

# Environmental Management Systems



## A Design for the Environment Approach

U.S. Environmental Protection Agency  
Office of Pollution Prevention and Toxics



**DRAFT**  
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# Acknowledgments

This document was prepared by Abt Associates Inc., Cambridge, MA, as part of an effort to show how Design for the Environment (DfE) technical work could be used to support development of an **Environmental Management System (EMS)**. This document is based primarily on The ISO 14000 Handbook and other EMS reference documents acknowledged in the references section and on DfE guidance documents such as the Cleaner Technologies Substitutes Assessment Methodology. The EPA Project Officer is Bill Hanson, Chief, Design for the Environment Program, in the Office of Pollution Prevention and Toxics. Important contributions were made by Jenny Fisher and Ted Cochin, EPA. The Abt project team included Dennis Chang, Jonathan Greene, Cheryl Keenan, and Jean E. (Libby) Parker. Important contributions were received from the Eastern Research Group, Inc. (ERG), Lexington, MA and from the University of Tennessee, Knoxville Center for Clean Products and Clean Technologies. The ERG project team included Jeff Cantin, Bob Ferrone and Dave Galbraith. The University of Tennessee project team included Kerry Kelly, Lori Kincaid and Mary Swanson. Valuable contributions were also received from Marci Kinter, Screen Printing and Graphic Imaging Association International (SGIA), Fairfax, VA.

# Disclaimer

This document is a preliminary draft. It has not been formally released by the Environmental Protection Agency and should not at this stage be construed to represent Agency policy.

# Foreword

EPA's Design for the Environment (DfE) Program has over seven years of experience building voluntary partnerships with industry, public interest groups, universities, research institutions, and other government agencies to develop cleaner, safer alternatives to existing products and processes. The DfE Program has developed technical methodologies that provide small businesses with environmental, economic, and performance information on traditional and alternative manufacturing methods and technologies. These approaches allow for a comparison of environmental issues, including options for addressing concerns that help businesses integrate environmental concerns into their daily business activities. In addition, DfE has gained valuable experience in communicating to a wide variety of people with varying degrees of technical sophistication, and in establishing and maintaining diverse stakeholder groups. The DfE Program is offering this experience to support the development of **Environmental Management Systems** in companies.

An Environmental Management System (EMS) is a set of management tools and principles designed to create the administrative **procedures** that a company needs to integrate environmental concerns into its daily business practices. The EMS developed and outlined by the International Standards Organization (ISO) in their standard ISO14001 provides a widely recognized set of principles and standards for integrating environmental management into quality control and other business activities. This manual uses ISO14001 as a guideline. To implement an EMS, however, there are steps that involve some technical work, such as identifying and prioritizing environmental concerns, evaluating options for addressing those concerns, and measuring the success of implementing those

## **POINTER:**

An Environmental Management System provides a systematic way to review and improve operations for better **environmental performance** and improved profitability, by setting up **procedures** that ensure the work gets done. An EMS requires both administrative and technical work.

## **POINTER:**

While based on the ISO 14001 approach, the DfE/EMS process described in this manual does not include all steps or core elements necessary for ISO **certification**.

options.

The DfE approach to creating an EMS involves using the DfE technical methods as the technical foundation of the EMS. The DfE approach emphasizes reducing **risk** to humans and the environment, pollution prevention, and wise resource management. DfE principles are presented below. Those elements of the EMS that require strictly management or administrative expertise will also be presented so as to maintain the continuity of the process, but more detail on these elements will be found in other referenced sources. This manual takes you and your company through the EMS creation process, step by step.

 **POINTER**

An EMS is intended to address only environmental concerns over which your company has control or which your company can affect.

## **DfE Principles**

A goal of DfE is to create healthier environments for workers, communities, and the ecosystem.

### **Method**

Integrate environmental considerations of risk reduction and wise resource management into daily business decision making that includes performance and cost.

Seek environmental solutions that promote competitiveness.

Recognize need for a commitment to continuous improvement.

Provide business with tools and methodologies to make better environmental choices.

### **Operating Principles**

Identification and comparison of alternatives to identify trade-offs and information gaps.

Use the DfE Substitutes Tree outline to structure this Cleaner Technology Substitutes Assessment.

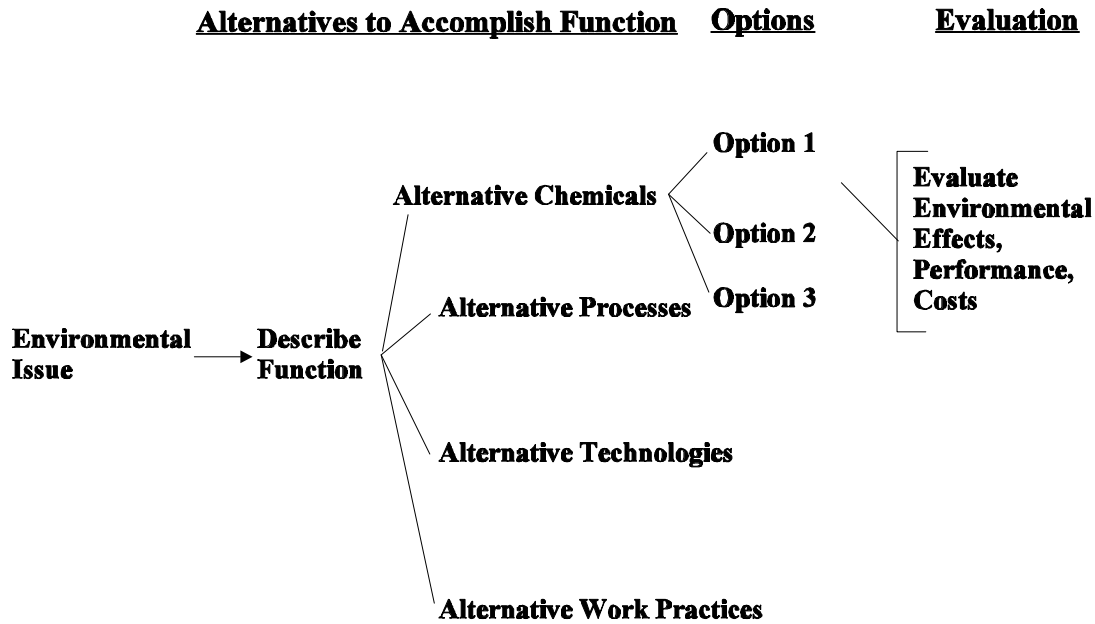
Understand the environmental effects of material flows.

Use the Pollution Prevention Principles as a guideline for evaluating and ranking approaches.

## Operating Approach

Work in partnership with **stakeholders**; engage participation and support of employees; encourage open communication.

## DfE Substitutes Tree



## Pollution Prevention Hierarchy

- ▶ Source Reduction: 1) Substitutes; 2) Process change 3) Management Work Practices
- ▶ Recycle/Reuse
- ▶ Control Technology
- ▶ Disposal

**Benefits:** Achieve sustainability; Reduce Risk; Cost Savings

# Contents of this Manual

<b>Module</b>	<b>Page</b>
How to Use This Manual .....	page vi
1 Overview of Environmental Management Systems .....	page 1-1
2 Laying the Groundwork .....	page 2-1
3 Making the Commitment: Creating an Environmental Policy Statement and Determining the Scope of Your DfE/EMS .....	page 3-1
4 Planning the Process: Decision Points, Leadership & Participants, Schedule & Plan .....	page 4-1
5 Identifying Environmental Aspects: Understanding Your Company's Possible Impacts .....	page 5-1
6 Determining Significant Aspects: Prioritizing Concerns and Setting Objectives .....	page 6-1
7 Setting Standards: Developing Operational Controls .....	page 7-1
8 Making Improvements: Evaluating Alternatives and Setting Targets .....	page 8-1
9 Setting Up Environmental Management Projects; Measuring and Achieving Success .....	page 9-1
10 Establishing Continuing Improvement: Your DfE/EMS Program, Audits, and Management Review .....	page 10-1
References .....	page R-1
Appendix A: Identifying Your Stakeholders: Who They Are; What Role They Can Play .....	page A-1
Appendix B: Communicating Your Work & Training to Get the Job Done .....	page B-1
Appendix C: Documenting Your Work .....	page C-1
Appendix D: More Tracking Help .....	page D-1
Appendix E: Tool Kit .....	page D-1
Glossary .....	page G-1

# How to Use This Manual

This manual has been designed to help small businesses integrate environmental concerns into business decision making by developing an Environmental Management System. While this manual follows the guidelines of ISO14001, the official international standard for EMS, it is designed to help small businesses set up and implement a simple, straightforward EMS.

This manual is laid out in ten modules designed to be completed through a group discussion. Each module can be completed in approximately two-hours, but it may take longer to complete some discussions. Sessions may be held once a week, once every other week or once a month until the job is done. Use whatever time these modules require for your company. It is more important to complete each section fully than to finish in any particular calendar time frame.

Best results will be achieved by involving everyone in the company in some way. There are two benefits to involving all employees: first, they will be more likely to take ownership of managing environmental concerns; second, they often have valuable insight into how improvements can be made.

You should consider regular sessions as suits your schedule to complete the work in each module. If your company can dedicate staff time, you may wish to set up a committee to meet regularly and lead the development of your DfE/EMS. The committee members can then also meet regularly with other employees to provide progress reports and solicit input. The importance of regular communication and involvement cannot be overemphasized. The process of getting people thinking about how to consider environmental concerns in their daily work is as

 **POINTER:**

Every choice you and your employees make can affect the environment. Involving everyone helps produce cost-effective long-term results.

important as any step in setting up your Environmental Management System.

In addition, some of these modules will have to be revisited at several steps in the process. For example, you will develop a communication plan in the beginning, but you may need to add to it as environmental concerns are identified. Therefore, some sections may not be completed in one meeting, but may be revised as needed throughout the process.

Finally, you don't need to do everything at once. This manual will help you identify possible projects and then help you determine which to prioritize, given your resources and time. You may, for example, want to start out by developing the DfE/EMS for only one part of your company or operation. You can expand later as your resources permit. It's important to start small with projects that will achieve success so that you and your employees gain experience with the process and build confidence in your ability to make changes.

# Module 1

## Overview of Environmental Management Systems

An **Environmental Management System (EMS)** provides a systematic way to review and improve operations for better **environmental performance**. An EMS can help a company better meet its compliance requirements. It can also help a company use materials more efficiently and streamline operations, thereby reducing costs and becoming more competitive. The EPA National Enforcement Investigations Center (NEIC) has recognized the contribution of an EMS in improving a company's compliance record by providing a guidance document for developing a "compliance-focused" EMS.<sup>1</sup>

The most commonly used framework for an EMS is the one developed by International Organization for Standardization (ISO) for the ISO 14001 standard. Established in 1996, this framework is the official international standard for an EMS.

**While the EMS described in this manual is based on the ISO 14001 approach, the process outlined in this manual does not provide for meeting all the requirements of that standard.**

The five main stages of an EMS, as defined by the ISO 14001 standard, are:

### **POINTER**

An **EMS** is a framework for managing those significant **environmental aspects** you can control and those over which you have an influence.

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<sup>1</sup>"Compliance-Focused Environmental Management System — Enforcement Agreement Guidance," EPA-330/9-97-002, USEPA, Office of Criminal Enforcement, Forensics and Training, August 1997.

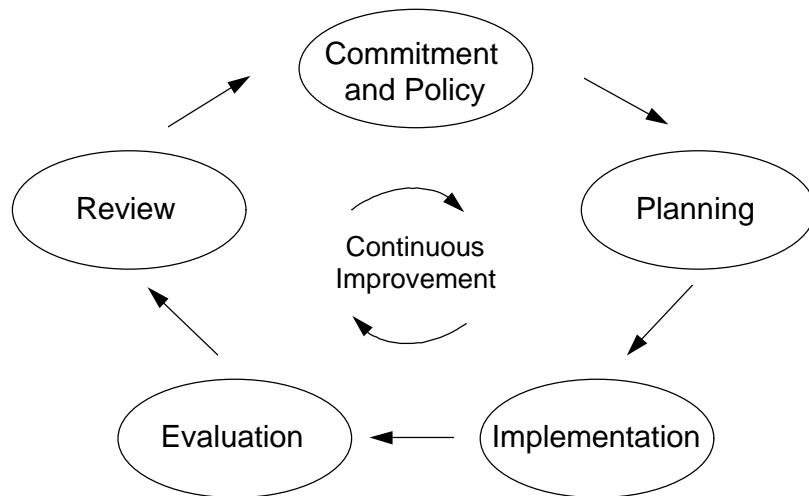


Figure 1. The Continuous Improvement Cycle

**POINTER**

Continuously identifying and reducing risk leads to improved competitiveness and environmental performance.

- ▶ **Commitment and policy:** top management commits to environmental improvement and establishes a company **environmental policy**.
- ▶ **Planning:** the company conducts a review of its operations, identifies legal requirements and environmental concerns, establishes objectives, evaluates alternatives, sets targets, and devises a plan for meeting those targets.
- ▶ **Implementation:** the company follows through with the plan by establishing responsibilities, training, communication, documentation, operating procedures, and an emergency plan to ensure that **environmental targets** are met.
- ▶ **Evaluation,** where the company monitors its operations to evaluate whether the targets are being met, and if not, takes **corrective action**.
- ▶ **Review:** the EMS is modified to optimize its effectiveness. The review stage creates a loop of continuous improvement for the company.

Using the approach provided in this manual, you can develop a DfE/EMS that helps you continuously identify and reduce risk to people and the environment. By focusing on reducing risk and more efficient natural resource use, improvements in environmental performance will be built into your DfE/EMS. This manual provides methods to help you consider risk reduction when answering the following questions:

- 1) How does your company **impact the environment**?
- 2) Which **environmental impacts** are **significant**?
- 3) How can your company **improve its environmental performance**?

### **What are the steps in developing a DfE/EMS?**

The modules are laid out to provide a step-by-step guide through the process of creating an EMS that incorporates DfE principles and that uses the DfE technical approach to evaluate alternatives for improvement in a selected area. Each module contains worksheets to assist you in completing the work. The focus of the manual is on the technical work. The appendix contains modules on stakeholders, communication, and documentation to assist you in completing those parts of your EMS when you are ready to work on them. The Appendix also contains a “toolkit” of blank forms that correspond to the worksheets in each module. There are also additional case studies and a glossary in the Appendix. In addition to the Appendix, more tools and guidance can be found on the DfE/EMS website at <http://www.epa.gov/opptintr/dfe/index/html> .

## **Module 1: Overview of Environmental Management Systems.**

Provides a general discussion of what an EMS contains and the process of developing one.

## **Module 2: Laying the Groundwork.**

Build support for your DfE/EMS by making a presentation to your company's managers and employees on what an EMS is and why the company is developing one. This presentation will help to develop support and understanding of the DfE/EMS within your company. In addition, you will need to develop an understanding of how your company currently manages environmental concerns. You may already have policies in place that can be part of an EMS. Understanding your company's approach to environmental concerns will help you identify areas for improvement. Discussion questions designed to help understand your current efforts are included.

## **Module 3: Making the Commitment: Creating an Environmental Policy Statement and Determining the Scope of Your DfE/EMS.**

You will begin the process of developing a DfE/EMS by writing your company's environmental policy statement and deciding how much effort you want to expend at the start. This policy will be based on what is important to your company. The module contains a set of discussion questions that will help draw out company concerns and values. It also contains some sample principles and policy statements.

