

## **Dow Chemical Company (A): The WRAP Program**

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One of the best known corporate programs in the environmental area is Dow Chemical's WRAP program. WRAP stands for Waste Reduction Always Pays, a name that reminds participants of the economic benefits available to companies who can reduce the pollution created in their production processes. Dow credits the program with major cost improvements along with reduced levels of pollution. In addition, the WRAP program has persisted over several years and has left ties mark on the company's culture.

### **Background and Program History**

The Louisiana Division of Dow Chemical Company is located in Plaquemine, Louisiana, where the company produces a number of chemicals, including such commodity chemicals as chlorine, caustic soda, vinyl chloride, polyethylene, propylene, ethylene, and benzene. The Louisiana Division consists of about two dozen main plants, each corresponding roughly to a major product, and the division employs 2300 people. The site, which as built in 1956, also contains a power plant, an incinerator for solid waste, and a biological oxidation plant for

aqueous waste. Organizationally, responsibility for the site rests with a general manager, to whom four production managers report. The production managers are each responsible for four or five plants, each one run by a superintendent. At each plant there is a non-union line organization, three or four levels of engineers, and a plant staff.

In the early 1980's, Dow was reacting to the second wave of oil price shocks that affected American manufactures. Like many other companies, Dow was taking a hard look at its energy use. As a result, there was a shift in emphasis toward greater diversification into specialty chemicals, and there was also growing financial conservation at corporate in supporting energy-intensive products such as commodity chemicals. Both trends made capital scarce for the Louisiana Division whenever it wanted to pursue expansions or process modifications. Thus, in 1981, the division initiated an energy contest in which the prize was essentially capital dollar. The funds came from the corporate budget for small-scale capital investments, which originally meant amounts from \$10,000 up to \$200,000. A decade later, this budget covered investments up to \$2 million, while larger investments came under the aegis of a separate, large-scale capital budget.

The energy contest was quite successful, and a few years later it was broadened to include yield improvement. Eventually, the program focus turned to waste reduction, and the program was named WRAP, for Waste Reduction Always Pays. The name of the contest was actually Energy/WRAP, since it continued to include projects aimed purely at energy savings. However, the number of winning energy-based projects declined from 90 in 1987 to 74 in 1992, while the number of winning WRAP projects rose to 54 by the same year.

The financial criteria were modified over the years. At the outset, when the capital crunch was severe and interest rates were high, the program required a return on investment (ROI) of at least 100%. In later years, the cutoff was lowered to 30%, and in order to qualify, a project also had to demonstrate savings of at least \$10,000.

Although Dow had a long history of environmental concern, the timing of WRAP may have been related to events outside the company. During 1985, a congressional committee asked Dow to compile a corporate-wide summary of emissions as part of a broader industry survey. For many top managers at Dow, this survey provided the first opportunity to see the magnitude of the company's waste streams on an aggregate basis, and the figures were surprisingly high. Around the same time, environmental groups were pressing vigorously for more information about Dow's emissions and for more evidence of waste reduction efforts. In addition, within another year, the reporting requirements of SARA Title III were being written into new legislation. WRAP was announced in 1986 and implemented for the first time during the following year.

### **Program Goals**

Each of the five divisions within Dow coordinated its own waste reduction activities, but the goals were common to all of the programs. In essence, these were as follows:

- Reduce or eliminate environmentally harmful waste streams
- Measure results to support monitoring of waste reduction activity
- Enhance employees' awareness about environmental impact
- Recognize and reward employee contributions
- Reduce long-run operating costs

The primary goal was to reduce pollution and, ideally, to eliminate it. Dow recognized that there was a hierarchy of policy options and placed pollution prevention at the top of the hierarchy. When certain wastes were unavoidable, the next level of desirability was the reuse or the recycling of waste material. In cases where recycling could not be accomplished, the next level was waste treatment, preferably on-site, and the final recourse was disposal in a secure landfill.

The importance of measurement has also been somewhat of a tradition at Dow, not only in conjunction with its continuous improvement initiatives but also in its accounting systems. The company had implemented the idea of full-cost accounting in the area of waste disposal. In particular, whenever a particular unit could be identified as responsible for a certain waste stream, that group was charged for managing the waste. This meant that products and processes had to bear the costs of such activities as incineration, treatment, or landfill, rather than relegating such costs to be captured in a more anonymous overhead account. Sometimes, at the discretion of top managers, these charge-back rates were set artificially high in order to focus attention on the activity.

The focus on environmental impact was consistent with the full-cost approach to accounting and also mirrored the increasing public awareness of environmental issues. In addition, the coordinators of the WRAP program wanted to broaden employees' thinking beyond their own plant or work area. Since waste management often had implications for downstream processes and activities, its analysis required engineers and operators to recognize the systems issues surrounding environmental impact.

Recognition and rewards were an integral part of the WRAP program, following the precedent that had been set with the energy contest several years earlier. There was wide agreement at Dow that the forms of recognition in the program had been strong motivators for employees. In keeping with precedent, however, there were no direct financial rewards to the winners in the contest. The rewards were of a different type.

