♻ EPA Project Summary

Industrial Pollution Prevention Opportunities for the 1990s

Ivars J. Licis, Herbert Skovronek, and Marvin Drabkin

A set of criteria was developed for the purpose of subjectively prioritizing industry segments for their pollution prevention potential and their opportunity for improvement. Using this set of criteria, high priority industries were selected from a Standard Industry Classification (SIC)-based list for investigation of the need or opportunity for waste reduction through source reduction and/or material recycle. Information concerning the opportunities in particular industries was then solicited through associations and individual companies, researchers, and state agencies.

A final list consisting of 17 industries was identified. In addition, the investigation identified a list of generic research or technological needs where industry contacts believed research could lead to waste minimization applicable to more than one industry. These were considered particularly attractive because of the effect they could have and also because they could avoid any of the proprietary and competitive issues that could inhibit EPA participation in industry-specific developments.

Since the start of this project, the U.S. Environmental Protection Agency (EPA) initiated the Industrial Toxics Project (also known as the 33/50) that identifies 17 high priority contaminants on the Toxics Releases Inventory (TRI) for voluntary reductions by the companies generating the waste. Although the number 17 for both projects is coincidental, the 17 priority contaminants are closely represented by the 17 industries identified in this project.

This Project Summary was developed by EPA's Risk Reduction Engineering Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Pollution prevention is assuming a key position in the Nation's efforts to reduce environmental impact on land, water and air. The 1984 Hazardous and Solid Waste Amendments (HSWA) specifically mandate waste minimization as a national objective. In response, the EPA has developed a pollution prevention program to identify priority pollution prevention areas, assess waste management practices, and identify waste reduction opportunities, particularly those that would benefit by agency participation in their development.

This segment of the EPA program was designed to develop a data base of attractive technologies not yet in wide use. The information would be used by EPA to develop a research strategy for waste minimization. A key aspect is the use of EPA participation in such efforts to stimulate the implementation of new procedures and processes and the transfer of appropriate technology from one industry to others. EPA's R&D program, although recognizing that regulatory incentives and disincentives also play a role, emphasizes the adoption of technological advances on a voluntary basis in source reduction and waste recycle as the key elements in waste reduction.

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The short-term goal of the EPA pollution prevention program is to help industry find methods and incentives for the reduction of high priority pollution (large quantities of releases, high potential for health and ecological effects, high toxicity, good opportunity for prevention). To reach this goal, the Agency initiated the high priority, Industrial Toxics Project (or 33/50). This program identifies 17 high priority contaminants on the TRI. Objectives are for an aggregate, one-third (33 percent) reduction of these contaminants by 1992 and a one-half (50 percent) reduction by 1995. These reductions are to be made on a voluntary basis, by the companies responsible for the largest amounts released or sent for treatment and disposal with the technical assistance and encouragement from the EPA.

The number 17 for both the SIC segments selected for investigation under the "Industrial Pollution Prevention Opportunities for the 1990s' program and the priority contaminants under the 33/50 is coincidental. However, the 17 SIC segments selected closely represent the major sources of the 17 contaminants under the 33/50. The results of this project are to be used as input for continuing work under the 33/50.

Procedures

The project plan called for an extensive list of industries to be screened by a number of persons with broad experience in industrial waste management. This initial screening was used to identify a shorter list of high priority industries that could then be investigated in more depth. To assist this effort, and to attempt to impose a degree of uniformity on the bases used in prioritizing industries, a set of 12 broad criteria or questions were developed. These covered such aspects as: the size of the industry, the types, volumes, and degree of hazard of wastes generated, the perceived potential for pollution prevention, and the perceived receptivity of the industry to EPA participation in development of alternative technologies.

Approximately 25 persons, representing state and federal agencies and academic organizations, participated in the initial screening of 175 industrial segments selected from the Department of Commerce's 1977 SIC. When compiled, the data produced a first list of industry segments wherein a few industries (e.g., electroplating and chemicals) were clearly of high priority followed by a gradual fall-off in perceived importance. No attempt was made to achieve statistical validity for the analysis of the data.

Scrutiny of the initial prioritizations indicated that certain of the industrial categories (segments) were parts of the same industry. A second compilation was carried out in which these sub-industry segments were combined, first at the 3-digit SIC level and then at the 2-digit SIC level. In some cases, some of the SIC-based industry categories were clearly not consistent with the industry as it operates or as it is represented by its associations.

The final list recommended for in-depth study consisted of 17 industries, with a mixture of 2-, 3-, and 4-digit SIC categories, selected to best represent pollution prevention priorities.

For each of the 17 industries selected, detailed information was gathered on pollution prevention problems and prevention opportunities from all readily available sources, such as state and agency officials where pollution prevention programs were in existence, representative trade associations, managers of individual manufacturing facilities and applicable literature. The scope of the program did not permit an exhaustive review of these sources; it attempted to get a reasonably broad view for the resources available.

Results

As a result of these discussions, a range of ideas and suggestions for new technologies were identified — technologies that would reduce the amount of raw materials used, reduce the amount of waste generated, substitute less hazardous materials, or allow the recycle of some waste. These data are summarized in compilation tables contained in the full report and also summarized in the next section.

In addition, it was found that a number of technological needs crossed industries. For example, if solvents could be recycled by distillation, their recovery might become attractive in the printing, painting, dry cleaning, and other industries. Consequently, discussions in one industry were often renewed with personnel in other industries to learn if such approaches would benefit the second industry. In this way, a number of "generic" technological needs were identified. Those generic technologies that apparently would benefit from EPA research support and stimulation have also been compiled for consideration by the Agency.

