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A Multi-National Industry's Perspective of Pollution Prevention

Alan B. Staples and David M. Benforado

Environmental Engineering Specialist, Senior Specialist
3M Company
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Abstract: The success of 3M's worldwide Pollution Prevention Pays (3P) Program convinced 3M's top management that the program should be expanded into a comprehensive environmental management system called 3P Plus. The emphasize of the 3P Plus program is to continually minimize the environmental impact of 3M processes, products, and operations to include energy management, resource recovery, and other initiatives. 3M's experience with the 3P and 3P Plus programs will be described. 3M's experience can serve as a model for other multi-national companies interested in sustainable development and economic growth with environmental protection.

1. INTRODUCTION

Pollution prevention is a key component of any multi-national industries' environmental management strategy for achieving sustainable development with economic growth and environmental protection.

In 1975, 3M Company became the first company to initiate an organized, company wide application of the pollution prevention concept with its Pollution Prevention Pays (3P) program. The 3P program was originally conceived to reduce pollution while providing economic benefits for 3M. The emphasis of the program was to prevent pollution at its point of generation instead of simply providing "end-of-pipe" control.

Today, the 3P program has developed into a comprehensive environmental management program called 3P Plus. 3P Plus integrates the established principles of the 3P program and many new environmental management programs designed to improve the quality of 3M's products and services while decreasing their impact on the environment.

2. POLLUTION PREVENTION PAYS(3p)

Dr. Joseph T. Ling, Staff Vice President of 3M Company's Environmental Engineering and Pollution Control(EE & PC) Division, now retired, founded the Pollution at its point of generation. Under the 3P program, recognition is provided to employees who develop projects that reduce pollution and provide some economic benefit to 3M.

Most 3P projects are based on the concepts of:

1. Recycling
2. Reformulation

3. Process modification
4. Redesigning Equipment

Recycling is a well known pollution prevention concept based on the concept of reusing waste as raw material. A typical example of recycling is 3M Venezuela's recovery and reuse of spent solvent. Like many 3M plants, 3M Venezuela generates pumpable and non-pumpable scrap as part of its manufacturing operation. This scrap includes materials such as rags, coating solution filters, and other solvent contaminated waste. Disposal of these wastes can sometimes be difficult when commerical disposal facilities may not be readily available. By installing a "Little Still", 3M Venezuela is able to recover the solvent from the scrap and reuse it in its manufacturing operations. The purchase of the Little Still cost about $ 10,000 and its cost was quickly recovered.

These small solvent separation units heat solvent contaminated scrap causing the solvent to volatilize so that it can be condensed in a separate vessel. The condensed solvent is quite pure. Little Stills come in various sizes which can process as little as 5 gallons and as much as 55 gallons every 8 hours. Other 3M plants operate much larger solvent distillation and solvent recovery systems which are capable of recovering hundreds of gallons of solvent per hour.

Reformulation is one the purest forms of pollution abatement. By using raw materials that do not cause pollution, no pollution is generated. An example of reformulation is the substitution of one raw material for another. At 3M United Kingdom's Atherstone plant a hydrocarbon solvent was used to dissolve adhesive so that it could be coated onto abrasive discs. The solvent was then evaporated in drying ovens and the dried adhesive remained on the disc. To eliminate the emission of the evaporated solvent, the plant replaced the backing used in the manufacture of the abrasive disc. The new backing allowed the use of a solventless adhesive. Consequently, the emission of solvent from the adhesive coating process is eliminated. The change in backing required no capital outlay and 75 tons per year of solvent emissions were eliminated at a savings of £150,000 per year.

Process modification can mean many things. It may include altering the manufacturing process itself, using less raw materials that cause pollution, or using new technology to replace antiquated manufacturing techniques. At 3M Germany's Hilden plant the cleaning of coating solution mixing kettles required the use of thousands of gallons of solvent each year. The spent wash solvent was then sent to a reclaimer. The plant changed the cleaning process to include the use of a rotating high pressure solvent spray system that dissolves, or blasts, the leftover coating solution from the walls of the kettle. Less solvent is used and the solvent that is used can be reused after filtering. Also, since the spray system is far more efficient, the time needed for cleaning was reduced from several hours to a matter of minutes. The spray cleaning system eliminated the generation of 200 tons per year of wash solvent, saves DM108,000 per year in solvent usage at a cost of DM125,000.

Redesigning equipment can effectively minimize pollution. For example, the ash removal system at 3M Company's hazardous waste incinerator located in Minnesota, USA, was redesigned to reduce the amount of ash that needed to be treated as hazardous waste. Prior to the modification, all the ash generated from the operation had to be considered hazardous waste, by regulatory definition, and disposed of accordingly. By altering the ash removal system to include a magnetic separator, the volume of hazardous waste was reduced by 50 %, or 840 tons per year. As a secondary bene-

fit to reducing the cost of disposal, US $35,000 per year of metal is reclaimed.

Through 1991, over 3,000 3P projects have resulted in the prevention of over 575,000 tons of pollution. The amount of pollution prevented can be broken down as follows:

Air Emissions	134,000 tons
Water Pollutants	16,900 tons
Wastewater	1.65 billion gallons
Sludge and solid waste	426,000 tons

These projects have also resulted in worldwide first-year savings of US $530 million for 3M Company.