#### **Module 4: Planning the Process: Decision Points, Leadership & Participants, Schedule & Plan.**

Next, you will create a plan for the DfE/EMS effort. This plan includes determining who will oversee plan implementation and who will participate in the process. It includes a schedule for meetings and for completing each step. In addition, there are recommendations for initial steps in identifying stakeholders, developing a communication plan, and preparing documentation.

#### **Module 5: Identifying Environmental Aspects: Understanding Your company's Possible Impacts.**

Your company's **environmental aspects** are any of your activities, products, or services that can have an impact on the environment. In order to identify potential environmental concerns you should consider regulations, inputs and outputs of various company activities from office work to production processes and the environmental effects of those activities. This module lays out a method for developing and organizing that information as it relates to your company.

#### **Module 6: Determining Significant Aspects: Prioritizing Concerns and Setting Objectives.**

You will need to determine which environmental aspects are significant and to prioritize them to determine what you want to address first. This module describes a method for making a judgement about environmental risk so as to prioritize environmental aspects. The module also helps to translate the results of prioritization into objectives to reduce environmental impact using practical, cost-effective criteria.

##### **POINTER**

You should not try to perfect or even complete each step on your first attempt. Many of the steps will need to be revisited as you proceed with developing the EMS.

##### **POINTER**

**environmental aspects** are elements of your business, such as air pollutants or hazardous **waste**, that can have negative impacts on people and/or the environment.

### **Module 7: Setting Standards: Developing Operational Controls.**

All significant environmental aspects should have standards set to provide guidance that will minimize environmental impact. This module lays out how to develop operational controls, measure for success of those controls, and provide corrective action when necessary.

### **Module 8: Making Improvements: Evaluating Alternatives and Setting Targets.**

Your environmental projects lay out how you plan to achieve your targets. It is important to consider a wide array of approaches before designing a project to meet objectives. This module shows how the DfE technical methodology considers a hierarchy of alternatives which include substitutes, pollution prevention and wise resource management.

### **Module 9: Setting Up Environmental Management Projects; Measuring and Achieving Success.**

You will implement your environmental project by assigning responsibilities and making desired changes in procurement, processes, or work procedures to meet your targets. It is also important to review progress at regular intervals and design ways to measure the success in meeting targets.

### **Module 10: Establishing Continuing Improvement: Your DfE/EMS Program, Audits, and Management Review**

To ensure success and continuing improvement, regular reviews of your DfE/EMS are needed. Management reviews should be scheduled regularly to check on progress of the DfE/EMS and of the environmental programs set up to meet targets. The EMS review would include progress made in communication,

#### **POINTER**

The EMS is an internal management tool. How much you choose to do and whom you choose to include as participants is entirely the decision of you and your company. Reviews of your company's performance are conducted by your own firm and the results revealed at your discretion.

documentation and developing stakeholders as well as the specific environmental targets. This review provides the basis for continuing improvement.

How much work each of the steps entails depends entirely on how large your company is and the scope of work that you decide to undertake. It is not necessary for your DfE/EMS to include all your operations, especially for your first effort. As you grow in experience in managing environmental concerns along with your daily operations, you will develop your DfE/EMS further.

## Road Map Between ISO14001 and DfE/EMS Approach

ISO14001 EMS Components	DfE/EMS Manual Modules
Commitment and Policy	<b>Module 2: Laying the Groundwork</b> <b>Module 3: Making the Commitment: Creating an Environmental Policy Statement and Determining the Scope of Your DfE/EMS</b>
Planning	<b>Module 4: Planning the Process: Decision Points, Leadership &amp; Participants, Schedule &amp; Plan</b> <b>Module 5: Identifying Environmental Aspects: Understanding Your company's Possible Impacts</b> <b>Module 6: Determining Significant Aspects: Prioritizing Concerns and Setting Objectives</b>
Implementation	<b>Module 7: Setting Standards: Developing Operational Controls.</b> <b>Module 8: Making Improvements: Evaluating Alternatives and Setting Targets</b> <b>Module 9: Setting Up Environmental Management Projects; Measuring and Achieving Success</b>
Evaluation	<b>Module 9: Setting Up Environmental Management Projects; Measuring and Achieving Success</b>
Review	<b>Module 10: Establishing Continuing Improvement: Your DfE/EMS Program, Audits, and Management Review</b>

# Module 2

## Laying the Groundwork

Before building your DfE/EMS, you need to take two important steps. First, build both management and employee support for your DfE/EMS. Second, develop an understanding of how your company currently manages environmental concerns.

### Step 1: Building Support for an EMS

It's important that both management and employees understand not only what an EMS is, but also why they would want one. This step is designed to get people to think about and discuss the ways in which an DfE/EMS would benefit your company.

First, set up times to discuss the following questions with managers and employees. Recording the discussion provides important documentation, which can be used to communicate the benefits of an DfE/EMS to others. These results may provide ongoing support for the development process. One way to record the discussion is to assign someone the task of writing answers on a flip chart, so that everyone can see them for discussion.

The first set of general questions will help you identify your need for an EMS.<sup>2</sup>

Which environmental and worker safety laws and regulations is your company required to follow?

Are you looking for ways to improve your overall environmental performance?

How does your company define environmental performance?

### **DfE Program**

Experience has taught the importance of building support from participants through open and frequent discussion about mutual concerns.

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<sup>2</sup>Adapted from: *Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations*. Ann Arbor, MI: NSF International, November 1996, p.3.

Does lack of time or resources prevent your organization from taking charge of its environmental obligations? Are there individuals appointed to be responsible for this function?

Does your organization know how its **environmental objectives** relate to its business objectives?

To build support, consider the benefits a DfE/EMS might provide for your company. A more systematic approach to meeting your environmental and business goals might contribute to the following in your company:


- ▶ improved environmental performance
- ▶ improved worker health and safety
- ▶ improved competitiveness
- ▶ improved compliance and reduced liability
- ▶ fewer accidents
- ▶ improved public image
- ▶ enhanced customer trust
- ▶ better access to capital
- ▶ improved internal communication
- ▶ improved company morale

It will be helpful at this point to create a worksheet to compare the expected costs and benefits of developing a DfE/EMS. The table below provides some general categories of costs and benefits. When making your comparison, provide specific examples from the discussion.

<b>Worksheet 2-1: Costs and Benefits of Developing and Implementing a DfE/ EMS<sup>3</sup></b>	
<b>Costs</b>	<b>Benefits</b>
<ul style="list-style-type: none"> <li>▶ staff/employee time for the following: information collection, read and understand manual, preparation of worksheets, facilitating EMS sessions, participating in EMS development</li> <li>▶ possible consulting assistance</li> <li>▶ training of personnel in new procedures</li> <li>▶ technical resources to analyze environmental impacts and improvement options</li> <li>▶ resources required to make changes</li> </ul>	<ul style="list-style-type: none"> <li>▶ improved environmental performance</li> <li>▶ expected increased efficiency/reduced cost of materials</li> <li>▶ new customers/markets</li> <li>▶ enhanced employee morale</li> <li>▶ expected savings in compliance and record keeping requirements due to changes in materials used.</li> <li>▶ reduced <b>waste</b> disposal/treatment costs</li> </ul>

## Step 2: Understanding How Your Company Currently Manages Environmental Concerns

This step is designed to help you review how your company currently handles environmental and human health concerns and compares current practice with where you would like to be. In some references, this is called a “gaps analysis” because it is designed to uncover ways to improve your management of these concerns. This step is best developed through group discussions with a group representing different functions in your company, especially line managers and line workers. You’ll need to involve those that have the day-to-day working knowledge of your company’s operations. It is important for everyone to understand your current efforts. In this way, they can then

 **POINTER**  
Remember to consider worker health and safety as well as people outside your plant when evaluating known health concerns.

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<sup>3</sup>Ibid, p. 5.

explore ways that things might be done differently, so as to improve both environmental management and cost savings for your company.

## Discussion Questions

1. Does your company have an Environmental, Health & Safety Policy?
  - ▶ Is this policy written down?
  - ▶ Where is it located?
  - ▶ How many employees know about this policy?
  - ▶ How did they learn of it? Is it included in a training or orientation program?
  
2. Who created this policy? How many contributed to its development? Do employees have the opportunity to make suggestions regarding environmental concerns?
  
3. What points are included in this policy?
  
4. Does your company have specific environmental or health & safety goals?
  - ▶ Are these documented?
  - ▶ How are these communicated to employees?
  - ▶ Is there a way of tracking whether goals are met?
  - ▶ Are there penalties within the company for not achieving the objectives?
  - ▶ Is there a way to change these goals when changes in processes, production, or activities occur? How are these changes communicated?
  
5. Does your company have a process to identify all environmental, health & safety regulatory requirements?

### POINTER

Your discussion should be comprehensive and detailed enough to give you some idea of what will need to be done to develop a DfE/EMS for your company.

- ▶ Has your company conducted compliance audits?
  - ▶ Has your company received any fines or penalties regarding corrective action?
6. How does your company evaluate risk to human health & safety and the environment caused by your business operations? How is this information incorporated into planning for business activities/production?
7. Is there a process within the company to review any changes in products or processes with an eye toward environmental concerns?
8. Who in the company is designated to be in charge of environmental, health & safety concerns?
- ▶ Is that person(s) responsible for achieving environmental goals identified above?
  - ▶ Does that person have the training resources and management support to carry out the job?
9. What training is offered at your company that would support environmental objectives?
- ▶ Do employees receive environmental, health & safety training? What percent of employees? Which ones?
  - ▶ How is that training documented? Where are the records kept?
  - ▶ Is there provision for regular training on environmental, health & safety requirements?
10. Does your company have a procedure for responding to suggestions regarding environmental concerns that it may receive from customers, neighbors, or employees?
- ▶ Is there a process for soliciting and recording any

 **POINTER**

As you discuss these questions, it will be beneficial to write down the answers for reference as you proceed with the following modules.

“suggestions”? Where are these records kept?

- ▶ Is there a process for following up on any of these suggestions to be sure that appropriate action was taken?

11. How does your company keep track of its documents?

- ▶ Is there a filing system?
- ▶ How many people are familiar with the system?
- ▶ How many people have access to it?
- ▶ How could someone find information relating to environmental, health & safety concerns? Are there Material Safety Data Sheets (MSDS) available? Does your company have documented standard operating procedures for plant operations, emergencies, or document control?
- ▶ How are decisions made about when to dispose of documents?

12. How does your company identify potential accidents or emergency situations?

- ▶ Are emergency procedures documented?
- ▶ How do employees find out about them? Is there regular training?
- ▶ Are these procedures periodically tested, evaluated, and revised as needed?
- ▶ Have there been failures in response to accidents or emergency situations?

13. Does your company have a way of measuring the environmental effects of any of its operations?

- ▶ Are there records kept? How long?
- ▶ Are these records reviewed regularly with an eye to whether performance has improved or worsened?
- ▶ Are these results available during management planning

 **POINTER**

Visit the DfE website for more tools related to gaps analysis:

<http://www.epa.gov/opptintr/dfe/index.html>

sessions?



# Module 3

## Making the Commitment: Creating an Environmental Policy Statement and Determining the Scope of Your DfE/EMS

This module will help you develop an environmental policy for your company and determine the scope of operation for your DfE/EMS. The discussion questions will help focus your values about the environment and identify which ones might be addressed by your company. A set of principles is also offered, that you may want to include in your statement. A sample environmental policy statement and some examples of other companies' environmental policy statements are presented at the end of the module.

### Environmental Policy Statements

An environmental policy is your declaration of commitment to the environment, including worker health and safety. This policy serves as the foundation for your DfE/EMS and provides a unifying vision of environmental principles that will guide the actions of employees and management. Your environmental policy is a statement of the shared values throughout the company in promoting cleaner, safer workplace practices, products, and technologies. This policy statement serves as the framework for setting environmental objectives and targets, and will be brought to life in your plans and business activities.

Because this statement contains the company's vision, it may include goals that cannot be achieved immediately. This is to be expected, since continuing improvement should be one of the principles included in the policy statement.

### **DfE Program**

Principles that can be a part of your environmental policy include a commitment to risk reduction, pollution prevention, and wise resource management. An important element is a commitment to consider an array of alternatives before determining a course of action.

### **POINTER**

The **environmental policy** is the foundation of the company's EMS. Top management should communicate goals such as preventing pollution and minimizing risk to workers and the environment.

## Discussion Questions

Discuss each of the following questions and make a list of the environmental issues and shared values of concern to your company.

1. What environmental issues are of the greatest concern to your company? For example, consider the air, water, and soil quality, and landfill issues that may be of concern to the surrounding community. Also consider worker health and safety issues.
2. What are the major environmental impacts of your company's operations? Think in terms of air emissions, effluent discharge, solid waste, and natural resource consumption.
3. Who is affected by your company's environmental impacts? Do they occur at a global level, a regional level, a local level? Are there any worker health and safety concerns related to environmental issues, such as using and handling toxic chemicals?
4. Are there significant environmental impacts associated with the **life cycle** of your product as you look upstream and downstream from your operations? For example, (upstream) do your suppliers create significant environmental impact in producing the products you purchase from them ? (Downstream) Do your customers create an impact in using or disposing of the products you sell them? Are these impacts important to you?
5. On a general level, how do you want to accomplish your environmental goals?

### POINTER

Consider who should be involved in developing this policy and the best process for writing it. Input from a range of people in your company will tend to increase commitment and ownership, as well as provide different viewpoints during the policy's creation.

## Scope of Your Policy Statement and Your DfE/EMS Refine Your List of Issues

Review the list of issues generated from the discussion questions and put a check beside those activities your company does or could affect.

### Set Your Boundaries

Think also about the boundaries of your policy. Decide if it will include activities beyond internal operations, such as supplier environmental performance or customer product use. You will want to drop issues from your list that do not fall within the boundaries set for your policy statement.

### Put It Into General Terms

Your list of specific issues should be addressed in general terms by your policy statement. For example, if chemicals occurring in water or air are a concern because they potentially impact the community, you could express a commitment to review and, where feasible, make changes in the chemicals used by your company. Another example would be that if solid waste in landfills is a concern in your area or to your company, this concern could be expressed as a commitment to reduce the solid waste your company produces.

Next, think about how your commitments will be achieved. For example, your commitment to reduce solid waste may be achieved through a pollution prevention program and a program to design products or services that result in minimal waste generated by the consumer. Also, these programs may be implemented one at a time over a several-year period, as part of your commitment to continuing improvement.

#### POINTER

You may wish to review this policy statement when you have completed some of the following modules, e.g., after identifying environmental aspects and determining which of them are significant.

## Sample Commitments

It is important to think through which commitments your company will be capable of addressing. Do not include commitments in your policy that the company will not be able to carry out. The following is a check list of commitments or principles that you may wish to consider including in your policy statement:

Commitment to comply with applicable environmental or worker safety laws/regulations.

Commitment to pollution prevention and prevention of accidents.

Commitment to identify opportunities for risk reduction associated with the processes and chemicals used in your plant, the supplies procured, the products produced, and the disposal of waste products.

Commitment to be aware of the life cycle (from raw materials extraction and processing to use and eventual disposal) of products produced, including packaging, so as to affect how suppliers and end users impact the environment through your products.

