:

- *Less toxic solvents* include aliphatic hydrocarbons (e.g., naphthas), terpenes (made from citrus plants and pine trees), N-methyl-2-pyrrolidone, dibasic acid esters.

- *Aqueous cleaners* which displace soils (rather than dissolving them). The simplest is water, used in conjunction with mechanical or ultrasonic agitation. Alkaline and acidic cleaners are applied using soak cleaning, spraying, ultrasonic cleaning, electrocleaning, and steam cleaning.

- *Mechanical or thermal methods* include air blast systems or abrasive blast cleaning, which can save time and generate less hazardous waste.

Minimizing Solvent Losses:

- *General housekeeping options* include:
  - standardizing solvent use to use the least number of different solvents
  - consolidating cleaning operations into one centralized degreasing operation
  - maintaining solvent quality to minimize replacement and disposal
  - controlling evaporative losses through tank lids or roll-type covers

- *Cold cleaning soak tank operations* can minimize wastes by:
  - reducing drag-out through proper racking, increased drainage, and installation of drain boards
  - using a counter-current cleaning arrangement

- *Vapor degreasing* — waste minimization options include:
  - limiting entrance and exit speeds to less than 11 feet per minute to limit excessive dragout
  - keeping the size of the baskets at less than 50% of the degreaser opening
  - avoiding work shock which results in expulsion of solvent-saturated air
  - spraying only below the vapor zone (solid stream, not fine mist)
  - maintaining proper solvent level in sump, and adequate solvent temperature

Segregation and Recycling/Reuse:

- *Segregating solvents* is usually essential to recycling. Always segregate:
  - Chlorinated from non-chlorinated solvents
  - Freon from methylene chloride
  - Aliphatic from aromatic solvents
  - Water waste from flammable waste

- *On-site recycling* is usually economical when 8 or more gallons of solvent waste are generated per day. Separation technologies for contaminated solvents include gravity separation, filtration, bath distillation, fractional distillation, evaporation, and fuel use.

Standardizing Solvent Use

A Massachusetts electronics firm switched from using 3 different solvents — mineral spirits for degreasing machine parts, perchloroethylene for computer housings, and a fluorocarbon-methanol blend for printed circuit boards — to a single solvent mixture of 1,1,1-trichloroethane and alcohol in a staged system.

Using Aqueous Cleaners

Aqueous cleaners are a viable substitute for many parts cleaning operations currently using solvents. The principal disadvantage is that the parts are wet after cleaning and ferrous parts can easily rust. Warm air for drying may be a useful countermeasure. Aqueous cleaning may not be suitable for electronic components because it may leave conductive residue.

Although aqueous cleaning is an improvement over solvents, there are plenty of waste reduction opportunities in most aqueous cleaning systems. First, abrasives, water, or steam may be good substitutes for acid or alkaline cleaners. If aqueous cleaners are to be used, maintaining the quality of the solution is important.

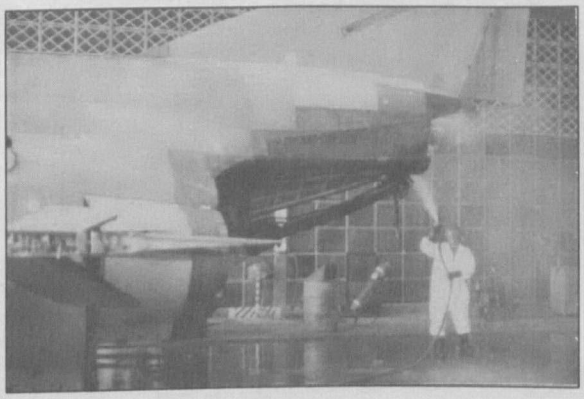
A checklist of key housekeeping elements includes:

- precleaning inspections
- continuous cleaning
- remove sludge and soils promptly
- equipment maintenance system
- increase rinsing efficiency while reducing water use
- avoid unnecessary loading
- proper solution make-up
- monitor cleaning solution strength
- reduce drag-out
- employ closed loop systems
- proper parts drying