3. THE 3P PLUS PROGRAM

3P has evolved into the 3P Plus program under the direction of Dr. Robert Bringer, Staff Vice-President, EE & PC. 3P Plus is a comprehensive, all encompassing program of *worldwide* environmental management. It integrates the established principles of the 3P program and many new environmental management programs designed to improve the quality of 3M's products and services while decreasing their impact on the environment.

3P Plus environmental programs include:

1. The *3P Program.*
2. The *Air Emission Reduction Program (AERP)* established in 1987 as a voluntary effort to reduce the emission of air pollutants by 65,000 tons worldwide by March, 1983, at a cost of more than US $170 million.
3. The *Underground Tank and Pipe Upgrade Program* requires the abandonment or removal of all underground tanks that store petroleum based products, or other environmentally threatening materials and associated piping by June, 1993.
4. *Year* 2000 *Goals* are long term corporate goals that call for a 90% reduction in all releases to air, water, and land; and a 50% reduction in waste generation.
5. *Environmental Audits* conducted at 3M facilities by EE & PC engineers insure that all 3M facilities are in compliance with corporate environmental policies and governmental regulations.
6. The *Corporate Product Responsibility* staff group was created as part of EE PC to provide guidance and support to 3M business units in creating and using environmentally compatible products and processes.
7. 3M's *Resource Recovery* department is dedicated to identifying means to recovery, sell, or reuse 3M wastes.
8. The *Energy Management Program* has reduced 3M's energy usage by 50% per unit of production and associated carbon dioxide emissions by 3.9 million pounds per year since 1973.

Examples of other efforts to improve environmental quality include a program to *phase-out all ozone depleting chemicals* more ambitious than the Montreal Protocol requirements, *PCB* and *Asbestos Abatement Programs* to eliminate the presence of PCB's at 3M facilities and secure or remove asbestos containing materials or products, creation of the "*Chairman's Environmental Leadership Award*" to recognize excellence in product environmental responsibility, an *Environmental Marketing Claims Review Committee*, and *Environmental Management Plans (EMP)* for each corporate facility.

4. ENVIRONMENTAL MANAGEMENT PROGRAMS

Successful multi-national companies know that responsible environmental management is a global necessity no longer limited to the requirements of any single country and that progressive environmental programs can lead to lower operating costs, higher quality products,

fewer liabilities, better employee morale, and a positive public image.

Through experience, 3M Company has learned that for programs like 3P Plus to work and continue to be successful requires:

1. *Top Management Support.* When the support of top corporate management is secured, the chances of a program's success are greatly increased. Involvement of upper management also fosters the growth of the environmental program as part of the corporate philosophy and culture. Enlisting the support of management should include:

   a. Explaining the benefits and the implementation plan for the environmental program to management.
   b. Making sure that management is committed to providing the necessary resources for the environmental program.
   c. The support of the environmental program by management should be evident to all of the company's employees.

2. A *Program Plan.* Without a plan that outlines goals, responsibilities for attaining those goals, and an explanation of how individuals and groups will be involved, no environmental program can succeed. Any plan needs a leader and the environmental program administrator should:

   a. set annual goals,
   b. make contacts at all corporate operating levels,
   c. establish incentives for participation,
   d. follow-up on the implementation of the environmental program,
   e. assist in the search for pollution prevention opportunities, and
   f. set up a system to measure and document the environmental program's results.

3. *Recognition.* Employees should be recognized and rewarded for outstanding performance and this holds true for environmental programs. A formal recognition program should be established to recognize employees for their efforts as judged by a panel of their peers.
4. *Promotion.* The development and success of environmental programs should be promoted outside the company. Outside exposure encourages the participation of other individuals and industries in their own environmental programs.

   a. Give the environmental program a high profile by using seminars, printed materials, articles in company and trade publications, and slide and video presentations.
   b. Develop a public outreach program which includes governmental agencies, the media, and the general public.
   c. Encourage individual environmental efforts.

5. GOVERMENT INVOLVEMENT

The concept of pollution prevention is based on eliminating pollution prevention at the source. To succeed requires a joint effort between government and industry. The government must commit to providing assistance to business and industry must commit to an organized effort to apply the necessary resources.

The governments of all countries have an opportunity to apply the principles of pollution prevention by encouraging corporate programs and offering technical assistance. For

example, in 1990, the Pollution Prevention Act was passed establishing pollution prevention as a priority. Consequently, the United States Environmental Protection Agency now has an Office of Pollution Prevention which establishes policies and strategies for pollution prevention programs. This approach encourages cost effective environmental protection while fostering economic growth for the country.

One of the purposes of an environmental government agency should be to encourage pollution prevention by industry and the public. These agencies should coordinate regulatory activities and create marketplace incentives. In addition, they should provide technology transfer assitance to make information for pollution prevention available.

6. CONLUSION

A pollution prevention program carried out within the context of established environmental objectives is an investment in sustainable development. By sharing the lessons learned, industry can make real progress towards protecting the environment while reducing the costs and liabilities of pollution. It is the responsibility of industry to make pollution prevention a first step toward sustainable development and growth in a manner that protects the environment.