Commitment to continuing improvement in use of cleaner technologies and processes, and the safer use of chemicals.

Commitment to wise resource management, including conservation of limited resources and reuse and recycling of materials.

## Examples

The following are sample environmental policy statements that in

### POINTER

Visit the DfE website for more tools related to policy statements.

<http://www.epa.gov/opptintr/dfe/index.html>

some way incorporate most of the principles listed above. Case Study #1, below, briefly shows how “Company A” set up a process for creating an environmental policy statement and some of the benefits of doing so.

**Sample Policy: Adapt for your company.**

**YOUR COMPANY (ABC)  
HEALTH, SAFETY AND ENVIRONMENTAL POLICY**

ABC Company is committed to managing health, safety and environmental (HS&E) matters as an integral part of our business. In particular, it is our policy to assure the HS&E integrity of our processes and facilities at all times and at all places. We will do so by adhering to the following principles:

Compliance

We will comply with applicable laws and regulations and will implement programs and procedures to assure compliance. Compliance with HS&E standards will be a key ingredient in the training, performance reviews, and incentives of all employees.

Risk Reduction, Prevention, Resource Management

We will seek opportunities, beyond compliance requirements, for reducing risk to human health and the environment, and we will establish and meet our own HS&E quality standards where appropriate.

We will employ management systems and procedures specifically designed to prevent activities and / or conditions that pose a threat to human health, safety, or the environment. We will look for ways to minimize risk and protect our employees and the communities in which we operate by employing clean technology, including safe technologies and operating procedures, as well as being prepared for emergencies.

We will strive to minimize releases to the air, land, or water through use of cleaner technologies and the safer use of chemicals. We will minimize the amount and toxicity of waste generated and will ensure the safe treatment and disposal of waste.

We will manage scarce resources, such as water, energy, land, forests, in an environmentally sensitive manner.

Communication

We will communicate our commitment to HS&E quality to our employees, vendors, and customers. We will solicit their input in meeting our HS&E goals and in turn will offer assistance to meet their goals.

Continuous Improvement

We will measure our progress as best we can. We will review our progress at least on an annual basis. We will continuously seek opportunities to improve our adherence to these principles, and will periodically report progress to our stakeholders.

{Signature}

President

Date

**Sample Policy**

**This is the environmental policy of a small environmental services company specializing in wastewater treatment and laboratory analysis of effluent. The policy is signed by the company's President.**

We supply quality products and services. This requires the commitment of everyone working in this institution to pursue our activities safely, protecting our health and preserving the environment.

To realize this vision we will:

- Establish and review periodically our environmental goals within a program of **continual improvement**.
- Comply with legal requirements pertinent to our industry and with the requirements of other initiatives we enter into in accordance with our commitment to offer quality products and services.
- Conduct laboratory analyses and supply environmental services without risk to workers' health.
- Operate the laboratory with a minimum of waste, in current and future operations.
- Pursue our work with a minimum of disturbance to our neighbors and the community.
- Maintain our vehicles in optimal condition to minimize their consumption of fuel and their emissions to the atmosphere.
- Manage our chemical products safely, principally to prevent spills in their storage and transport.

This policy and any subsequent modifications should be familiar to all employees and available to the public. Implementation of this policy is a primary objective of the President and the responsibility of all employees.

## **Environmental Policy: Module 3**

### **Case Study 1: Company A**

Company A is a 20-person manufacturer of large custom metal machine parts for industrial customers. To initiate its EMS, the company formed a small EMS implementation team that includes the managers of quality, purchasing, and human resources and is led by the owner's son. This team developed the environmental policy for review and approval of the owner and, equally importantly, set up a structure for involving all employees in the EMS process. Employees receive general environmental awareness training during some of the company-wide Friday meetings and have been involved in identifying environmental problems and solutions in their areas of responsibility.

Company A's comprehensive approach to environmental management yielded immediate results. After identifying oil usage as a significant environmental aspect, a team of workers and managers identified faulty gaskets as the primary cause of oil leaking from the machines. By replacing these gaskets, the company cut its oil use by 50%. This change, as well as more general improvements in work environment and worker safety, caused the local environmental enforcement agency to reclassify Company A as a non-hazardous waste generator (it had been classified as a hazardous waste generator). The company also reports significant improvements in the environmental awareness of management and workers; though less tangible, this change in attitude may prove equally significant over the long run.

# Module 4

## Planning the Process: Decision Points, Leadership & Participants, Schedule & Plan


This module will help you set up a plan for completing your DfE/EMS. This plan will be unique to your company. You will want to identify:

the steps that need to be taken, in the appropriate order;  
the decisions that will need to be made;  
resources and schedules for accomplishing the tasks; and  
stakeholders that will participate, communication needs,  
and documentation for your EMS process.

### Planning Steps

Your review of current environmental activities by your company, discussed in Module 2, gives you some idea of what will need to be done. To plan for your EMS development, consider the steps presented below. You may not be able to complete every step at this time, but addressing them now will facilitate your EMS development.

1. Decide which areas of environmental activities are of the highest priority.
  - ▶ Are there some areas that are critical and need to be addressed first?
  - ▶ Should you work on the EMS in stages?

 **POINTER:**  
The level of detail you want will vary with your organization. Some plans can exist on one page and still be effective.

2. Determine what level of management involvement is required and what decisions will be needed.
  - ▶ Can you proceed with action steps or do you need additional approvals?
  - ▶ Is management aware of its options?
  - ▶ Which decisions can be made by the EMS team and which ones need higher-level management approval?
3. Decide who will be responsible for overseeing completion of various parts of your DfE/EMS. That person will be the “management representative” with responsibility for implementing the EMS (in a small business, this person could be the owner). Someone should be designated as responsible for at least the elements listed below (see worksheet at end of this module):
  - ▶ Identifying and determining significance of environmental aspects.
  - ▶ Identifying and determining applicability of legal and other requirements.
  - ▶ Competency-based training.
  - ▶ Operational controls.
  - ▶ Emergency preparedness and response.
  - ▶ Monitoring and measurement of “key characteristics” of operations and activities that can have significant environmental impacts (i.e., the “significant environmental aspects.”).
  - ▶ Periodic evaluations of environmental compliance.
  - ▶ Handling and investigating non-conformance with the EMS.
  - ▶ Records management.
  - ▶ Internal EMS audits.
4. Decide who should be involved. (See worksheet at the end of this module.)
  - ▶ Do you know what resources you need to complete the

- EMS design?
- ▶ Do you know what resources are available?
  - ▶ Who will make the decision about participants? resources?
  - ▶ How will you define roles, responsibilities, and authorities? The way that will work best is one that is consistent with the way your company is currently managed. Are decisions made centrally, or are they delegated?
5. Set a deadline for developing your EMS and establish a schedule. (See worksheet at the end of this module.)
- ▶ How much time do you estimate it will take to complete design?
  - ▶ To implement?
6. Estimate a budget.
7. Set your boundaries.
- ▶ How much planning is enough?
  - ▶ How much is too much?

### Create an Outline for the Process

It will be helpful at this point to develop some idea of what your EMS document will look like, and thereby what work will need to be done to fill it in. Create an outline that suits your company. What and how much you actually include depends upon your company and its needs. The following are some of the parts you may want to include:

- I. Environmental Policy
- II. Environmental Action Responsibilities Assignments
- III. Environmental Documents and Their Location
- IV. Environmental Aspects
- V. Significant Aspects
- VI. Legislative and Regulatory Requirements

 **POINTER:**

Spend enough time only to find the major decision points and set some tentative guidelines for how those decisions will be made.

- VII. Objectives and Targets
- VIII. Environmental Program to Meet Objectives and Targets
- IX. Emergency Preparedness Plan
- X. Internal Auditing Procedures
- XI. Corrective Action Procedures
- XII. Program Review Procedures

The actual content of your outline will be filled in as you proceed to develop your EMS.

### Additional Considerations

An important part of the development of your DfE/EMS is the participation of stakeholders; communication with employees, shareholders, and the community; and documentation of your DfE/EMS. Appendices C, D, and E contain information and ideas that will help you consider these three areas as you work through your DfE/EMS. The following three worksheets summarize the kinds of things you will need to consider.

**👉 POINTER:**  
When creating a plan, add the elements that are suitable for your EMS effort and retain flexibility as the process develops.

<b>Worksheet 4-1: Identification of Stakeholders</b>			
<b>Your Stakeholders</b>	<b>What you want to tell them:</b>	<b>What you want them to tell you:</b>	<b>How to communicate with/tell them:</b>
(Example) Employees	Environmental policy	How to get it done	Memo, bulletin board, meetings, suggestion box
(Example) Neighbors	Environmental policy and EMS plans	Their environmental concerns	Meetings, open house, flyers, suggestion box
Date Completed: _____		Contact Person: _____	

Worksheet 4-2: Communication Work Plan					
Target Audience	What to Communicate	Mode of Communication	When	Budget	Who is Responsible
Sample: Staff	Environmental	Newsletter	Monthly	?	?
	Policy	Staff Meetings	Weekly	?	?
Date Completed: _____			Contact Person: _____		

Worksheet 4-3: Documentation							
List Existing Documents	Determine Format: Who/ Date Completed	Develop Prototype (Content): Who/ Date Completed	Assign Writing: Who/ Date	Review Writing/ Compare to Prototype Who/ Date	Added to Document List/ Date	Who has access	Where Located
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
List Documents to be Created							
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
Date Completed: _____ Contact Person: _____							

## **Estimating Resources and Schedules**

If you have never developed an EMS before, estimating resources and time can be very difficult. There is no magic formula. Even in the smallest organization, some estimate of people resources and other costs, together with a schedule of milestones and decision points, will be needed.

One way to begin is to create a schedule and estimate resources for completing the modules in this manual. Other steps can be added as needed. As you begin to work on each module, you may want to identify intermediate steps for which you will set additional target completion dates. At some points, you may need to alter the overall schedule. Below is a worksheet to assist you in developing and tracking this plan. As you go through each module, revisit this worksheet and list who is participating in each task and your estimated budget and schedule. Also, below is a worksheet to help you identify the persons responsible for different parts of the EMS and the resources needed to support their effort.

<b>Worksheet 4-4: Persons Responsible for DfE/EMS Development</b>			
<b>Roles</b>	<b>Individual Responsible</b>	<b>% of Time Designated</b>	<b>Budget</b>
“Management representative” having responsibility for implementing the EMS (in a small business, this person could be the owner).			
Identifying and determining significance of environmental aspects.			
Identifying and determining applicability of legal and other requirements.			
Competency-based training.			
Operational controls.			
Emergency preparedness and response.			
Monitoring and measurement of “key characteristics” of operations and activities that can have significant environmental impacts (i.e., the “significant environmental aspects.”).			
Periodic evaluations of environmental compliance.			
Handling and investigating non-conformance with the EMS.			
Records management.			
Internal EMS audits.			



<b>Worksheet 4-5: DfE/EMS Development Schedule and Resources Worksheet</b>			
<b>Module</b>	<b>Participants</b>	<b>Budget</b>	<b>Target Completion</b>
Planning the Process: Decision Points, Leadership & Participants, Schedule & Plan			
Intermediate steps: (Fill in)			
Understanding What Your Company Does and Its Possible Impacts: Identifying environmental aspects			
Intermediate steps: (Fill in)			
Determining Significant Aspects: Prioritizing and Setting Objectives			
Intermediate steps: (Fill in)			
Making Improvements: Evaluating Alternatives and Setting Targets			
Intermediate steps: (Fill in)			
Setting Standards: Developing Operational Controls			
Intermediate steps: (Fill in)			
Setting Up Environmental Management Projects; Measuring and Achieving Success			
Intermediate steps: (Fill in)			
Establishing Continuing Improvement: Your EMS Program, Audits, and Management Review			
Intermediate steps: (Fill in)			
Date Completed: _____ Contact Person: _____			

# Module 5

## Identifying Environmental Aspects: Understanding Your Company's Possible Impacts

In this Module, we begin the technical work that will help you identify the environmental aspects and impacts of your activities. An environmental aspect is any element of your company's activities, products, and services that affects the environment. Environmental impacts are the changes to the environment resulting from any of the environmental aspects. Most elements of your business operations will have environmental aspects, intended or unintended. For example, an unintended aspect of using a cleaning solvent may be that there are volatile (airborne) emissions produced during use. The "impact" of these emissions may be hazardous exposure to workers or the community or a contribution to smog formation. The table below shows some examples of environmental aspects and the impacts associated with them.

<b>Figure 3</b>	
<b>Environmental Aspects</b>	<b>Potential IMPACTS of each Aspect</b>
Metals discharged to POTW	Contamination of aquatic habitat and drinking water supply
VOC emissions	Contribution to smog; worker or community exposure to volatile organic compounds (VOCs)
Scrap generation	Degradation of land, habitat, water supply
Solid waste generation	Degradation of land, habitat, drinking water supply
Fresh water use	Depletion of natural resources
Electricity use	Contribution to global warming; degradation of air quality

### **DfE Program**

Each project has started with a simple mapping exercise to identify possible environmental concerns. Informed participants then select a priority concern that becomes the focus of the DfE project.

### **POINTER:**

An environmental **aspect** is any element of your company's activities, products, and services that affects the environment.

This module will help you review your business activities, products, and services, in a way that will identify their environmental aspects. These aspects are not necessarily a problem; most activities have them. Module 6 will help you decide which environmental aspects are significant for your business and to choose which ones you wish to improve. Module 8 will help you identify and evaluate options for those improvements. The remaining modules will help you set up an environmental project for each aspect that you have chosen, establish methods of evaluating progress, and develop a system for management review and for ensuring continuing progress.

### **Identifying Aspects: A Five-Step Process**

Environmental aspects of your company's activities are identified in a five-step process. The first involves identifying regulatory and other requirements. The second, third, and fourth step involve reviewing in detail your company's flow of activities so as to identify the environmental component of each. This process is best undertaken through group discussion, partly to gain insight through different perspectives and partly to engage everyone in the process of understanding the environmental component of your daily activities. The fifth step requires identifying the environmental and human health impacts of each chemical identified in your activity flow.

#### **Step I: Identify your legal and other requirements.**

Identifying environmental aspects begins with your knowing all legislative and regulatory requirements that pertain to your business activities, products, and services. Even regulations that may not apply to your small business may contain important information about the environmental impacts associated with your type of business. Regulated concerns that do apply to your business should be included in your system of environmental

#### **POINTER:**

It is helpful to begin identifying regulatory requirements by making a list of those regulations that you now know affect your company. A search for additional information can take time and can be added into your EMS at a later date, as you learn about it.

programs because your EMS will strive to integrate all of your company's efforts to manage environmental concerns.

You can obtain information on regulatory requirements from a variety of sources. State or City Departments of Environmental Protection might be able to assist you in finding this kind of information. For example, state technical assistance programs are often excellent resources for small businesses and can provide one-on-one consultation.

In addition, public affairs offices of both the Environmental Protection Agency (EPA) and the Occupational Health and Safety Administration (OSHA) of the Department of Labor (DOL) can help provide publications that explain regulations pertinent to your company's activities. Publications by the DfE Program at EPA and EPA's Office of Enforcement and Compliance Assistance (OECA) also identify federal regulations affecting certain industries. In addition to Federal, state and local legal requirements need to be considered. Often states administer Federal environmental and occupational safety and health regulatory programs and may have stricter and/or different requirements than Federal regulations. The Reference Section in the Appendix gives full citations of the DfE publications and describes how to obtain them. You can also visit the DfE Web site at [www.epa.gov/dfe](http://www.epa.gov/dfe).