Finally, cost reduction was an explicit part of the program. (Dow had a separate budget covering investments required to achieve compliance with environmental regulations.) This emphasis reflected the notion that, in matters of pollution prevention, there remained a great deal of proverbial "low-hanging fruit" to be harvested. An essential part of the program was project justification using ROI calculations, so that waste reduction and financial benefit could be seen as linked. In fact, several Dow managers were skeptical that cost reductions and pollution reduction could be married for very long. They expected the program to wither after a year or two, but the actual experience was quite different. Six years after inception, the number of projects funded by the program continued to grow.

## **Program Organizations**

The first step in the contest was a call for projects. Specifically, a set of submissions forms was distributed in the spring, with an entry deadline set for the end of October. The form was fairly streamlined, could be filled out by hand, and only one copy was required. The form asked for a brief description of the project, a summary of anticipated benefits (quantified by waste flows, yield improvements, and utility savings), a calculation of the ROE, and sketches of the “before” and “after” states. The form itself provided utility costs and the standard formula for computing ROE, so participants could tell right away if their idea looked desirable.

Initially, the entries were submitted by junior engineers at the various plants, but over the years, these engineers had learned to team up with operators or other staff members, in order to leverage their own time as well as to ensure viability. Over time, employees at various levels of the organization submitted proposals. Often the submissions would be made by teams consisting of engineering and operating personnel.

Project reviews were held late in the calendar year, and winners were designated in January. The evaluation was carried out by a coordinating committee, which contained representatives from a number of areas, including production management, process engineering, and economic evaluation. (One member of the committee acted as the Division’s WRAP coordinator.)

Part of the evaluation involved an oral presentation. Prior to these presentations, the WRAP Coordinator informed entrants about the kind of information the coordinating committee wanted to see. In addition, any member of the committee who had questions about a particular proposal could contact the submitter and clarify outstanding questions before the presentation took place.

The coordinating committee designed several winners, but their main task was to assure that the projects proposed made sense technically and that they were free from major implementation barriers. In fact, the 30% ROI cutoff was somewhat flexible. The Division coordinator assigned projects to one of three categories: high-return projects, whose ROI values exceeded 100% at any given plant. The number of proposals declared winners was always relatively high: in most years, more than 90% of the WRAP proposals were designated as winners. (See the appendix for some recent examples of WRAP projects.)

A formal presentation of awards was made in February, at a seminar held in Washington. As part of the presentation, the division’s general manager presented distinctive plaques to all individuals and teams who had submitted winning proposals. Back in their own plants and departments, this recognition was reinforced, and WRAP winners were quite visible among their peers. Winners were typically put in charge of implementing the projects they had proposed. Although there was no financial prize associated with winning, supervisors were asked to acknowledge each participant in the contest when

annual performance reviews were done. Over the years, the impression grew that promotions often followed success in the contest.

Later in the year project audits were held. Audits were mainly aimed at verifying that the projects accomplished what they had proposed, in terms of process improvement and financial benefit, and to maintain the contest's credibility. The audits imply asked what was anticipated in the proposal and what actually happened after the project was implemented. In addition, each project was potentially a learning experience, and the audit process assured that the lessons from any particular project were not lost. Like the evaluation itself, audits emphasized the positive aspects of the project and were relatively brief.

### **Program Results**

By most measures the WRAP program has been a success. For example, in 1992, WRAP projects accounted for a 55% return on investment, savings of over \$10 million, and a reduction of 13 million pounds of waste. Meanwhile, the number of WRAP project winners grew from 24 in the program's first full year of implementation to 54 in 1992.

In addition to the visibility generated by the award themselves, awareness was reinforced by the publication of a "Waste Elimination Idea Book," which featured descriptions of all proposals submitted. The Idea Book was distributed each year, not only adding to the recognition of the contest participants but also providing a mechanism for transferring the knowledge from plant to plant.

Building on the notion of idea sharing, the Division organized a two-day Waste Elimination Workshop every year or two. The workshop served as a basic seminar in pollution prevention concepts, and for examples it drew heavily on recent WRAP projects to illustrate in concrete terms how the concepts could be applied.

Managers involved with the WRAP program took pride in the economic benefits derived from the program's activities, as well as in the level of participation. On top of these dimensions of success, they were often quick to point out that all of these accomplishments came from a program that itself had not dedicated bureaucracy and that in fact had not budget at all.

### **Challenges for the Future**

A few years after the WRAP program took hold, Dow's management was ready to confront several issues emanating from its success. The first of these challenges was how to export WRAP to other divisions, especially those in other countries. Management wanted to understand precisely what features of the Louisiana implementation were crucial to success. Among these, which were generic to all Dow divisions, and which were special to the Louisiana Division? For the later, how could similar conditions be put in place to enhance the prospects of exporting WRAP successfully?

