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Case Study: How 3M Makes Pollution Prevention Pay Big Dividends

Thomas W. Zosel

Company:
3M

Location:
St. Paul, MN, headquarters;
facilities in fifty-two countries

Number of Employees:
87,500

Business:
Research, manufacture, and
marketing of home and
business products including
pressure-sensitive tapes,
photographic films, recording
tapes, coated abrasives, and
insulating materials

Objective:
Prevent pollution at the
source in products and
manufacturing processes,
rather than deal with
end-of-pipe waste

Program:
"Pollution Prevention Pays," a
companywide, worldwide
program based on employee
involvement and recognition

Bottom Line:
\$500 million saved since
1975, 50-percent reduction in
pollution per unit of
production

3M IS ONE of the nation's leading "blue chip" companies. It is an integrated enterprise characterized by substantial interdivision and intersector cooperation in research, manufacturing, and marketing of products incorporating similar component materials manufactured at common sources. Its business has developed from its research and technology in coating and bonding for coated abrasives, the process of applying one material to another. Today 3M markets more than 60,000 products, including pressure-sensitive tapes, coated abrasives, roofing granules, photographic film and lithographic plates, magnetic recording tape, reflective sheeting, electrical insulating materials, and repositionable notes.

3M employs some 87,500 men and women in fifty-two nations, all of whom are encouraged to explore new ideas and share what they learn with fellow employees. This philosophy carries over to environmental responsibility and is the basis of the internationally known 3M Pollution Prevention Pays (3P) Program.

The 3P Program Philosophy— Pollution Prevention, Not Waste Removal

The 3P Program, begun in 1975, has been recognized the world over for its achievements in waste minimization and preventing pollution at the source. It has been copied by many companies and has received numerous environmental achievement awards.

The 3P idea is to prevent pollution at the source in products and manufacturing processes, rather than remove pollution after it is created. Although the idea itself is not new, the concept of applying pollution prevention on a companywide worldwide basis, and recording the results, had not been done before 3M's initiative.

In the beginning, the 3P Program was established because of the recognition that prevention is more environmentally effective, technically sound, and less costly than conventional control procedures. Natural resources, energy, manpower, and money are all used in

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building conventional pollution control facilities, and more resources are consumed to operate them. Furthermore, at best, conventional pollution removal facilities only constrain a problem temporarily; they do not eliminate the problem, which is the objective of Pollution Prevention Pays.

This prevention approach to pollution abatement has become standard practice at 3M. The company is engaged in a continuing effort to eliminate pollution at the source through product reformulation, process modification, equipment redesign, recycling, and the recovery of waste materials for resale.

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How the 3P Program Works

The Pollution Prevention Pays Program is conducted by and for the 3M operating divisions. It is run by a 3P Coordinating Committee composed of representatives from 3M's engineering, manufacturing, and laboratory organizations and from the corporate Environmental Engineering and Pollution Control (EE&PC) organization.

EE&PC provides a manager to carry out the Coordinating Committee plans and to administer the program. The Coordinating Committee establishes criteria for 3P participation.

One of the most important functions of the manager is to encourage participation in the program by 3M technical employees. These employees in 3M laboratories and manufacturing facilities are the people who initiate most individual 3P projects. Encouragement in the past has come primarily from awards and recognition. More recently 3M has set goals for its more than fifty operating divisions, which in turn have passed goals on through their organizations.

Typically 3P projects are initiated when employees recognize a specific pollution or waste problem and a possible solution. An employee team is then developed to analyze the problem and develop solutions. Such a team might consist of employees from several disciplines including engineering, research, marketing, and legal. A proposal is then submitted to the affected operating division and a decision is made on whether to commit funds, time, and other resources to it.

Awards and Recognition

Projects that are developed under the 3P Program are eligible for recognition by management. In order to qualify for an award, a 3P project must fulfill certain established criteria. These are based on four distinct payoffs that 3M identified as goals before initiating its 3P Program: (1) a better environment, (2) conserved resources, (3) improved technologies, and (4) reduced costs. Thus, to receive formal recognition under the 3P Program, a project must meet the following guidelines:

- It must, through process change, product reformulation, or other preventive means, eliminate or reduce a pollutant that currently is a problem or has the potential to become a 3M

problem in the future.

- It should exhibit, in addition to reduced pollution, environmental benefit through reduction in energy consumption, more efficient use of raw materials, or improvement in the use of other natural resources.
- It should involve a technical accomplishment, innovative approach, or unique design in meeting its objective.
- It must have some monetary benefit to 3M. This may be through reduced or deferred pollution control or manufacturing costs, increased sales of an existing or new product, or other reduction in capital or expenses.

Award suggestions usually are initiated by the more than fifty 3M operating divisions. The Coordinating Committee then determines what projects will receive awards. If a project is recommended for an award, the division is contacted for information concerning who should be cited. Only persons who have made a direct, personal, and measurable contribution are eligible. Members of the EE&PC staff are not eligible, nor are winning project supervisors or managers, unless they meet the criteria for a "hands-on" contribution to the effort.

Division management staff members present the awards, frequently at a meeting of the unit's management committee. The award consists of a certificate signed by the chairman of the board and the vice president for Environmental Engineering and Pollution Control. These awards are considered a significant honor and can influence decisions on pay increases and promotions.

3P projects have succeeded in eliminating a variety of pollutants at the source, including hydrocarbons (which contribute to ozone and smog), odor, water, dissolved solids, sulfur, zinc, alcohol, and incinerated scrap.