In addition to regulations, industry codes of practice and other non regulatory guidelines can help point to environmental aspects of your business activities. Your trade association also may be able to help identify useful publications.

 **POINTER**

Developing an EMS provides an opportunity to review your company's compliance successes and concerns. The Tool Kit in Appendix B contains a sample compliance tracking worksheet.

Worksheet: 5-1 Regulations		
Agencies that can help	Regulations that apply to my business	Business Activities Affected
Date Completed: _____		Contact Person: _____

**Notes:** This table will help you organize your search of regulations that affect your business. In many cases, very small businesses are exempt from some regulations. Still, the problems addressed by the regulations may affect your business and may be concerns you would want to address in your EMS. Thus, it is worthwhile to familiarize yourself with regulations, just to identify concerns and determine whether there are any that apply to your operations.

**Step 2: Map Your Company’s Activities and Processes**

First, categorize your business activities into areas or steps in the process so that you can review them one by one. Some typical areas to consider might include:

- Receiving Raw Materials
- Storing Raw Materials

**POINTER:**  
 These technical sections are best developed through group discussions. There is no “right” way to build these lists. The process, however, must make sense to you and be documented so that you can review it or change it later.

Manufacturing Process, Step 1  
Manufacturing Process, Step 2  
Manufacturing Process, Step 3  
Packaging  
Process Clean-up  
Waste Disposal  
Office  
Building Maintenance  
Shipping Product  
Transportation (including employee, sales, and  
management staff, parking)

Use this list of areas to develop a flow chart describing the order in which activities take place in your company. Some areas may need their own flow chart; others could be parts of a larger flow chart. Examples of how you might set up your flow chart are shown in Figure 3.

 **POINTER**

Visit the DfE website for more tools related to process mapping.

<http://www.epa.gov/opptintr/dfe/index.html>

**Figure 4  
Generic Flowchart for Business  
Activities**

**Office Operations:**

Word Processing

Copying

Drafting

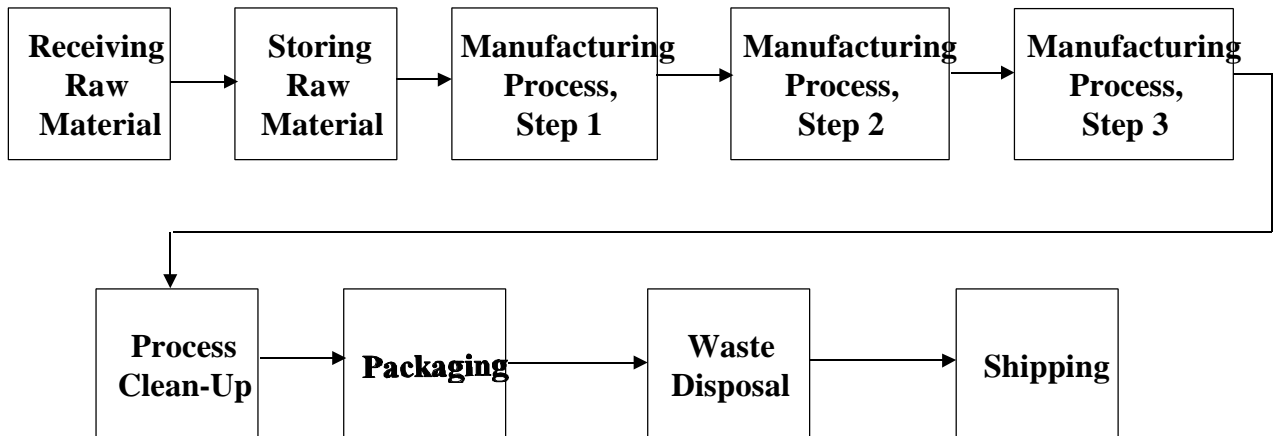
**Building Maintenance:**

Lighting

Cleaning

Heating and Air Conditioning

**Creating Your Product**

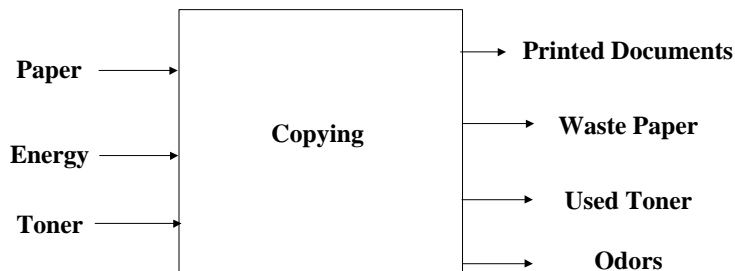


You will notice that the first two areas of activities, office operations and building maintenance, have boxes that are separate rather than being part of a sequence. The activities identified under these areas are not related. Under the area “Creating your product,” the activities are connected in steps required to produce a product or service. This order will be important to understand later if you decide to work on an aspect that is part of a sequence of steps.

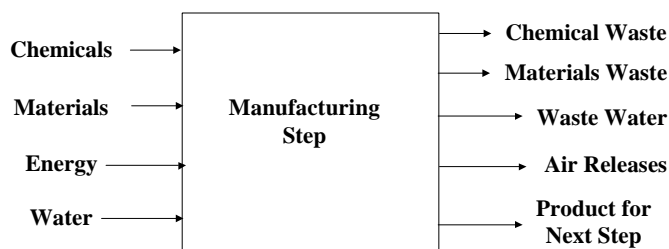
**Step 3: Identify the Inputs and Outputs of Each Activity**

Next, identify the inputs and outputs of each box. Among those inputs and outputs will be some that have environmental effects. Figure 5 is an example of a business activity that is not part of an operational sequence. Figure 6 represents an activity in a manufacturing operation that is a step in a sequence.

**Figure 5**  
Generic Input-Output Diagram for Office Operations



**Figure 6**  
Generic Input/Output Diagram for a Manufacturing Operation



**Step 4: Identify environmental aspects of Each Activity**

Using your flowchart, identify the environmental aspect of each input and output. Keep the following key points in mind when identifying the environmental aspect of a particular activity:

Can it be toxic or hazardous to humans or anything in the environment?

Does it use natural resources?

How is it disposed of?

Create a worksheet like the one below to help you list each process step and its associated environmental aspect. The Appendix Tool Kit contains a blank copy for your use.

<b>Worksheet 5-2: Identifying Environmental Aspects</b>		
<b>Input/Output</b>	<b>Environmental Aspect</b>	<b>Environmental Impact</b>
<b>Office Activities</b>		
Paper (In)	Use of paper	Use of natural resources
Energy (In)	Use of energy	Use of natural resources; air quality degradation
Toner (In)	Harmful chemicals	Health and environmental effects*
Documents (In)	Solid waste	Degradation of land, habitat, drinking water
Waste Paper (Out)	Solid waste	Degradation of land, habitat, drinking water
Used Toner (Out)	Solid and chemical waste	Degradation of land, habitat, drinking water
Odors (Out)	Production of odors	Indoor air quality
<b>Manufacturing Process</b>		
Chemicals (In) List	Chemicals that are toxic to humans or the environment	Health and environmental effects*
Materials (In) List	Materials that are toxic to humans or the environment	Health and environmental effects*
Energy (In)	Use of energy	Use of natural resources; air quality degradation
Water (In)	Use of water	Use of natural resources
Chemical Waste (Out) List	Production of hazardous waste, solid waste	Degradation of land, habitat, drinking water*
Materials Waste (Out) List	Production of hazardous waste, solid waste	Degradation of land, habitat, drinking water*
Waste Water (Out)	Production of waste water	Degradation of drinking water*
Air releases (Out)	Production of air pollutants	Degradation of air quality*
* See next section for information on chemical effects		

## Step 5: Identify Chemical Concerns

To identify the environmental aspects associated with chemicals used in your business operations, you will need to find information on the human health and ecological concern of those chemicals. Without this information, you cannot identify the potential impact of each chemical on the environment. In addition, this information is necessary in the next module to help you assess the significance of environmental aspects associated with chemical use. Unfortunately, the information record is incomplete for most chemicals. Information that will help you understand the concerns associated with the chemicals you use may rest in several different sources.

Taking the time and effort to find the information about the chemicals you use will allow you to better understand the potential effects of the chemicals on humans and on the ecology, and how to use them in a way to minimize or avoid harmful effects. Furthermore, you can decide whether you want to continue using your current chemicals, or find alternatives that would mitigate any potential harmful impact.

Sources of information about chemicals include:

Manufacturer's Safety Data Sheets (MSDSs). These are supplied by the manufacturer according to OSHA regulation. You should receive these with any chemicals you purchase and keep them in a location that is available for review.

Your suppliers. Ask them for hazard and exposure information on any products you purchase.

Your trade association.

EPA or state environmental agency.

Online sources in various websites.

### **POINTER:**

Remember, any chemical strong enough to take the place of human labor or to make human labor easier is strong enough to have some kind of environmental risk associated with it. The question is how to manage that risk.

Organize the information you have into a format that will enable you to make comparisons. You will find that sometimes little information for a particular chemical exists. That in itself is useful. By using this format, you will know that whatever decision you make now may change if information becomes available at a later date. Although you may want to use the chemical now, you may need to make adjustments later when more information becomes available.

The following worksheet will help you organize your information on the chemicals you use in your business activities. This information will be used to help identify environmental aspects and impacts in the worksheet above, and also to determine significant aspects in the following Module.

Worksheet 5-3: Health, Safety and Environmental Concerns Information										
Work Activity/Chemical	Information Sources	carcinogen? <sup>a</sup>	OSHA Exposure limit? <sup>a</sup>	VOC? <sup>a</sup>	Human Health Effects			Effects on wildlife <sup>c</sup>	Other environmental effects <sup>c</sup>	Safety Concerns
					Inhalation effects <sup>b</sup>	Dermal effects? <sup>b</sup>	Ingestion effects? <sup>b</sup>			
Manufacturing Step 1										
Chemical 1	MSDS, trade association	yes	10 ppm	no	cancer, dizziness	sensitizer		soil: kills worms; soil: kills fish	ozone depletion	flammable

a Information for these columns can usually be found on the MSDS

b Partial information for these columns might come from the MSDS, but other resources may be needed

c MSDSs usually do not include environmental effects

# Module 6

## Determining Significant Aspects: Prioritizing Concerns and Setting Objectives

From your work in Module 5, you have probably identified a number of “environmental aspects” associated with your company’s activities. This Module will help you prioritize those aspects. It will also help you determine which one(s) you will want to work on first. Do not expect to work on all the environmental aspects identified. “Continuous improvement” implies that this is an on-going process where you address some concerns now and others in the future.

Your operations may have many environmental aspects, but they may not all be significant. By scoring each aspect against a set of environmental criteria (e.g., toxicity, wasted materials), you can determine which are most significant. Selecting significant environmental aspects (SEAs) to work on involves practical considerations as well as some idea of expected improvements (benefits) from the project. Scoring against a set of practical criteria (e.g., technical and economic feasibility) and listing benefits criteria (e.g., improved health), will help you decide which aspects to address first. For those you select, you will set objectives in terms of the improvements you hope to make.

Determining what aspects are significant includes making subjective decisions. For this reason, results will be improved by having a team of people representing different job categories who can provide a cross-section of operational experience when you work on this Module.

### Step 1: Determine Your Selection Criteria

#### **DfE Program**

Projects emphasize integrating risk and conservation of resources evaluation into performance and cost evaluations.

#### **POINTER:**

It is important to prioritize aspects carefully. Two considerations are: if you intend to seek ISO certification for your EMS, it will be necessary to address **every** aspect you select as significant. Secondly, you may wish to include some short term, relatively easy projects to get started on your EMS. Therefore, include resources, time frame and ease of carrying out as criteria in your prioritization scheme.

First, make a list of criteria against which you will judge or score the environmental aspects. It will be helpful to review Module 3, where you gained an understanding of your company's values regarding the environment. Concerns of companies that have gone through this process include:

### Regulatory Concerns

Are regulatory concerns for this aspect being met in a consistent manner? How difficult is it to meet compliance obligations?

### Pollution

How much unintended output or byproduct is there from this aspect? In other words, how much waste output is there? What are the sources of pollution to air, water, land? Does the pollution output occur inside the facility before being released outside, or is it all being released outside? Is there control technology for the pollution?


### Risk

Effects of Chemicals: How serious are the environmental concerns with this aspect's chemicals or materials or to pollution from it?

Workers: How frequently and how severely will employees be **exposed** to this aspect or to pollution from it?

Community: How frequently and how severely will people in the surrounding community be **exposed** to this aspect or to pollution from it?

Environment: How frequently and how severely will the environment be **exposed** to this aspect or to pollution from it?

 **POINTER**  
Pick those criteria that are important to your company.

Safety, including noise: What safety/noise hazards may be generated by this aspect?

**Natural Resource Use:**

How much water, soil, energy, or other forms of resources, such as landfill space and fossil fuels, are being consumed during this aspect?

**Global and Local Concerns:** (not on chart)

Other criteria that some companies have used include global warming, water quality, ozone depletion, photochemical smog, acidification, habitat destruction, etc.

The explanation under each criterion is phrased as a relative question because the scores will be based on your judgment rather than on precise measurements. Also, there are potential overlaps between some of the categories, such as global concerns, risk and pollution. It is only important that you understand the categories that you select and know what you understand to be included in each. You may wish to use this list, add to it, break the categories into parts, or make it shorter. The important thing is to keep it simple and clear and to make sure it reflects your company's values.

Using your list of criteria, create a worksheet using Worksheets 6-2a and 6-2b, shown later in this module, as an example. These worksheets use the criteria identified above and the aspects from Module 5. There is also a blank worksheet in the Appendix Tool Kit. At this point, you may not wish to look at all business activities. You may wish to pick one and work through the rest of the modules with that information before examining the other areas. Make this process work for you according to your schedule and needs.

**FLAG!**

Remember: "aspect" refers to the potential for environmental impact. A significant aspect would have the potential for large impact. Even aspects that are well-controlled should be considered for their **potential** for impact should controls fail.

## Step 2: Score Your Environmental Aspects

When scoring your aspects, you may wish to organize your criteria under the headings “Regulatory Concerns,” “Risk,” “Pollution,” and “Natural Resource Use.” Organizing the columns in this way helps to identify the category of concern for each aspect, and helps in determining which approaches are desirable in addressing the concern. Including regulatory concerns will help you identify those aspects that are of regulatory interest so that you can include management of these in your EMS. You may wish to work on these first if they are important to your company. The following provides a brief explanation of one way to evaluate the criteria in the worksheet.

The aspects are scored using symbols representing a range of high (H) to low (L). The following symbols are used and their meanings are interpreted for use in this exercise. It is important that you phrase the meaning consistently across all scoring categories. This is most straightforward if you think of “high” as meaning ultimately a project you would like to undertake and “low” as one having lesser priority. Thus, when considering environment effects, a chemical receiving a “low” score would be one with low impact or good environmental performance.