Using Abrasives

Abrasives can be used in tumbling barrels or applied to a buffing wheel or machine. Other methods include air or water-assisted blasting, brushing, vibratory processes, centrifugal barrel finishing, centrifugal disc finishing, spindle finishing, and use of natural mass finishing abrasives. To reduce wastes associated with abrasives:

- Use greaseless or water-based binders for buffing or polishing instead of oil-based binders
- Use liquid spray compositions to reduce wheel wear and compound waste
- Control water level in mass finishing equipment to achieve maximum efficiency



The Department of Defense's Plastic Media Blasting uses air blasting of small plastic beads to remove aircraft paint by abrasion.

To Order . . .

To obtain copies of the full document, *Waste Minimization in Metal Parts Cleaning Operations,* please call the RCRA/Superfund Hotline, 1-800-424-9346. (In Washington, D.C., call 382-3000.)
Comments on this pull-out section and the full document are requested. Please send comments to:

James Lounsbury
Director, Waste Minimization Staff
Office of Solid Waste
U.S. EPA (WH-565)
401 M Street SW
Washington, D.C. 20460

People and Places in the News: SERI

by Gary Cook, Senior Writer, SERI

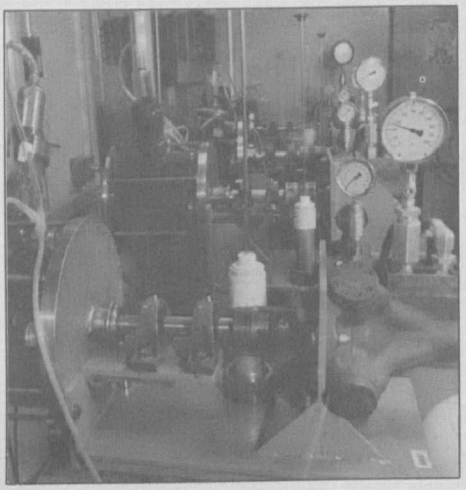
The Solar Energy Research Institute (SERI) was born of the concerns surrounding the energy crises of the 1970s. Although the crises themselves have passed, they have left as a legacy a deeper understanding of the truths about energy. One truth is that energy production and consumption are chronic issues that will confront the world for decades to come. Another emerging truth is that the growing demands of humanity are upsetting the complex, intricately balanced ecosystems that nurture us. Hence, energy R&D must involve well thought out strategies and long-term research.

This is a guiding principle around which SERI has crafted its mission. With an annual budget of almost $60 million, a staff of 425 researchers and other professionals, and many subcontractors from the private sector, SERI has become the world's largest center for solar energy research.

Two major solar electric technologies studied at SERI are photovoltaics and wind energy. Photovoltaic cells are solid-state devices that directly turn sunlight into electricity. Wind turbines mechanically convert wind energy into electrical energy. The use of these technologies does not result in exhaust fumes or wastes, so they do not pollute the air, amplify the greenhouse effect, deplete the ozone, or toxify our soil and water. Yet each of these technologies has great potential for producing energy. They can meet virtually any electrical requirement, and few places on this earth lack sunshine or wind.

The same may be said of solar thermal systems, which use concentrated sunlight to produce process heat or electricity. Several large-scale solar thermal systems are already on line and are beginning to provide significant amounts of energy, especially in California. Interestingly, SERI's solar thermal research has implications beyond energy systems. Because of photoenhanced chemical reactions and extremely high temperatures, it appears that concentrated solar flux can destroy toxic substances more effectively than conventional methods.

In biotechnology, SERI scientists are developing processes that convert waste to clean-burning fuels. SERI scientists also are developing systems that use yeast or bacteria to turn wood or municipal solid waste into high quality fuels for transportation, heat, or electricity. One such system is SERI's invention of a unique device, called a high-solids reactor (patent pending). Using specially adapted microorganisms and a little stirring, the device converts low-moisture waste to harmless or even valuable products. The reactor has already proven its ability to convert municipal solid waste to methane, a clean-burning gas. SERI is now seeking additional funding from the U.S. Department of Energy, other federal agencies, and industry to expand and refine the reactor's uses.