In the initial industry prioritization effort and subsequent recompilation, the following 17 industries were selected as those where the priority needs and opportunities for pollution prevention were most apt to be encountered and where EPA support might be expected to stimulate or accelerate the implementation of the technology.

The 17 selected for further study and their respective SICs are listed below.

Textile dyes and dyeing	226
Wood preserving	2491
Pulp and paper	26
Printing	271-275
Chemical manufacture	281
Plastics	2821
Pharmaceuticals	283
Paint industry	285
Ink manufacture	2893
Petroleum industry	291
Steel industry	331
Non-ferrous metals	333-334
Metal finishing	3471
Electronics/ semiconductors	3674
Automobile manufacture/ assembly	371
Laundries/dry cleaning	721
Automobile refinishing/ repair	753

The full report briefly describes the approaches to source reduction and waste recycle identified for each industry by discussions with academic, governmental, and industrial representatives and from a limited review of current literature. The technologies are discussed in both narrative and tabular format. In some cases, only a need or opportunity has been identified and no method is yet available, or proposed, to achieve the desired waste reductions.

The following technologies or needs within individual industries are believed to have major impact on pollution prevention and would benefit from EPA research activity.

Textiles: Dye and scouring agent recovery.

Wood preserving: Less toxic preserving agents.

Pulp and paper: Improved recovery of coated stock; fiber strength/restoration.

Printing: Solvent recovery.

Chemicals: Solvent recycle and substitution; improved catalysts.

Plastics: Scrap segregation or compatibilization.

Pharmaceuticals: Solvent recycle and substitution.

Painting: Low and non-VOC paints and application.

Ink Manufacture: Low and non-VOC inks; elimination of metallic pigments.

Petroleum industry: Spill prevention, materials recovery.

Steel: Reuse of tars, electric arc furnace dust, calcium fluoride.

Non-ferrous metals: Arsenic isolation; sulfur oxide emission reductions.

Metal finishing: Improved bath constituent recovery; alternate corrosion protection approaches.
Electronics: "Clean" fabrication.
Automobile manufacturing and assembly: Life extension of oils, coolants, painting improvements.
Automobile refinishing/repair: Solvent loss reductions, substitution.
Laundry/dry cleaning: Improved solvent recovery, substitution.

As noted earlier, a number of generic technologies were also identified that could, potentially, serve the pollution prevention needs of several different industries. The report discusses these in some detail and indicates industries where the approaches may be suitable. Table 1 summarizes the technologies suggested.

Conclusions/Recommendations

This project has been a starting point in prioritizing industries for their pollution prevention and their opportunities for making improvements; it is by no means exhaustive. To become a usable tool, regular additions and updating should be scheduled. The evaluation criteria need to be simplified.

It was apparent before the start of the project, but made more obvious during its course, that a classification tool that gets around the shortcomings of adapting the SIC system is needed so that more representative priorities can be made for pollution prevention research.

Decisions concerning pollution prevention by a particular industry are often influenced by factors beyond the cost of treatment/disposal or the amount of waste being generated. Factors such as environmental regulations that may restrict or inhibit source reduction or recycling, manufacturing restrictions imposed by other governmental agencies (e.g., FDA), perceived customer requirements, availability of personnel, space, or required capital investment all come into play.

Confidentiality and economic advantages gained when waste reduction practices are put into operation but not disclosed to others in an industry also cannot be ignored.

Industries composed largely of small businesses (e.g., automotive services, electroplating/metal finishing, et al.) would benefit from government-supported research into new and innovative approaches directed to their scale of operations.

A large number of industry-specific and generic technologies exist that would benefit from EPA-supported research investigations and stimulation. Investigating these opportunities should hold significant priority.

The full report was submitted in fulfillment of Task 0-9 of EPA Contract No. 68-C8-0062 by Science Applications International Incorporated and Versar Inc. under the sponsorship of the U.S. Environmental Protection Agency.

Table 1.   *Generic Technologies*

Technology	Specific Aspects
VOC control	Develop practical solvent vapor recovery at small-scale
CFC substitutes	Design non-CFC foaming agents for urethane
	Find effective substitutes for cooling/refrigeration
Oil/water separation	Recover materials from petroleum industry wastes
	Improve recovery/recycle with improved emulsion breaking technology
	Recycle/recover metal cutting fluids
Improved seals	Improve valve and pump design for decreased maintenance frequency
Reaction efficiency	Redesign for improved mixing and improved reaction rates
Process control	Improve manual process control methods
	Use automatic controls with feed-back/feed-forward features
	Recover solvents from vapor degreasers
	Develop nonsolvent degreasing
Acid recovery	Recover pickle liquor and battery acid
	Develop electrodialytic purification
Boiler technology	Identify techniques for reducing waste from boiler blow-down
Adsorption systems	Develop selective adsorbents
Scrap metal	Improve manufacturing methods

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Ivars Licis (also the EPA Project Manager see below) is with the Risk Reduction Engineering Laboratory, Cincinnati, OH 45268; Herbert S. Skovronek is with Science Applications International Inc., Paramus, NJ 07652; and Marvin Drabkin is with Versar Inc., Springfield, VA 22101.

The complete report, entitled "Industrial Pollution Prevention Opportunities for the 1990s," (Order No. PB91-220376; Cost $19.00 subject to change) will be available only from:

> *National Technical Information Service*
> *5285 Port Royal Road*
> *Springfield, VA 22161*
> *Telephone: 703-487-4650*

The EPA Project Officer can be contacted at:

> *Risk Reduction Engineering Laboratory*
> *U.S. Environmental Protection Agency*
> *Cincinnati, OH 45268*