<b>Figure 7: Scoring Symbols</b>		
<b>Symbol</b>	<b>Meaning</b>	<b>DfE/EMS Meaning</b>
H	High	Most environmental impact
M-H	Moderately High	More environmental impact
M	Moderate	Less environmental impact
M-L	Moderately Low	Lower environmental impact
L	Low	Lowest environmental impact

### Regulatory Concerns

For each aspect, identify whether or not it has regulations associated with it and how important these are to your company. For example, an aspect might be regulated but your company might be so small that it was exempted from the regulation. The regulatory concern for your company might therefore be considered low (not as important for a project). On the other hand, there might be an aspect that does have a regulation applying to your company. If you don't have a problem staying in compliance, you might rank the regulatory concern low. Or you may rank this high (meaning it may be a good candidate for a project) if the cost of compliance is large or you have experienced difficulties in meeting compliance. You do not need to consider in this column what kind of environmental concern this aspect is. That will show up as you rank the remaining columns for this aspect.

### Pollution

Pollution is the byproduct of your company's operations. A byproduct may be created unintentionally or as a known output of operations. It can occur in the form of releases to the air, water, or soil during operations, or it can occur as the waste product left after your production or servicing cycle is completed. It can also occur in a consumer product that your company produces. For example, excess packaging around a product might be considered "pollution" because it can contribute to a landfill's solid waste burden. Conversely, a consumer product whose waste materials can be recycled might not be "pollution," but rather an example of successful "pollution prevention." Score aspects according to the degree of pollution created. In some cases, the pollution might result from inefficiencies in your process or "wasted materials." There may be some overlap between "pollution" and risk because some kinds of pollution may cause risk. Still, highlighting pollution with a score might

#### POINTER

Pollution Prevention may provide some "low-hanging fruit" in the form of quick and low-cost things that can be done to achieve environmental improvements. These may be accomplished in addition to larger projects. Some examples include turning off lights/equipment when not in use, recycling/reusing office paper, and keeping the lids on solvent containers. Further discussion and tracking form are provided in the Tool Kit.

provide some quick solutions when you identify aspects to work on. High pollution = H; Low pollution = L.

### **Risk**

In brief, **risk assessment** is a process that integrates the work of several sciences to determine the kind and degree of environmental and human health impacts **potentially** produced by **exposure to** a chemical or material. Although you will not attempt a formal risk assessment for your DfE/EMS, this module will help you apply your working knowledge and judgment about the chemicals and materials your company uses, and the way in which they are used, to select environmental goals to help create healthier working conditions, communities, and environments.

Risk is composed of two parts: toxicity (hazard) and exposure. **Toxicity** is the ability to cause harm to the health of humans, wildlife, or vegetation, as well as the type and seriousness of that effect. The information needed to form a judgment about effects was collected in Module 5 in the “Environmental Concerns Worksheet.” Review the chemical effects information for each aspect and give a score based on your judgment of the seriousness of the effects of this chemical or substance.

**Exposure** is the **amount** of material that workers, the community, or the environment come into **contact** with. The amount is determined by both the **severity** and the **frequency** of contact. Severity refers to the amount of material that one can come into contact with at any one time. Frequency refers to the number of times in a given period that contact might occur.

#### **POINTER**

Visit the DfE website for more tools related to risk.

<http://www.epa.gov/opptintr/dfe/index.html>

An important element in exposure is **contact**. If there is no possibility of contact occurring, then there may be no exposure and therefore no risk. In some cases, as when a toxic substance such as lead is embedded in a product such that no contact occurs during use of that product, the toxic substance may still leach out of that product if it is disposed of in a landfill. The possibility of contact throughout the use and disposal of a product should therefore be considered. If, however, a toxic substance is contained such that neither humans nor the environment would come into contact with it, then exposure would be low, and the rank given to the “Workers,” “Community,” and “Ecology” would be “Low” (L). It is necessary, therefore, in ranking exposure, to consider how contact might occur and whether, in fact, it does.

Contact with humans and animal or plant life is characterized as occurring along **pathways**. These pathways describe the routes along which the substance must travel and how the substance is taken up by the living organism. Several pathways for human exposure include:

- ▶ breathing the material (inhalation pathway),
- ▶ touching the material (skin pathway), and
- ▶ ingesting the material (oral pathway).

Substances can come into contact with living organisms through air, water, soil, and other solids. For example, chemicals and substances can be inhaled from the air in the form of dust, vapors, and mists. Humans can ingest chemicals and substances in fluids or in food. Substances can get into liquids or food by falling into them from the air, or by food coming into contact with chemicals on surfaces or hands. Finally, touching the chemical or substance can occur when dust, mists, or vapors contact bare skin or when unprotected hands touch contaminated

surfaces. Animal and plant life can take up chemicals and substances from the environment in much the same way. Figures 9 and 10 show some typical exposure pathways for chemicals used in business operations. When scoring aspects, determine how contact might occur and then decide how severe and how frequent that contact actually is for a given time period. (Choose one month or one year and apply it to every aspect in your scoring exercise.)

The following worksheet will help you think about the exposure for each of the chemicals you consider. This chart can be filled in for each chemical or material and represents your best judgment about exposure. The total score can then be placed in Worksheet 6-2.

<b>Worksheet 6-1 Exposure Scoring Summary</b>			
<b>Pathway</b>	<b>Occupational</b>	<b>Nearby population</b>	<b>Environment (e.g., aquatic organisms)</b>
<b>inhaling</b>			
<b>skin contact</b>			
<b>ingesting</b>			
<b>TOTAL</b>			
<b>Note: Refer to consolidated scoring, Figure 8, which shows how to combine your judgement about frequency and severity into one score for exposure.</b>			

In scoring, consider both severity and frequency and put the score under “Workers,” “Community,” and “Ecology.” Use the Consolidated Scoring for Exposure Table (Figure 8) to combine your judgements about frequency and severity of exposure. For example, small amounts of a chemical might be released constantly during a process. Thus, frequency would be high (H) while severity might be moderate (M). The consolidated score

which would be entered in Worksheet 6-1 would be M-H. In another case, it is possible that a large amount of a substance might be released occasionally. The frequency would be low (L) but the severity would be high (H). Thus, the consolidated score which would be entered in Worksheet 6-1 would be M-L.

**Figure 8: Consolidated Scoring for Exposure**

frequency	high	mod-high	moderate	mod-low	low
severity					
high	H	H	M-H	M	M-L
mod-high	H	M-H	M-H	M	M-L
moderate	M-H	M-H	M	M	M-L
mod-low	M	M	M	M-L	L
low	M-L	M-L	M-L	L	L

Figure 9, Screen Printing Exposure Pathways

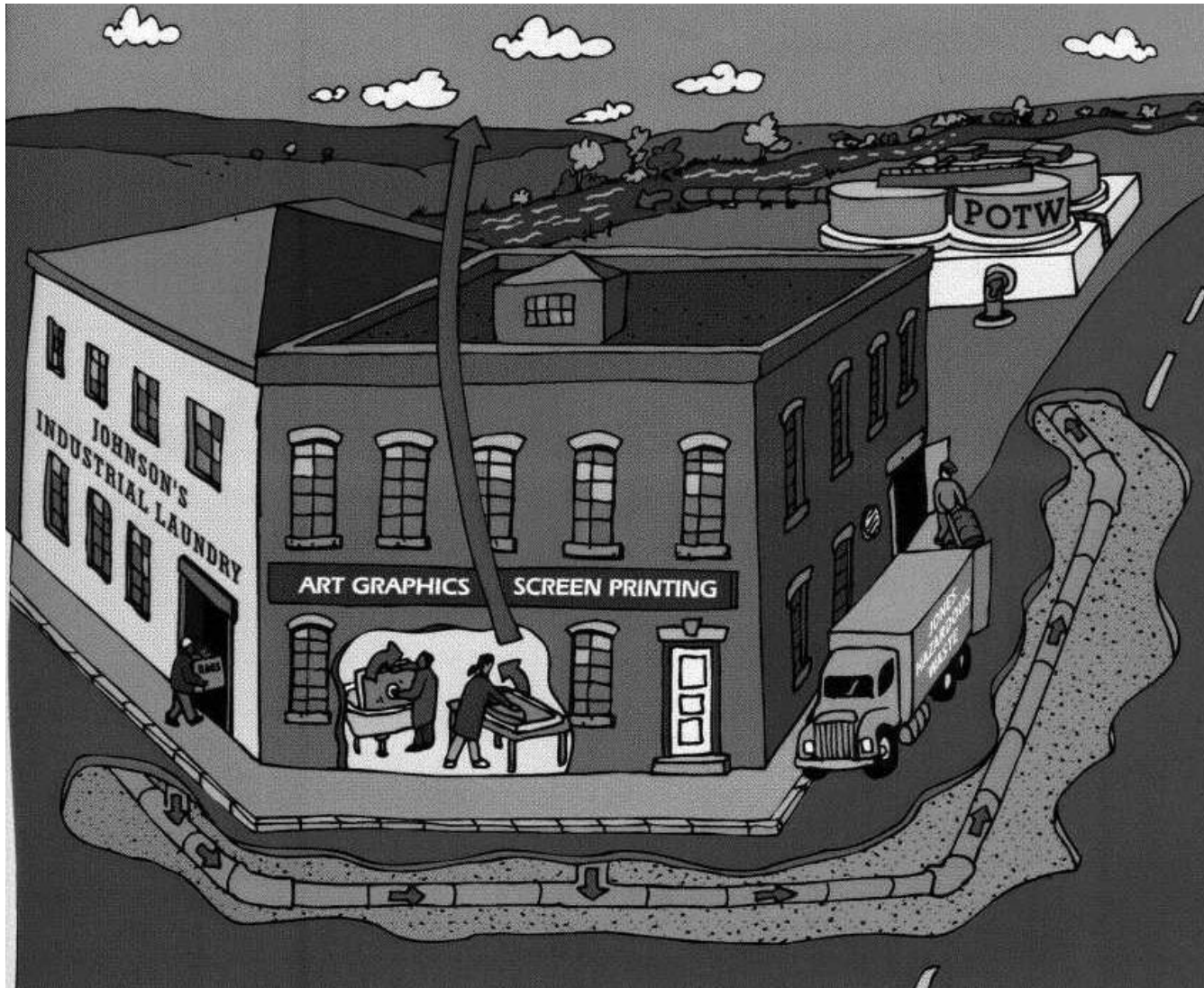


Figure 10, Dry Cleaning Exposure Pathways



### Natural Resource Use

This criterion should be used to identify use of water, energy, and other environmental resources such as forests or land. The score given a particular aspect under this criterion is highly subject to the specific circumstances and values of your company. For example, a high rate of water use would be of higher concern in a desert region than in a region where water is more plentiful. This column allows you to consider what resource issues might be associated with a particular aspect. The score you give is based on your judgment related to your own specific circumstances.

### Scoring Examples

The following example shows you how to score the aspects identified in Module 5 using the criteria in Worksheets 6-2a and 6-2b. Examples of both small and large projects are included. It is important to think through even solutions that seem obvious, because sometimes there are better solutions.

#### Example 1: Toner Cartridges

Consider the use of toner in copying. Unused toner is considered as an input, while used toner is considered as an output. The same product generates different concerns at different stages of its use. Let's look at the criteria for each.

#### POINTER

Remember: The scores have no intrinsic meaning. They are merely a shorthand for expressing your judgment about priorities.

Worksheet 6-2a: Criteria to Determine Significant Aspects*											
Criteria Aspect	Regulatory Concerns	Pollution	Risk							Natural Resource Use	Total Score
			Effects of Chemicals and Materials		Workers (Exposure)	Community (Exposure)	Environment (Exposure)	Noise	Safety		
			Humans	Environ- ment							
<b>Copying</b>									N/A		
Paper											
Toner (Input)	M	L	M-H	M-H	L	L	L	L		L	M-L
Documents											
Waste Paper											
Used toner (Out)	M-H	H	M-H	M-H	L	L	H	L		M-H	M-H
Odors											

\* Include each input and output of a process step.

**Scoring Notes:**

**Regulatory concerns** may be present due to the chemicals used inside the cartridge or due to solid or hazardous waste regulations.

Input toner = M                      Output toner = M-H

**Pollution** would be a concern unless you recycle the cartridges.

Input toner = L                      Output toner = H

**Effects of Chemicals and Materials** inside the toner cartridge are probably of concern. You would have identified these in Module 5. However, since the cartridges are not opened either during input or output use, there would be no exposure. Frequency of impact, therefore, would be low.

Input toner = M-H      Output toner = M-H

**Workers:** Worker health and safety would be of low or no concern if the toner is used only in the cartridges.

Input toner = L                      Output toner = L

**Community:** The community's health and safety would be of low or no concern if the toner is used only in the cartridges.

Input toner = L                      Output toner = L

**Environment** might be high if you do not currently recycle your cartridges. Chemicals can spill out of the cartridges if they are placed in a landfill.

Input toner = L                      Output toner = H

**Safety and Noise** would show no impact. L

**Natural Resource Use** would be low for air and water, but might be a concern for land if you do not recycle the used cartridge Input toner = L, Output toner = M-H.

How to Obtain Total Score: this can be done in two ways.

- 1) Look across the columns and assign a total that in your judgement best reflects the individual scores in each column.
- 2) Assign a number from 1-5 to each score such that H = 5 and L = 1. Sum these across the columns and then divide by the number of columns used to get an average score for that row. For toner input the total would be 13 (not counting Safety). Divide by 8 (the number of columns used). The average score would be 1.63 which corresponds with M-L. Place M-L in the Total column.

**Meaning of Score:** The total score for toner used as an input is M-L and for used toner as an output is M-H. These scores tell you that toner cartridges as waste outputs of your copying generate more concern than they do as new inputs. This makes intuitive sense, and your main concern would be to reduce any potential impact of the used toner cartridges. This could be accomplished in three ways:

- ensure that the cartridges are not opened either before or after use, to avoid exposure to the chemicals;
- ensure that the cartridges are recycled according to the distributor's instructions, so that there is neither concern for ecological exposure to the chemicals in landfills, nor a contribution to the solid waste going into landfills; and
- reduce the number of waste toner cartridges by cutting down on unnecessary copying.

**Example 2: Chemical Use and Waste**

A second example will provide more points to consider in developing objectives. Consider the chemical inputs and the chemical waste outputs identified for "Manufacturing Step 1" in Module 5.

Worksheet 6-2b: Criteria to Determine Significant Aspects*											
Criteria Aspect	Regulatory Concerns	Pollution	Risk							Natural Resource Use	Total Score
			Hazards of Chemicals and Materials		Workers (Exposure)	Community (Exposure)	Environment (Exposure)	Noise	Safety		
			Humans	Environ- ment							
<b>Making Product Step 1</b>											
Chemicals #1...	M-H	M-L	M	M	M-H	M-L	M-L	L	M-L	M-H	M
Materials #1...											
Energy											
Water											
Chemical Waste #1...	M-H	M-H	M	M	M-H	H	H	L	M-L	M-H	M-H
Mat. Waste #1...											
Waste Water											
Air Releases #1...											
Product for next step											

\* Include each input and output of a process step.

**Scoring Notes:**

**Regulatory Concerns:** check the lists of regulations and standards to see if they apply to any of the chemicals you have identified as inputs. For outputs from your manufacturing process, find out whether the regulations for solid and hazardous waste make mention of these chemicals. Consider whether new chemical products are formed and become wastes during the process of step 1. If so, don't forget to check for these chemicals as well as the input chemicals. Assuming that the chemicals have some kind of regulatory concern, we will assign a M-H for both input and output.