A Record of Success

To date, since 1975 there have been 2,511 recognized 3P projects throughout the company. Of these, 785 have been in the United States and 1,726 have been from 3M operations in Argentina, Australia, Belgium, Brazil, Canada, France, Germany, Italy, Japan, Mexico, New Zealand, the Philippines, South Africa, Spain, Sweden, Switzerland, Thailand, United Kingdom, and Venezuela.

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Another project involved the redesign of a resin spray booth that had been producing some 500,000 pounds of overspray a year that required special incineration disposal. New equipment was installed

to eliminate excessive overspray. Efficiency was increased to provide a net reduction in the total amount of resin used, saving more than \$125,000 annually, on a \$45,000 equipment investment.

International 3P projects have ranged from improved control of coating weight at a 3M facility in Gorseinon, Wales, and recycling of wastewater at Hilden, West Germany, to a variety of combustion control and heat recovery processes in Japan.

The Bottom Line: \$500 Million Saved

The results of the 3P Program have been dramatic. In the fourteen years the program has been in existence (1975-1989), the pollution prevented has resulted in a savings of \$500 million for 3M (\$426 million from U.S. operations and \$74 million from international operations).

Equally dramatic are the reductions in pollution as a result of the program. Table 1 shows the 3P results for the first year alone. Projected over a period of several years, these figures become significant indeed. In fact, since 1975, through the 3P Program 3M has reduced pollution by an estimated 50 percent.

**Table 1. Reductions in Pollutants:
First Year of 3P Program**

<i>Pollutant</i>	<i>U.S.</i>	<i>International</i>
Air pollutants	112,000 tons	11,000 tons
Water pollutants	15,300 tons	1,100 tons
Wastewater	1 billion gallons	600 million gallons
Sludge/solid waste	397,000 tons	12,000 tons

Looking to the Future

Achieving environmental benefit and some cost savings through pollution prevention is better than no savings and no benefits. But 3M believes its task is to reach as high a percentage of pollution elimination and pollution minimization as possible, and, as successful as 3P has been, 3M top management decided that the company should be doing even more. In June 1989, 3M announced challenging new goals intended to spur the development of new and environmentally better ways to manufacture our products.

3M intends to cut all hazardous and nonhazardous releases to the air, land, and water by 90 percent and to reduce the generation of all waste 50 percent by the year 2000. This is from the base year of 1987. We also have an ultimate goal of achieving as close to zero emissions as technically possible.

These goals will take 3M from a position of complying with governmental regulations to being substantially under the limitations established by the environmental regulations. What we believe is

extremely important to note is that this significant commitment is an entirely voluntary effort.

3M will achieve its goals primarily through an updated 3P Program called 3P Plus. 3P Plus involves both a commitment to substantially reduce emissions through whatever means are available and longer-term scientific research to reduce sources of pollution in our manufacturing processes—the classic pollution prevention approach.

Air pollution is a particular challenge to 3M because of the kinds of products we make. Coating processes used to manufacture such products as pressure-sensitive tapes, sandpaper, and videotape have in the past required the use of petroleum-based solvents, similar to paint thinners, which evaporate and become air emissions.

3M scientists, as part of the 3P Program, have found ways to reduce or eliminate the use of solvents in making a number of products. But as solventless processes that work well for some products will not necessarily work for others, research is an important part of 3M's effort to achieve our goals. We expect to find ways to make more of our products with low- or no-solvent processes and to substantially reduce our generation of waste and pollution.

As an intermediate step, to help us reach our goals more quickly 3M has initiated a \$150 million program to achieve Best Available Control Technology (BACT) at our plants worldwide by 1993 (1992 in the U.S.). Pollution control devices will be installed on all existing facilities emitting more than 100 tons a year and all new facilities emitting more than forty tons a year, even though strict reductions are not required by government regulations.

3M has already completed emission-control projects in New Jersey (1,000 tons a year reduced) and Los Angeles (1,050 pounds a day reduced). We are currently in the process of developing similar returns in Illinois, Pennsylvania, and Ventura County, California.

Along with this commitment to substantially reduce emissions, 3M's top management has decided that the Emission Reduction Credits that are created by the 3P Plus efforts will not be sold to other companies. Any credits that are not needed for future 3M expansions will be donated back to the state or local agency for improvement in air quality. In addition, we have made a commitment not to use the techniques available through the Emission Trading Policy, namely bubbling and netting, to avoid the installation of pollution control equipment.

Despite this \$150 million commitment to emission control technology, the most important part of our effort will continue to focus on source reduction. 3P Plus, like 3P before it, will require a commitment from management and employees throughout the company.

But 3P Plus will be a more structured effort than the voluntary 3P Program. Waste minimization teams are being formally established in every operating division to identify source reduction and recycling opportunities and develop plans to address them. These teams are interdisciplinary groups consisting of representatives of

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manufacturing, laboratories, engineering, marketing, packaging engineering, and other units needed to ensure as broad a perspective as possible.

A pollution prevention staff within the corporate environmental organization has also been established to facilitate the program. Among its responsibilities, the pollution prevention staff will monitor the program and report to management on problems, technical breakthroughs, and the overall progress. Regular quarterly reports will be made showing gains from the 1990 baseline year.

The pollution prevention staff will also encourage the sharing of good ideas and technical breakthroughs among the many divisions. And it will monitor legislative and regulatory activity that might affect our program and goals.

Finally, and perhaps most importantly, the pollution prevention staff will encourage the pollution prevention concept by continuing recognition programs for successful projects and by establishing a new award program for divisions and plants that meet their goals.

Although 3P Plus primarily involves mobilizing internal sources to achieve our goals, outside sources will also participate. Suppliers of materials to 3M will be asked to improve their products to ensure that they cause a minimum of hazardous waste.

As we enter the decade of the nineties, 3M intends to continue its corporate dedication to pollution prevention. ♦