The Roles of Materials and Cost Accounting
in an Environmental Management System:
A Case Study of Precix, Inc. (formerly Acushnet Rubber Company)

by Jack Bailey, Toxics Use Reduction Planner
Karen Thomas, Northeast Waste Management Officials' Association
2003

Today, like no other time in our recent history, the term "accounting" evokes much emotion. Practices at companies such as Enron, Arthur Anderson, and WorldCom have shaken the confidence of the world's economic community. Innovative companies in all sectors are taking this opportunity to review their own accounting procedures.

Honest financial performance demands honest accounting. Likewise, truly understanding a company's environmental performance, as a first step toward improving it, depends on accurately accounting for the materials that are used. Materials accounting generally involves determining the amount of materials in inventory, amount brought on site, produced on site, recycled on site, consumed in process, produced as non-product output, shipped in (or as) product, and amount in ending inventory. Materials accounting provides a clear picture of the use and potential waste involved with each material accounted for.

Accounting for the amount of materials alone can inform some decisions that will positively affect environmental performance. After completing a materials accounting exercise, some companies are able to immediately identify a particularly wasteful process that is ripe for improvement. This has often been the case, for example, when materials accounting is performed on a solvent degreasing operation. Oftentimes it is found that, due to poor worker practices or inadequate cooling, close to 90 percent of the solvent is lost to evaporation. This low efficiency can easily be improved through worker education, maintenance, and other pollution prevention mechanisms.

Sometimes the amount of materials alone does not provide so obvious an action. Honest costing information is necessary to assist companies in making good decisions about materials use. Cost accounting practices assure that all expenses will be allocated to the particular process or product where they originated. This differs from conventional accounting, which has allowed for some costs, although clearly dedicated to a particular process or product, to be assumed as overhead and not properly allocated. Historically this has been true for all environmental costs (e.g., staff time, permitting fees, waste management costs) which have been lumped into overhead.

Using cost accounting practices, a company might learn that a particular product line has become unprofitable due to a specific toxin that has become more expensive to

> The term that incorporates environmental costs and information into a variety of accounting practices is "environmental management accounting" (EMA). EMA can be defined as the identification, collection, estimation, analysis, internal reporting, and use of materials and energy flow information, environmental cost information, and other cost information for both conventional and environmental decision-making within an organization. (Source www.emawebsite.org).

purchase, properly handle and dispose of. Using this information, the company can decide to replace the toxin, reduce its use, or discontinue the product.

This case study is an example of how one company effectively used materials and cost accounting in an environmental management system framework to achieve their goal of reducing the use and release of toxic chemicals, and reducing exposure to employees, the public and the environment.

Precix, Inc., formerly Acushnet Rubber Company, in New Bedford, Mass. manufacturers elastomeric products for the automotive, safety, electrical, office products and golfing industries. In 1996 the company became the first in Massachusetts, and the second in the United States, to be certified to the environmental management systems standard, ISO 14001. Materials and cost accounting were critical tools in the success of their system.

Being a Massachusetts company and having complied with the Massachusetts Toxics Use Reduction Act for the past ten years, materials and cost accounting for large quantity toxics were nothing new to Precix. But Precix wanted to do more than just focus on their large quantity toxics. Having already become certified to the ISO quality standards, QS 9000, ISO 9001 and AS9100, they recognized the value of the structure that the certifiable standards require and the value of public recognition in motivating employees.

Environmental Management Systems

An environmental management system (EMS) is a continual cycle of planning, implementing, reviewing and improving the processes and actions that an organization undertakes to meet its business and environmental goals. Most EMSs are built on the "Plan, Do, Check, Act" model. This model leads to continual improvement based upon:

- Planning, including identifying environmental aspects and establishing goals [plan];
- Implementing, including training and operational controls [do];
- Checking, including monitoring and corrective action [check]; and
- Reviewing, including progress reviews and acting to make needed changes to the EMS [act].

One certifiable EMS, developed by the International Organization for Standardization, is the ISO 14000 series. This series is a continuation of the 9000 series of international standards dealing with quality systems. The ISO 14000 series was developed for incorporating environmental aspects into operations and product standards. In September 1996, the international committee finalized the ISO 14001 standards for environmental management systems. The ISO14001 requires implementation of an EMS in accordance with defined internationally recognized standards. The ISO14001 standard specifies requirements for establishing an environmental policy, determining environmental aspects & impacts of products/activities/services, planning environmental objectives and measurable targets, implementation & operation of programs to meet objectives & targets, checking & corrective action, and management review. (Source: www.epa.gov/ems).

Using the ISO 14000 framework, Precix organized employee teams to assist in identifying environmental and worker health aspects and impacts of their operation. This exercise involved accurate materials and cost accounting of the materials and operations studied. Following are three examples of successful projects undertaken by Precix, within the framework of their EMS, that reduced pollution, reduced worker and public exposure potentials, and saved the company money.