**Pollution** would probably be M-L for the input side of chemicals, but probably a M-H for the output side.

**Chemical Hazards:** review your table of Environmental Concerns from Module 5. In this case, let's assume the chemical showed moderate effects M. For Workers, consider whether opportunity exists for exposure to these chemicals. Consider whether the exposure is by air, skin contact, or some other route. Assign the score from your Exposure Worksheet, let's assume a M-H for this exercise. Consider the surrounding Community and also the Environment. Is there any way that the chemicals used during input escape into the air, water, or land? How about the waste chemicals? Again, take your score from your Exposure Worksheet. Let's assume for this discussion that there are some concerns and assign this category a M-L for input and an H for output.

**Safety and Noise** might be zero, but safety might include reference to a flammable chemical. Hence the score of L for Noise and M-L for Safety.

**Natural Resource Use** would be important for both input and output of step 1. As for water, consider the quantity of water the step 1 process uses as an input or to take care of waste. Finally, does step 1 involve releasing chemicals to soil? How much land or soil does it use during the process or for disposal of waste? We'll assign a M-H for purposes of discussion.

**Meaning of Score:**

The total for chemicals used as input for step 1 is M and for the chemical wastes from step 1 is M-H. If you compare all the scores, it would seem that the chemical wastes for step 1 in your company, using your criteria, constitute a more significant concern than the other activities.

**Step 3: Determining Which Aspects Are Significant**

By reviewing the totals column in your table, you can determine which concerns have the most significance for your company. One approach might be to decide on an arbitrary cut-off point and call all those aspects above that cut-off “significant”. This cut-off might change from year to year and different aspects might fall above or below it depending on changing circumstances or values. Furthermore, if the score shows an aspect falling below the significant line, but your instinct tells you that it should be “significant,” by all means change the score. The scores, after all, reflect your judgment.

Note: If you are pursuing ISO 14000 **certification**, you will have to address each significant aspect. You may want to consider reducing the number of significant aspects to one or two in the beginning and add more as your company grows in experience with the DfE/EMS process.

**Step 4: Consider “Practical” Criteria Also**

The next step in developing your EMS is to decide which of these significant aspects it will be practical to work on. “Practical” includes both economic and technical feasibility. It also includes a time frame. While it is important to select high priority projects from an environmental perspective, there is value in undertaking some short term, “easier to implement” projects. The easier projects provide a useful learning experience, boost morale as people see results, and focus

** POINTER**

You do not have to work on all significant environmental aspects. Therefore, it is important to consider the “doability” of each project and to determine what improvements might be achieved by each project before deciding which ones to undertake.

attention on environmental goals.

In the examples above, deciding to reduce the volume of copying and to recycle toner cartridges used in your office copier is a relatively short-term, low-cost environmental program to set in place. Determining how to deal with chemical waste products could be a longer process. It is difficult to pre-judge projects, for the obvious solution may not be the best and a project that appears difficult and long-term may turn out to have a simple solution. Nevertheless, the many alternative approaches to dealing with waste products that could be considered can range from chemical substitutions to changing the nature of the wastes, changing work practices to reduce the value of the waste, and changing disposal methods. The final environmental program might include changes in each of these phases. Deciding to address the problems identified with chemical wastes could be longer-term and more costly. It also might yield greater cost savings than the quicker, cheaper toner cartridge example.

Furthermore, the practical criteria need not be scored but could be considered by simply describing the practical considerations for each potential project.

<b>Worksheet 6-3: Criteria to Select Environmental Projects</b>				
<b>Criteria</b>			<b>Technical Feasibility</b>	
<b>Aspect</b>	<b>Time Frame</b>	<b>Cost</b>		<b>Total Feasibility</b>
Toner (In)	N/A	N/A	N/A	N/A
Used Toner (Out)	Short (1 month)	Negligible; time to write procedure	Easy	Excellent
Chemicals (In)	longer evaluation	Employee time	Needs help from suppliers, etc.	More difficult
Chemical Waste (Out)	longer evaluation	Employee time, process change	Needs help from suppliers, etc.	More difficult

**Step 5: Consider the Potential Benefits**

The last set of criteria has to do with the expected benefits to be derived from improving the environmental impact of the significant aspects. The purpose of this exercise is simply to identify what effects you would have to achieve, not to try to quantify returns. Like any undertaking in a business operation, you should be able to describe what you expect to get before you undertake the project! First, develop a list of benefits criteria. These might include such things as:

- Improved human health
- Improved ecology
- Cost savings
- Improved community relations
- Improved employee morale

Again, these particular criteria might not fit your company. Make a list of criteria identifying benefits that could be derived from undertaking a particular environmental project. These expected improvements or benefits need not be scored; simply describe the potential for each criterion to be achieved. Scoring

**POINTER**  
 Considering the benefits does not mean undertaking an analysis of potential outcomes. It means identifying the kinds of improvements that might be achieved by implementing a particular project and then deciding what value (priority) that improvement has for your company.

is one way to represent your judgment. Worksheet 6-4 illustrates the two examples.

<b>Worksheet 6-4: Criteria to Determine Benefits</b>						
<b>Criteria Aspect</b>	<b>Human Health<sup>1</sup></b>	<b>Environment</b>	<b>Cost Savings</b>	<b>Community Relations</b>	<b>Morale</b>	<b>Expected Benefits</b>
Toner (In)	Little effect	Little	Low	N/A	N/A	N/A
Used Toner (Out)	Some effect through waste	Some effect in waste	Some	Good; shows effort	Good learning tool	Some
Chemicals (In)	Improve worker health	Some improve, air	Some through efficiency	Good	Good; workers happy	Good
Chemical Waste (Out)	Improve community; reduce presence of hazardous materials	Improve effect on landfill, groundwater, habitat	Some through efficiency and reduced waste fees	Excellent PR	Good; workers would appreciate less noxious waste	Excellent

<sup>1</sup> Workers, Community, Global

**Summary of Scoring**

If you are using scoring in your decision process, Figure 9 provides an example of a summary worksheet. The example illustrates that while chemical waste may present one of the most involved projects from the point of view of feasibility, it may also provide the greatest benefits. The final decision rests with your company and should reflect both your values and your needs. You may want to undertake both a short-term and a long-term project.

**POINTER**

It is important to recognize that the tables are merely a tool to help you summarize your judgment and organize your thoughts. The scores placed in the tables do not have any intrinsic value but are used for purposes of comparing the results to each other.

<b>Worksheet 6-5: Overall Criteria Scoring Summary</b>					
<b>Process Step</b>	<b>Criteria</b>	<b>Aspect Total</b>	<b>Feasibility Total</b>	<b>Benefits Total</b>	<b>Significant Y/N</b>
	Toner (In)	M-L	N/A	N/A	
	Used Toner	M-H	H	M	N
	Chemicals	M	M-L	M-H	
	Chemical Waste	H	M-L	H	Y

### **Step 6: Making Improvements: Creating Standards and Setting Objectives**

The point of the priority setting exercises, of course, is to improve your company's impact on the environment. Module 7 describes the process of setting and carrying out environmental performance standards for the significant environmental aspects. Module 8 describes the process of setting environmental objectives, evaluating alternatives, and selecting targets for those significant aspects you choose to change.

You now have a short list of significant environmental aspects. You are ready to improve your company's performance by improving the environmental impact of one or more of these significant environmental aspects. Tackle what you can handle, tackle what is environmentally important, and tackle whatever is urgent. Your company can start on any remaining significant environmental aspects when you have completed the first ones.

**Note on Grouping Environmental Aspects:**

In reviewing your company's list of aspects you may discover that there are aspects that occur in more than one process step. Energy use is a good example. There might be circumstances where it would be effective to combine all the process steps having energy aspects and develop a facility-wide strategy and program for achieving improvement. It is important to understand, however, that the energy aspect should be scored in each process step to determine its relative importance in that step. For example, energy use in office work might be a different priority than energy use in a manufacturing step. In addition, standards and procedures developed to reduce energy use would be different for each process step. Consequently, while a facility-wide effort might achieve certain efficiencies, the actual environmental improvement will be attained through objectives set for each process step.

# Module 7

## Setting Standards: Developing Operational Controls

For every aspect your company determines to be significant, some action must be taken. Action may include either writing operational control procedures for activities or steps in a production process where the potential impact may be well controlled or making changes in processes in order to reduce the potential for impact. In writing operational controls, determine the environmental performance standard desired for that aspect, set targets for that performance and write procedures (operational controls) to ensure that the standard will be met. Your company may already have procedures in place. These should be reviewed to be sure they are consistent with EMS objectives. If you determine that procedural change should take place in order to improve control of, or to reduce the cost of, controlling the potential impact, the DfE approach emphasizes the need to evaluate alternatives before setting targets. Module 8 describes the process for evaluating alternatives and establishing targets. This module describes the process for setting standards, developing operational controls, and creating the organizational support for ensuring that those standards are met.

The following are some examples of the kind of activities that might be improved with operational controls<sup>1</sup>:

- ▶ management/disposal of wastes,
- ▶ approval of new chemicals,
- ▶ storage & handling of raw materials and chemicals,
- ▶ wastewater treatment,

### **DfE Program**

Experience has demonstrated the importance of written procedures and thorough employee preparation and involvement.

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<sup>1</sup>Adapted from “Environmental Management Systems: *An Implementation Guide for Small and Medium-Sized Organizations*”, see References.

- ▶ building and vehicle maintenance,
- ▶ operation of paint line,
- ▶ transport,
- ▶ operation and maintenance of equipment,
- ▶ management of contractors,
- ▶ marketing and advertising, and
- ▶ acquisition or construction of property and facilities.

The process of setting standards and ensuring their success has several steps. These include:

- 1) determining the possible causes for the potential for impact,
- 2) setting standards or objectives for the desired environmental performance,
- 3) drafting operational controls,
- 4) designating persons responsible for maintaining operational controls and for reviewing the success of the controls,
- 5) developing training for responsible persons,
- 6) establishing methods for monitoring and measurement of environmental performance,
- 7) taking corrective action when standards/objectives are not met, and
- 8) establishing a DfE environmental review for new processes and products.

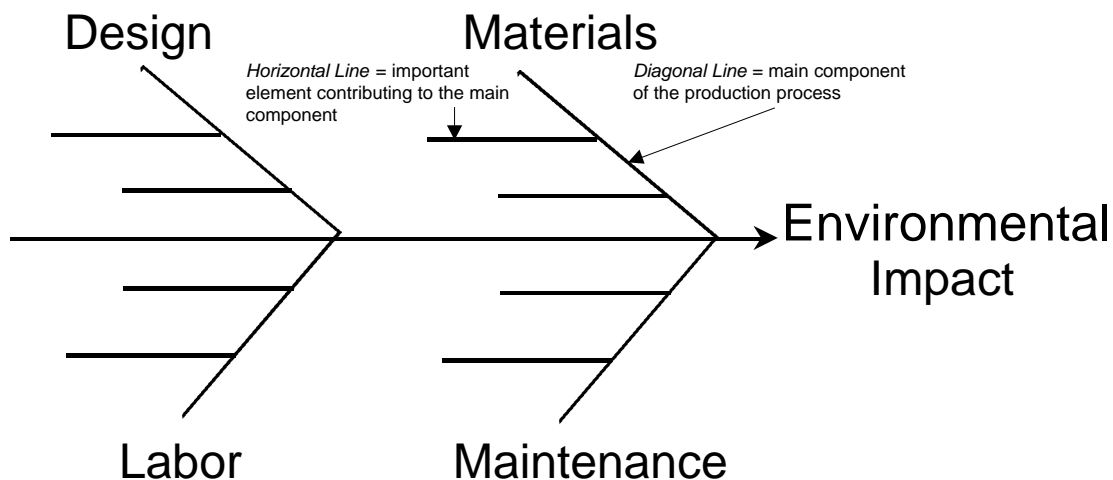
## **1. Determine the possible causes for potential impact**

Review your list of significant aspects. For each one, list possible causes for the potential environmental impact. One way to determine causes is to conduct a “root cause” analysis.

The root cause diagram, shown below, will help you organize your thinking when you analyze your company’s potential for environmental impact. This analysis can be done by one person or by a group, with one person writing down the ideas produced. Each diagonal line represents a main component of the

production process. Your company may have different or additional components (for example, “disposal”) beyond those represented here. Each horizontal line stemming from the diagonal represents an important element contributing to each of the main components. For example, elements of work practices might contribute to the labor component. This diagram is simply a device to help organize the analysis of the cause of failure to meet targets. Use it if it helps, but don’t get hung up on trying to make it work.

Figure 11: Root Cause Diagram



The following are typical, but not necessarily obvious, causes of problems:

- ▶ poor communication,
- ▶ faulty or missing procedures,
- ▶ equipment malfunction (or lack of maintenance),
- ▶ lack of training,

- ▶ lack of understanding (of requirements), or
- ▶ failure to enforce rules.

Be sure that these possibilities have been considered in your environmental impact analysis.

## 2. Set standards or objectives for environmental performance

Write down an environmental performance standard for each significant aspect. Each standard expresses the environmental goal or objective you wish to meet for its corresponding significant aspect. Your objectives should be consistent with your company's environmental policy.

<b>Worksheet 7-1: Significant Aspect Objectives</b>		
<b>Significant Aspect</b>	<b>Objective</b>	<b>Related Environmental Policy</b>

## 3. Draft operational controls

Next, draft procedures for the standards you have developed for each significant aspect to ensure that the objectives for that aspect will be met. Review each of the causes identified in your root cause analysis that would contribute to the environmental impact of a significant aspect. Each of these causes should be addressed by drafting operational controls.

**DfE Partner, Jeff Adrian of the John Roberts Company has provided operational control examples. See the Case Study at the end of this module.**

In some cases operational controls may already exist for some of the activities associated with a significant aspect. Identify which aspects have written procedures that describe operational controls and which aspects will need to have procedures developed. In some cases the procedures that you have in place to comply with environmental and health and safety regulations may be useful to meet your DfE/EMS objectives. Generally, they may at least provide examples of how to write procedures. The worksheet below will help you track which aspects will require procedures and controls to be developed.

<b>Worksheet 7-2 Procedures for Significant Aspects</b>					
<b>Aspect/Cause</b>	<b>Procedure needed (none exists)</b>	<b>Procedure exists, but is not documented</b>	<b>Procedure exists and is documented</b>		<b>No procedure needed</b>
			<b>Adequate</b>	<b>Not Adequate</b>	

It is important that the people who will implement the procedures be involved in drafting them. You can accomplish this in several ways:

- ▶ Have a meeting with the workers where they can describe current procedures. Discuss the environmental performance desired and how to write procedures to ensure that the objectives will be met.
- ▶ Have someone (possibly an intern) interview the workers to establish current procedures; then draft newly-written or revised procedures. Have the workers review the draft procedures.
- ▶ Have a manager draft the new or revised procedures. Be sure

that workers have a chance to review and comment on the draft procedures.

Keep the written procedures simple and concise. The procedures should include the appropriate actions, precautions, and notifications required. For the small business, it is also important to focus on activities that may lead to significant impacts and not get overwhelmed trying to control every activity and process.