SERI's prototype reactors can turn low-moisture waste into valuable end products such as methane and ethanol.

Says SERI Director H.M. Hubbard, "The relationship between energy and environment is increasingly recognized by policy makers both in this country and abroad. These issues will shape future plans and priorities for energy research and development. At SERI, we are developing technologies that can mitigate environmental problems."

For more information, contact SERI at (303) 231-1000.

Resources

DOE Issues Notice of Program Interest

The U.S. Department of Energy (DOE), Office of Industrial Programs, has issued a notice of program interest in research and development projects that will conserve energy in the industrial sector while utilizing, reducing, or eliminating industrial gaseous wastes. DOE is interested in innovative concepts in this area, that are projected to have an annual net energy savings greater than one trillion BTU/year by the year 2010 if implemented on a national scale.

Examples of R&D that might serve as a basis for a cooperative agreement application include applications of biotechnology (development of improved catalysts, recovery of bio-modified hydrocarbons, or improved waste gas cleanup with bioreactors); reduction or elimination of VOC emissions; new product development; improved process controls; and new or unusual processes for improving performance to reduce gaseous waste.

DOE anticipates making several awards, totaling approximately $500,000 in FY 1990. Applications may be received until January 31, 1990. For further information, contact Peter Waldman, U.S. DOE, Chicago Operations Office, 9800 South Cass Ave., Argonne, IL 60439, (312) 972-2189.

Proceedings of 7th National Recycling Congress

The National Recycling Coalition has a limited number of proceedings from the 7th National Recycling Congress held last September in St. Paul, MN. The congress focused on sustaining recycling and the complementary roles of the public and private sectors, with sessions on local, state, and federal recycling policy, composting, plastics recycling, and options for recycling operations.

Proceedings may be ordered for $35 from David Loveland, Executive Director, National Recycling Coalition, 1718 M Street NW, Washington, D.C. 20036, (202) 659-6883.

Upcoming Events in November & December

Title	Sponsor	Date/Location	Contact
Conference on House Bill 592: Planning for Ohio's Solid Waste Management Districts	Ohio Alliance for the Environment	Nov. 1, 1989 Columbus, OH	Irene Probasco (614) 421-7819
Short Courses:	AICHE	San Francisco, CA	Registrar (212) 705-7526
Process Design for Waste Min & Energy Conservation		Nov. 3-4, 1989	
Prevention, Mgt., & Compliance for Haz. Wastes		Nov. 8-9, 1989	
4th Household Hazardous Waste Management Conference	U.S. EPA	Nov. 6-8, 1989 Orlando, FL	Kay Hickman (301) 460-3860
2nd Topical Conference on Emerging Technologies in Materials	American Institute of Chemical Engineers	Nov. 6-9, 1989 San Francisco, CA	John Kardos (314) 889-6062
HazMat West '89 Conference & Exposition	HazMat World Magazine	Nov. 7-9, 1989 Long Beach, CA	Brenda O'Neal (312) 469-3373
Used Oil: Coming Full Circle	Assn. of Petroleum Re-refiners, Project ROSE	Nov. 30-Dec. 1, 1989 Baltimore, MD	Mary Kay Olson (716) 855-2757 or Janet Graham (205) 348-4879
Pollution Prevention for the 1990's: A Chemical Engineering Challenge	American Institute of Chemical Engineers	Dec. 4-5, 1989 Washington, D.C.	Dr. Martin Siegel (202) 223-0650
Waste Equipment & Recycling Expo '89	Tower Conference Management, Inc.	Dec. 5-7, 1989 Long Beach, CA	Bill Harrington (312) 469-3373
5th Intl. Conference on Solid Waste Management & Secondary Materials	Journal of Resource Management & Technology, EPA Regions 2 & 3, others	Dec. 5-8, 1989 Philadelphia, PA	Ron Mersky (215) 499-4042
Keep America Beautiful 36th Annual Meeting	Keep America Beautiful, Inc.	Dec. 6-9, 1989 Washington, D.C.	Lis Biles (203) 323-8987

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