A second challenge was how to institutionalize waste reduction efforts effectively. For the most part, WRAP was a bottom-up initiative, which enjoyed early success. In order to sustain such a program it would be necessary to make sure that its focus was consistent with top-down initiatives. In particular, WRAP had to stay compatible with strategies and priorities set by top management. These directions were bound to be influenced by public opinion, expressed directly through various environmental organizations that had contact with Dow, and indirectly through new laws and regulations. How could this compatibility be encouraged?

**APPENDIX:**

**Samples of WRAP Projects**

# WRAP PROJECT SUMMARY



## DowBrands

**Project:** Waste reduction and recovery/recycling for polyvinyl chloride (PVC) and polypropylene plastic at the DowBrands contract operations of Kleen Test Products, Port Washington, Wisconsin. DowBrands is a wholly-owned subsidiary of The Dow Chemical Company.

**Opportunity:** A DowBrands task force identified an opportunity to develop and implement a waste reduction program at Kleen Test, the producer of S'WIPE'S® and SPIFFITS® moist cleaning towels. The team's goal was to reduce the waste of PVC and polypropylene plastic. PVC is used for the outer shell of the product packaging, while polypropylene plastic is used to make the towels themselves.

**Action:** A material yield program was developed to account for weekly inventories and yield measurements. Key to the program was the daily collection and measuring of waste at various points in the process. Using these data, short- and long-term goals for waste reduction, recycling, incineration, and landfilling were established and milestones were used to develop and measure progress. The DowBrands contract operations WRAP team trained Kleen Test employees in data collection and analysis and goal setting. Kleen Test held weekly meetings with its operators, quality assurance personnel, and management to share information and get input from the operating personnel.

Production became less wasteful after problem areas were identified, and the WRAP team located recycling channels for the remaining waste at Kleen Test. Corrugated and paper products are sold to a paper recycler. The plastic scrap previously bound for landfill is now sold to local companies that make a variety of useful products, including fence posts and paint roller trays.

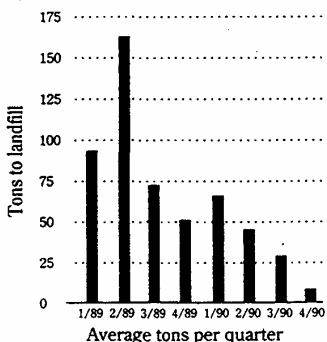
**Results:** Production line waste has been reduced by 77 percent and is on a strong continuous improvement track. Plus, 85 percent of Kleen Test waste is recycled; 15 percent is being incinerated. None of the solid waste is being landfilled. The savings from this project exceed \$300,000.

**Waste Reduction Team:** The team consisted of members from DowBrands' Contract Operations in Mauldin, South Carolina.

*"Waste reduction begins with getting the information to the people who actually do the job - in production. When they understood the need for and importance of reducing waste, they put their minds together and worked as a team to accomplish the goal - and they did it. The goal was accomplished."*

*Manager of Contract Operations*

1989-1990 Kleen Test  
Waste Reduction: SPIFFITS/S'WIPE'S

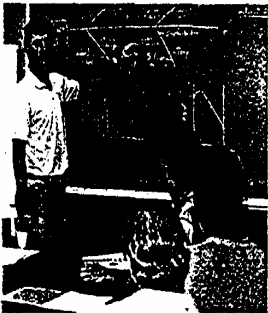




# WRAP PROJECT SUMMARY



Outstanding Achievement Award



*Using the continuous improvement process, a waste reduction team from manufacturing and research implemented a WRAP project at the Cell Service Plant in Plaquemine.*

## Louisiana Division

**Project:** Asbestos waste reduction at the Cell Service Plant in Plaquemine, Louisiana.

**Opportunity:** The plant's waste reduction team found several opportunities to reduce the amount of waste asbestos being disposed in the on-site landfill. Asbestos is used in the manufacture of chlorine cell diaphragms, which separate the chlorine gas and brine from sodium hydroxide (caustic soda) and hydrogen gas in the chlorine cell. Chlorine is used in the manufacture of plastics, solvents, and water purification applications. Caustic soda is used in the manufacture of paper, aluminum, and soap. It is also used in food processing.

**Action:** The team made changes to the diaphragm manufacturing process, which improved consistency. The use of higher quality asbestos doubled the diaphragm's working lifetime. The higher quality asbestos also meant that the cathodes used with the diaphragms could be washed and redeposited with fresh asbestos, rather than being discarded with the old asbestos.

**Results:** By increasing the working lifetime and reducing the amount of asbestos used, the waste going into the landfill was reduced by 3.3 million pounds a year. This translates into savings of \$1.1 million a year.

**Waste Reduction Team:** The project team included representatives from Research, the Cell Service Production Plant, and Chlorine Operating Plants.

*"It's really satisfying to see the difference in the amount of asbestos that went to landfills five years ago versus the amount going today. The improvement is very significant ... and it wouldn't have happened without the team effort of the years."*

*Research Engineer*