Materials Accounting Prompts Improvements
Using the environmental management system framework, the company identified trichloroethylene as a significant environmental aspect for three main reasons: high hazardous waste disposal costs, impact on human health, and its International Agency for Research on Cancer (IARC) listing as a potential carcinogen. In 1995, Acushnet used 47,000 pounds of TCE and emitted 19,000 pounds. This materials accounting showed an inefficient process that emitted 40 percent of the amount used. Acushnet set a goal of eliminating TCE by the end of the fiscal year. TCE was used in a vapor degreaser primarily to clean metal parts that had been stamped by Acushnet's suppliers using a grease coating. Acushnet convinced the supplier to replace the grease with a water-based coating that could be removed by an aqueous cleaning process. Eliminating the use of TCE saves the company approximately $100,000 annually. This includes $20,000 in TCE costs alone. (Savings are in 1996 dollars). The remainder is shared by savings in labor, handling, equipment, maintenance, and waste disposal costs.

In another operation, the volatile organic compounds (VOCs) emitted during an adhesive spraying process were identified as a potential worker health risk. The EMS framework encouraged workers to get involved in identifying impacts and in finding solutions. In the adhesive spraying operation, workers suggested a new process that dips the pieces in liquid adhesive and then spins them in a centrifuge. The company saved approximately $40,000 per year (1996 dollars) in labor and material costs.

The company previously used methylene chloride to purge lines and clean urethane mixing tanks. The process resulted in nine tons of methylene chloride emissions. Due to these large emissions, Acushnet evaluated alternatives and eventually switched to dibasic ester (DBE). The DBE caused an unforeseen problem by dissolving the rubber gaskets in the production equipment being cleaned. This was solved by replacing the gaskets with teflon gaskets manufactured in-house and training the employees not to clean unnecessarily. This project was estimated to save the company approximately $60,000 annually (1992 dollars).

Cost Accounting Identifies Additional Savings
Following the previous toxics use reduction projects, the annual air permit cost of $26,000 was decreased by changing to a restricted emission status, saving $23,000 annually (1996 dollars). Likewise, changing from a large quantity generator of hazardous waste to a small quantity generator saved approximately $4,000 annually and provided some flexibility in storage and handling of wastes.

If the company had not used cost accounting practices to appropriately allocate these permitting/regulatory costs to their originating process, they may not have been identified for reduction once the process was modified.

Mike Walther, President and CEO has fully supported and funded these programs at Precix, Inc. The continuous improvement and lean manufacturing aspects of these models fits the corporate culture and company business plan. Reduction of waste, preventing

pollution and designing for the environment are valued objectives on Precix's quest to maintain world class manufacturing to bring added value to their customers.

Costs and Savings of EMS

Precix estimated the cost of implementing the environmental management system to be $250,000 (1996 dollars). This included staff time, EMS training, consultants, software, registration and Occupational Safety and Health (OSHA) training, which is required by OSHA and was combined with EMS training. (The OSHA training would have cost approximately $100,000 if provided separately.) The few projects detailed in this case study total enough in annual savings to offset this one time EMS cost as shown in Table 1. Cost savings from earlier projects to conserve energy and water (purchase and sewer cost savings) are not included but were used to financially justify undertaking the EMS project.

Through the EMS "continuous improvement" framework, the company continues to identify projects that improve the company's environmental performance, improve working conditions, and save money. In addition the company notes many other positive outcomes of the EMS process including spreading the ownership for environmental issues in the company, improved communication within the company, improved self-esteem of employees, and positive publicity.

Table 1: Summary of Costs and Savings of Projects and EMS

Project	(Costs) or Savings 1996 dollars
Costs (one-time)	
EMS implementation	(250,000)
Annual Savings	
TCE elimination	100,000
Adhesives process change	40,000
Methylene chloride elimination	87,846
Air permit fees	23,000
Change in generator status	4,000
OSHA training	100,000
Total Annual Savings	354,846

Notes: All costs were adjusted to 1996 dollars using a 10% discount rate; This table reflects only a few of many cost savings projects undertaken by the company; These projects alone reflect an 8.4 month payback.

Conclusion

The data obtained by materials and cost accounting allowed for the evaluation, decision making and viability of the goal of limiting environmental impact and reducing the cost of doing business. The framework of an environmental management system provided the structure, recognition and employee participation in the process, all of which were essential to the process.

In today's honesty-in-accounting mindset, companies should take this opportunity to review their own materials and cost accounting practices to ensure honesty and full knowledge of actual environmental and financial costs and potential savings.

Bibliography

Barbara Quinn, Contributing Editor, "Moving Beyond Pollution Prevention," *Pollution Engineering*, 1997.

Cochin, Ted J., "Continuously Improving Your Environmental Strategies," *Corporate Environmental Strategy*, Volume 5, Number 2, Winter 1998.

INFORM, "Tracking Toxic Chemicals: The Value of Materials Accounting Data," 1997, http://www.informinc.org/tracktox.pdf

Tellus Institute, "Snapshots of Environmental Accounting: A Report to the US EPA Environmental Accounting Project," May 1998, http://www.dep.state.pa.us/dep/deputate/pollprev/pdf/ALLSNAPS.pdf