**4. Designate responsibility for maintaining and reviewing controls**

In order to ensure that procedures are followed and deviations corrected, it is important to designate those people responsible both for maintaining the controls and for reviewing them. Generally, the workers responsible for the significant aspect under consideration will be responsible for implementing the procedures designed to meet the environmental objectives. The immediate line manager would most likely be responsible for regular review of the procedures and controls. It is helpful to list those people responsible for each set of procedures. The worksheet below will help with documenting responsibilities.

<b>Worksheet 7-3: Operational Control Responsibilities</b>			
<b>Significant Aspect</b>	<b>Procedures</b>	<b>Responsible for maintaining controls</b>	<b>Responsible for review of controls</b>

In addition to documenting who is responsible, it is also helpful to specify in the employee’s performance standards the percent of time to be devoted to maintaining or reviewing controls. In addition, the performance standards could specify what

percentage of deviation from controls would result in unfavorable performance reviews.

## **5. Develop training for persons assigned responsibility**

Achieving success in meeting environmental objectives for each significant aspect depends upon making sure that each person responsible for maintaining or reviewing controls and procedures has received adequate training. After procedures are drafted, develop a training program that ensures everyone understands both the procedures and their own role in ensuring that the procedures are followed. The worksheet below identifies some of the main decisions to be made when setting up a training plan. Integrate this training into any general training plan that your company might have or might have developed for your DfE/EMS. For example, the communication module in the Appendix contains information on developing a general training plan that would include 1) any existing training associated with occupational health and safety or environmental regulations, and 2) any new training designed to acquaint employees with the development of the DfE/EMS. Training in procedures and operational controls should be included in the broader company training plan.

<b>Worksheet 7-4: Training Plan for Operational Controls</b>								
Environmental Aspect	Procedures	Responsible Person	Training Needs	What Vehicle	When/Length	Budget	Completion Date	Person Responsible for training

Again, this worksheet is included in the Appendix Tool Kit. The purpose of this table is to help you identify, plan for and track the training needs of your employees with respect to ensuring that operational controls succeed in achieving your environmental performance objectives. Include this training with any general environmental training to create an integrated training plan for your DfE/EMS.

## 6. Establish methods for monitoring and measurement of environmental performance

Some say that “an EMS without an effective monitoring and measurement program is like driving at night without the headlights on – you know that you are moving but you can’t tell where you are going!”<sup>2</sup> To determine how well you are doing in meeting your goals, you need to decide how you will measure progress. Identify the key characteristics of the process you are working to improve. Your performance indicators should be:

- ▶ simple and understandable,
- ▶ objective,
- ▶ verifiable, and
- ▶ relevant to your goals and targets.

Below are some sample indicators of environmental performance. Each indicator that you choose should be related to the cause of potential impact by the aspect under consideration. The samples below are to illustrate a way to state your indicators.

- ▶ tons of SO<sub>2</sub> released per unit of electricity produced,
- ▶ pounds of hazardous substance “X” emitted per pound of product, and
- ▶ percentage reduction in the discharge of a material versus a base year.

It is important to measure “input” with respect to “output,” rather than by itself. Changes in input can be caused by reduced sales of the product as well as more efficient use of the input during the production process. To be sure you are measuring success rather than simply changes in sales volume, be sure to include

### POINTER

Measurement and evaluation of environmental performance is an ongoing process.

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<sup>2</sup>Environmental Management System: *An Implementation Guide for Small and Medium-Sized Organizations*, NSF International, Ann Arbor, Michigan, November 1996, p. 49.

output in your measurement criteria. Each measure should be an indicator of where problems may be occurring in the process. The worksheet below is designed to assist you in tracking your measurement indicators.

<b>Worksheet 7-5: Environmental Performance Measurement Indicators</b>						
<b>Aspect</b>	<b>Objective</b>	<b>Indicator</b>	<b>Date Checked</b>	<b>Who Checked</b>	<b>Result</b>	<b>Corrective Action</b>

It is also important that, when you measure your environmental performance, you maintain and calibrate any sensitive measurement equipment on a regular schedule. Again, designate a person to be responsible for this task, provide appropriate training on maintaining the measurement equipment, and document the schedule of checks and calibration.

**7. Take corrective action for operational control failure**

Action to correct failures in procedure should be taken as quickly as possible to meet environmental objectives. Assigned responsibilities for action and schedules should be clear. Employees in the shop may recognize the need for corrective action and provide good ideas for solving problems. Find ways to get them involved in the improvement process. It's important to determine whether a lapse is temporary or due to some flaw in the procedures or controls. For this reason, communicate any findings to the employees and provide any follow-up training for changes in the procedures that may result. The following is a checklist to help complete corrective action. Have you:

- ▶ Identified the problem(s)?

- ▶ Identified the cause(s)?
- ▶ Come up with a solution for each?
- ▶ Implemented the solution(s)?
- ▶ Documented the solution(s)?
- ▶ Communicated the solution(s)?
- ▶ Documented the action(s)?

Below is a sample Corrective Action Notice that will assist in documenting the resolution process.

<b>Worksheet 7-6: Corrective Action Notice</b>	
Issue Date:	Solution Due Date:
Requested by:	
Issued to:	
Problem Statement:	
Most Likely Causes:	
Suggested Solutions:	
Action Taken:	
Measured Results:	
Corrective Action Closed by:	Date:
<i>Contact for Notice:</i>	

In addition to the Corrective Action Notice, which helps to document and track specific actions, it is also helpful to track measurement, problems, and solutions. The sample log, below, will be useful in integrating the documentation and tracking of your environmental quality control system.

<b>Worksheet 7-7: Measurement and Corrective Action Tracking Log</b>		
Area and Step Measured:		Date:
Person Responsible	Means of Measurement	Results
Person Responsible	Problems Identified:	Solution Due:
Person Responsible	Solutions Identified:	Action Taken:
Person Responsible	Effectiveness Verified:	Date:
<i>Contact person for log:</i>		

## **8. Establish an Environmental Review for New Processes and Products**

In addition to establishing operational controls for all significant aspects, it is important to set up a procedure for reviewing any changes in process or products. In most companies change is an important part of business survival. New products, new technologies, new ways of doing things are regular occurrences. In order to avoid creating new “significant environmental aspects” that must be addressed later, it is helpful to integrate new processes and products into the environmental management program that you are developing for the rest of your company. You can do so by setting up a procedure for reviewing new processes, products, or activities while they are in the planning stage. One way to accomplish this is to create a sign-off form to be circulated among the people responsible for or affected by the new process or product, including those responsible for the area of the company where the new process or activity will be carried out. Below is an example of such a sign-off form.

<b>Worksheet 7-8: Environmental Review of New Processes and Activities</b>				
<b>Area of Company</b>	<b>New Process, Product, or Activity</b>	<b>Environmental Review by:</b>	<b>Environmental Effects:</b>	<b>Pollution Prevention Opportunities</b>
	Manager/Date	Manager/Date		
<i>Contact for form:</i>				

The above worksheet is a model that should be modified to reflect your company's activities and environmental policy.

**Case Study 2: The John Roberts Company**

Jeff Adrian, Director of Environment & Safety, provided the following example of operating controls. He stated, "I am sending along by FAX some documents that I used to effectively change working procedures for cleaning printing presses with a low vapor pressure cleaning solvent. You can see that there was a 1) background sheet, telling the employees why this change was important; a 2) procedures sheet, that spelled out the new procedure and most importantly covered "critical points"; and finally, 3) two pages of Q&A addressing issues that had come up during preparation for this change. All the above to be sure employees know why the change is necessary and what part they are to play in making the change happen. When implementation day arrived, the change was made without any disruption and we have never looked back."

## Case Study 2: The John Roberts Company

# Example Of Preparation For Effectively Changing Work Practices

### Three Components:

1. Backgrounder Sheet
2. How To Instructions with Critical Points
3. Questions & Answers

### PRESS/BLANKET WASH - NEW PROCEDURES

#### Background

As some of you may already know, the elimination of Blanket Wash 2215 is necessitated by the tightening of environmental regulation.

Blanket Wash 2215 is a blend of solvents that includes the chemical 1,1,1 Trichlorethane (TCA), a chemical that has been banned internationally by the Montreal Protocol..

The reason for this is that TCA is an upper level ozone depleter, destroying the ozone layer that shields us from the harmful effects of the sun's ultraviolet radiation.

While still being manufactured today, TCA is being taxed at ever higher rates until it will no longer be manufactured in 1995.

Additionally, because Blanket Wash 2215 evaporates readily to the atmosphere, the other chemicals in the blend contribute volatile organic compounds (VOC's), which when combined with nitrogen oxides (from the burning of fossil fuels) and sunlight, leads to the formation of smog in the lower levels of our atmosphere.

The replacement for Blanket Wash 2215 will be the use of the much less volatile, and thus less harmful, Press Wash.

Because Press Wash solvent works at a different rate than the discontinued Blanket Wash 2215, a new cleaning procedure will have to be followed.

This new procedure, though somewhat different than today's method, will work nicely to clean press blankets. Here's how it works:

## Case Study 2: The John Roberts Company

### PROCEDURE FOR CLEANING PRESS BLANKETS

#### Steps:

1. On the first turn of the cylinder, use a solvent saturated shop towel pad (as is the current practice) to loosen and remove most of the ink from the blanket's surface.
2. With a second shop towel pad that has been first dipped into water and then wrung out, remove the balance of the ink from the blanket's surface on the second turn of the cylinder.
3. Start the press as before.

#### Critical points:

1. By *not* using water on the first turn of the cylinder, the full strength of the Press Wash is available to move the ink. So, do not blend down Press Wash with water.
2. It is *not* necessary that the blanket be *absolutely* dry after the second turn of the cylinder. Rather, a slight film of water (think of how the sidewall of your car's tires look after just washing the car) will not be problem on startup of the press. The first few sheets will very easily carry this moisture off.
3. By using a second pass with a water wipe, clays, starch and paper dust are better removed. A water wipe should be easier to slide across the blanket than a drywipe.
4. *Care* does need to be taken in just one respect, and that is in the area of the blanket cylinder's grippers. Excess Press Wash or moisture there has the potential of being spun off the cylinder onto the stock if not removed.

#### Towel usage:

1. When the solvent shop towel pad is dirty, discard it in the safety cans as before.
2. The water wipe shop towel pad now becomes the solvent shop towel pad and a new pad (from clean shop towels) is made up for the water wipe step.

## Case Study 2: The John Roberts Company

### QUESTIONS YOU MAY HAVE

**Q. If we can still buy solvent blends that contain some 1,1,1 Trichloroethane (TCA), why do we need to make the change now?**

A. Well, there are several reasons. First, there are some health concerns with TCA, so we want to eliminate any exposure as much as we possibly can. Second, in an effort to discourage the use of TCA now, the government is increasing taxes on this chemical (and other targeted chemicals), making the product unduly costly. Third, this is a reportable usage chemical, which requires that we complete Form R (a complicated procedure) that is also public information. It is better that we have no reportable chemical usage because if we do, then we are also brought into the regulatory loop on many other time consuming and costly programs. Fourth, John Roberts has made a commitment to *reduce* its total emissions as part of the Minnesota Toxic Pollution Prevention Plan and we will be accountable for reaching these goals. Fifth, as a responsible member of the community (in which many of us live as well as work), it is the right thing to do for the betterment of our environment.

**Q. Will this new procedure slow down my work and reduce my productivity? Will I be penalized because of this?**

A. Unquestionably, this new procedure will slow things down slightly, but not by much. Even with the older Blanket Wash, pressmen would often use two turns of the cylinder to complete the cleanup of the blanket. Understanding that the blanket does *not* need to be *completely dry* will save otherwise wasted time. So the only remaining time element is the need to switch to a water wipe shop towel pad and the time to take care to wipe the blanket ends, especially the cylinder gap. Management's commitment to environmental responsibility supports your efforts

**Q. What if I find I need more shop towels? Won't this new procedure use a lot more shop towels?**

A. If it turns out that you need more shop towels, they are available (we ordered extra last week and have them in stock). Testing that we have already done has shown that towel rotation (where the water wipe pad becomes the new solvent wipe pad and clean towels are then used for the new water wipe pad) works very well.

**Q. Can I use a sponge instead of a shop towel pad for the second (water) wipe?**

A. Yes, its possible to use a sponge instead of a padded shop towel for the water wipe. But if you do choose to use a sponge, you will have to use less wiping pressure or you will squeeze the water out of the sponge onto the blanket leaving the blanket too wet. Try it and see if you like it. You may find a shop towel water wipe easier to control.

## Case Study 2: The John Roberts Company

**Q. Can I mix water with the Press Wash and do it all at one time? Why might this not be a good procedure?**

A. Yes, again it's possible to do this, but it's not recommended. Here's why. When you add water to Press Wash, you dilute the Press wash's ability to cut the ink in the first place. This may mean more work and slower cleaning. Also, Press Wash contains surfactants that make it able to mix with water, and it is these surfactants that tend to *remain* on the "clean" blanket that cause problems with both the ink roller train *and* the water fountain systems. It's good to remove surfactants as completely as possible, and this is best done with a separate water wipe.

**Q. Can I just use a dry shop towel pad to wipe the blanket completely dry instead of a second water wipe? Would I be better off?**

A. Well, for the reasons listed above, it's not recommended to use a dry shop towel second wipe. Aside from the fact that some feel a dry shop towel is harder to move across the blanket (it tends to drag), how would you clean the blanket of water solubles such as starches, clays and paper dust? The only reason I can think of to completely dry the blanket would be to ease your fear of "throwing" solvent drops on the work after startup. This is addressed by taking a little care on the second (water) wipe, especially at the ends of the blanket in the cylinder gap.

# Module 8

## Making Improvements: Evaluating Alternatives and Setting Targets

In this module we continue working with the examples of toner cartridges and chemicals from manufacturing step 1. In Module 7 we reviewed how to write and implement operational controls to fulfill your company's environmental performance objectives with respect to your significant aspects. In this module we explore how to evaluate alternatives for environmental aspects that you want to change. In this case we will work with one project having a quick, low cost solution and one requiring greater analysis and longer-term implementation. Using the results from the scoring tables in Module 6, a company could specify its objectives as follows:

Reduce the waste from used toner cartridges.

Reduce the environmental impact of chemical wastes from manufacturing step 1.

This module will help you develop specific targets out of the objectives you selected above. In some cases, setting targets might not be a difficult process. In others, however, the solution might not be obvious. For example, you may have identified the waste from the use of a chemical as a significant aspect and determined that alternative practices exist. You may have then set an objective of reducing the environmental impact from that chemical as it is used in your business processes. One alternative is to target that chemical for replacement, but that may not be the best solution for your company. It is important, then, to consider other options for managing the environmental impact of that chemical as it is used by your company as well as the option of replacement. This module will walk you through a process of

### **DfE Program**

Emphasizes the importance of evaluating an array of alternatives before determining appropriate action. The best solution may not be the most obvious and risk reduction, like pollution prevention, may save you money.

evaluating options both for substitution and for management of a significant aspect. It will also help you develop achievable targets having both environmental and economic advantages.

## Evaluating Alternatives

Let's continue working with the two examples above:

Reduce waste from used toner cartridges.

Reduce the environmental impact of chemical wastes from Step 1 of the Manufacturing process. For purposes of illustration let's make Step 1 be the function of cleaning a printing press. The environmental aspect is the air vapors released during the press cleaning process and the air vapors released at the industrial laundry where the press wipes are sent. The identification of this significant aspect occurred when the laundry called the company and said they had received complaints from the POTW regarding solvent traced to the printer's cleaning wipes. The information for this example comes from the Lithography Case Study 1 of the DfE program.

### Step 1: Identify the Function

First define the function of the process or step in a process or product with which a significant environmental aspect is associated. Defining the function helps to broaden your perspective in developing alternatives. Here are two examples:

#### Example 1

**Aspect identified:** Toner cartridges used in copier.

**Function of toner cartridges:** to provide the chemicals used in copying documents.

#### POINTER

Consider this list of alternatives as a checklist to think through your environmental aspects list and any changes in products or manufacturing processes that you have in mind. It will save you money in the long run to make this hierarchy of alternatives a part of your business planning.

## Example 2

**Aspect identified:** air emissions from press cleaning fluid left in cleaning wipes.

**Function of press wash:** to ensure good quality printing by thoroughly cleaning the press during and after the printing process.

### Step 2: Develop a List of Alternatives

The important question to ask is how could this function be accomplished in other ways that might prove to be environmentally preferable while still meeting cost and technical feasibility concerns. Different levels and kinds of alternatives should be considered, for example:

Substitute products

Reduce product use, through technology changes and improved work practices

Improve treatment technologies

Improve disposal technologies

### Example 1: List the alternatives for reducing the waste from used toner cartridges

First, are there substitute products that could be used in place of toner cartridges? Probably not, given current technology and the fact that the toner cartridge specifications are required by the make and model of the printer.

Is there a way to reduce the use of the toner cartridges, thereby reducing the waste product? By defining more careful use of the copier the quantity of copying could possibly be reduced.

Improved treatment technologies — does not apply for this example.

#### POINTER

Visit the DfE website for more tools related to evaluating alternatives.

<http://www.epa.gov/opptintr/dfe/index.html>

#### POINTER

When developing alternatives, it's important to think broadly. Sometimes an alternative that is upstream or downstream from your process will produce better results than a change of chemicals or another in-process change.

Improved disposal technologies. The disposal alternatives include throwing in the trash or recycling.

**Example 2: List the alternatives to the current press wash process**

Substitution: First ask the question, is there any way to accomplish obtaining the required print quality with the use of less or no press cleaning solution? Thus, you may consider **substituting** the printing process with another **technology**, such as xerography, which would not require press cleaning. You may also consider **substitutions** in another part of the **process**, such as the type of ink, so that less or different press cleaning solution could be used. Third, you could also consider **substituting** the **press wash** solution for a less volatile<sup>3</sup> cleaner. Such substitution may require other process changes to work. Fourth, you could consider a mechanical cleaning rather than a chemical cleaning method. Fifth, you could also consider using disposable cleaning wipes, which would eliminate the releases and exposures at the laundry. In doing so, however, you may be creating a problem of hazardous waste at the landfill, thereby merely transferring the problem from one location to another rather than solving it.

Reducing use of the product: reduction in use of the press wash solution might be brought about by scheduling jobs to require less cleaning (e.g., heavy coverage jobs after light coverage; dark colors after light colors).

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<sup>3</sup>“Volatile” means that the substance evaporates easily.

Responsible recycling/reuse: Possibly the waste press wash solution could be reused one or more times; if not on the press, then in other clean-up applications.

Improved treatment technologies: Not applicable for this example.

Improved disposal technologies: What are alternatives for disposal? Sending the wipes to the laundry; extracting waste solvent from the wipes and reusing the solvent for other cleaning jobs, then sending it to be burned as a fuel; using disposable wipes and throwing them in the trash.

Worksheet 8-1 will help you organize the functions and alternatives for your evaluation. Create your own worksheet and list from the aspects you selected as objectives above.

<b>Worksheet 8-1: Functions and Alternatives Worksheet</b>							
<b>Aspect</b>	<b>Function</b>	<b>Alternative Products</b>	<b>Alternative Technologies</b>	<b>Alternative Work Practices</b>	<b>Recycling / Reuse</b>	<b>Treatment</b>	<b>Disposal</b>
Example 1: Waste toner cartridges	Provide ink for printing	N/A	More electronic media use would reduce need for toner cartridges	More careful about use of printing could reduce quantity of toner needed	Follow mfg. directions to recycle	N/A	Trash
Example 2: Press washes	Provide crisp print quality	Prod. A (current) Prod. B Prod. C (Special formulation)	Different blankets; Disposable wipes; Different ink; extraction of wash from wipes	Work Practice A Practice B Practice C	Reuse of fluid for other clean up.	N/A	Trash Drain Haz. Waste
Date Completed: _____				Contact Person: _____			

**Notes:** Some of these boxes can be filled out by brainstorming within the team working on the EMS, but some will require further work before they can be completed. Some additional sources of information include chemical product suppliers, machinery manufacturers and suppliers, workers on the line, trade associations, technical magazines associated with your business, or other businesses like yours. You may be surprised at how much information you will uncover. One way to proceed might be to assign each member of the team one area of information to collect and then have them use it to fill in the chart at the next team meeting.

### Step 3: Scope of Evaluation

You have now reached a critical decision point in your evaluation of alternatives. You must decide how detailed an evaluation you will need to undertake, can afford, and that is feasible to complete.

The following tables show the kinds of information that must be collected for each set of alternatives to yield a decision about which option would be the most feasible, both technically and economically, for your company to undertake to reduce environmental impact. These tables will also give you the information needed to frame specific targets that are measurable for your environmental programs.

Each alternative requires developing several kinds of information: health, safety, and environmental effects, performance capabilities, cost, effects on resource use, and regulatory concerns. This information will help you integrate human health and environmental concerns into your usual decision-making criteria of performance and cost. The following worksheets are designed to help you organize this information in a way that makes comparisons easier. The first worksheet organizes information to evaluate the human health and environmental effects, resource use, the management of those effects, and the cost of managing the effects of each product under consideration. The second worksheet organizes information to compare the performance of each product under your business conditions, regulatory concerns, and the cost of using the product. Each worksheet provides a scoring column where you can place your judgment as to how these products compared with each other. The final worksheet summarizes the environmental, performance, and cost information so that you can apply a final score.

Example 1 can include brainstorming about the options for more use of electronic media in your office and otherwise reducing the need to use the copier in your office activities. Developing ways to cut down on copying can extend the life of toner cartridges and reduce the volume requiring disposal. Steps that seem appropriate and desirable can be recorded and incorporated into your targets. You could establish a dual goal of reducing the volume of copying and 100% recycling of toner cartridges. How this becomes one of your “environmental projects” will be explained in the next module.

For Example 2, a full evaluation would require research for each of the alternatives identified. You may not have the resources to do this all at this time. Any of the alternatives can be evaluated or not as you choose. The point of identifying a range of alternatives is so you choose the options to evaluate with full knowledge of the range available to you, rather than in response to preconceptions. For example, you could choose to evaluate one set of alternatives now and another set next year as part of a continuing effort.

### Evaluation of Alternatives <sup>4</sup>

In this example, the worksheet shows the kind of information needed to evaluate alternative products. Each set of alternatives, such as work practices, may require some changes to the worksheet headings.

<b>Worksheet 8-2: Alternative Products Environmental Effects Comparison</b>					
<b>Chemical Product</b>	<b>Known Effects<sup>1</sup></b>	<b>Management of Effects<sup>2</sup></b>	<b>Cost of Mgmt.<sup>3</sup></b>	<b>Resource use</b>	<b>Effects Score</b>
Chemical Product A (Baseline) Chemical 1 (list main chemicals in product)	inhalation: causes dizziness; dermal contact: causes cancer; soil: kills worms; water: kills fish	inhalation: wear face mask; dermal contact: wear gloves, soil: protect against leakage in landfills or burial, water: don't flush down drain	face masks, gloves, hazardous waste disposal \$?	Uses water in chemical wash	H
Product B					M-H
Product C					H
Product D					M

**Notes:**

<sup>1</sup> Return to the "Environmental Concerns Worksheet" in Module 5 for the "known effects."

<sup>2</sup> List protection required for each effect.

<sup>3</sup> Identify cost items.

The following steps show you how to evaluate the performance of your alternative chemical products.

#### **Step 1: Identify the baseline.**

The baseline is the standard chemical, activity, or technology that is currently used. The alternatives will then be compared to this baseline.

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<sup>4</sup>All information in worksheets is created for purposes of illustration and does not represent real data.

**EXAMPLE:** ABC Printers used a highly volatile cleaning solvent called “type wash” for all kinds of press cleaning. This product was a blend of acetone, toluene, methyl ethyl ketone (MEK) and isopropyl alcohol. This is the company’s baseline. It has been used by the company for many years.

**Step 2: Identify the most important performance traits for the selected process area.**

Some sample performance traits include the following: how well does it work, how long does it take, how easy is it to use, and how easy is it to install?

**EXAMPLE:** To ABC Printers, the most important performance traits for press wash are that it work quickly to cut ink, require minimal wiping to remove any oily residue, and dry quickly.

**Step 3: Determine how the alternatives will be compared with the baseline.**

One example of a quantitative comparison is measuring the time it takes to complete a task. One example of a qualitative comparison is using a scale, such as ++ representing “much more favorable than the baseline.”

**EXAMPLE:** ABC Printers selected a comparison scale from -2 to +2, where -2 represented “much less favorable than the baseline,” +2 represented “much more favorable,” and a 0 represented “no difference with the baseline.”

**Step 4: Select the operating conditions for testing the baseline and alternatives and conduct the evaluation.**

The operating conditions should be realistic and consistent for the baseline and alternatives. If it is not possible to test an alternative at your facility (e.g., new equipment), have the supplier provide off-site service or performance test data. The important thing is that the conditions be as similar as possible for

each test, otherwise the results will not be comparable. Often work practices must also be examined to ensure similar application from test to test. Other elements that may effect testing, include room temperature and humidity. Make a list of what things might affect your test results and try to make sure that they are similar for each test.

**EXAMPLE:** ABC Printers evaluated the baseline and alternatives using the same size printing run, the most commonly used ink formulation, the same application procedures, and the same printed image.

ABC Printers conducted the evaluation and compared the three alternatives to the baseline. Results appear in the table below.

<b>Worksheet 8-3: Performance Comparison of Alternatives</b>				
	how well does it work	how long does it take	how easy is it to use	total
Product A	0	0	0	0
Product B	+2	-1	0	+1
Product C	+1	+2	+2	+5
Product D	+1	+1	-1	+1

**Step 5: Evaluate what regulations may be triggered by using each alternative.** What management controls might be required by these regulations? What additional cost might be attributed to the regulation?

<b>Worksheet 8-4: Regulatory Comparison of Alternatives</b>				
	Regulations Required (list)	Controls Required (list)	Cost of Regulations	total
Product A				
Product B				
Product C				
Product D				

**Step 6: Evaluate the cost of the baseline and alternatives.**

Determine the cost elements to include: for example, raw material, labor, and disposal costs. Don't forget to calculate any saving that might accrue due to the use of an alternative. This saving does not include a reduced cost of the fluid, since that would show up under the cost column. It would include, for example, the savings from not having to use gloves because a chemical product is less toxic.

**EXAMPLE:** ABC Printers completed a simplified cost assessment of the baseline and alternatives. The results appear in the table below.

<b>Worksheet 8-5: Cost Comparison of Alternatives</b>						
	raw material	labor	disposal	total cost	savings <sup>1</sup>	net cost
Product A	\$500	\$800	\$400	\$1700	0	\$1,700
Product B	\$600	\$800	\$200	\$1600	\$500	\$1,100
Product C	\$200	\$1,800	\$1,000	\$3000	\$100	\$2,900
Product D	\$300	\$1,300	\$800	\$2400	\$200	\$2,200

<sup>1</sup>Savings might include reduced product consumed, reduced controls to manage, ability to reuse product, etc.

<b>Worksheet 8-6: Alternative Products Evaluation Worksheet</b>					
Chemical Product	Performance	Regulations	Cost	Effects <sup>1</sup> Score	Overall Score <sup>2</sup>
<b>Chemical Product A (current baseline)</b>	0		\$1,700	H	Poor due to effects
<b>Product B</b>	+1		\$1,100	M-H	Best
<b>Product C</b>	+5		\$2,900	H	Worst
<b>Product D</b>	+1		\$2,200	M	Better

Date Completed: \_\_\_\_\_ Contact Person: \_\_\_\_\_

<sup>1</sup> Take score from Environmental Effects Comparison Table above (last column).  
<sup>2</sup> Score on a scale of low to high to reflect the desirability of each product. This is a judgment call.  
 Note: For more information on the methodology for comparing alternatives, refer to both the DfE/EMS Website and the Cleaner Technologies Substitutes Assessment, A Methodology Resource Guide, DfE, U.S. EPA 744-R 95-002, Dec. 1996.

**Interpretation of Score:**

The score provided reflects the judgment that Product B has a lower effects score, a higher performance score, and a lower cost than the baseline. Product C is too costly and also has a high effects score. Product D is also more costly although similar to B in other categories. Thus, an environmental project might be developed to move the ABC Company to use of Product B.

**Evaluation of Additional Alternatives**

Each of the categories of alternatives that you wish to consider will have to be evaluated in a similar manner as we did products. It would be helpful to create worksheets with similar headings for each category of alternatives, including technologies, work practices, recycling/reuse, and treatment or disposal options. For each alternatives evaluation, you will need the same kinds of information about environmental effects, management of those effects, performance, cost, and benefits in order to make a choice and establish targets. The column on environmental effects may be somewhat different for each set of alternatives. In the case of work practices, for example, you may wish to evaluate how much of the product is used or released rather than the environmental effects. In the case study regarding press washes, above, the ABC Company also evaluated work practices because they discovered big differences in the quantity of press cleaner fluid being used from person to person. This study was performed by engaging the help of the operators. Involving them also helped them to understand the importance of the results, and improvements were accepted more readily. The ABC Company also looked at options for removing the cleaner fluid from the wipes.

## Setting Targets

Lets assume that your evaluation has shown that ABC Company could reduce the air releases both in plant and at the laundry by substituting product B, and that this shows an acceptable level of performance and cost. The environmental target then could be stated as:

**Reduce air releases of cleaning fluid by 80% in plant and 40% at laundry by end of 12-month period by substituting product B and improving work practices in application of fluid. Reduce releases in laundry by 60% after 18 months by removing excess fluid from wipes before sending to laundry.**

The evaluation showed you what is possible in terms of reducing air releases, and also showed you the best means to accomplish that. An important element to consider in framing your target is how you will measure the results. You will need to establish ways of measuring your progress in meeting the targets in order to evaluate your process and in order to document success. In addition, time frame is important. How long will it take you to implement the program, which includes training people, acquiring product, phasing out product, acquiring equipment, and defining new work procedures for several steps of the production process? We will consider these questions fully in the next modules; for now, simply take them into account in setting your targets.

### POINTER

It's important to state your target in terms of the environmental improvement to be achieved rather than the means of achieving it. For example, "reduce air releases of X" rather than "substitute X." The desired improvement may continue for a long time, but the means may change with circumstances.

# Module 9

## Setting Up Environmental Management Projects; Measuring and Achieving Success

In this module, we will provide the steps and worksheets to help you set up environmental management projects that will help your company achieve each objective and target selected above. We will also help you develop ways to measure the achievements of those projects.

### Setting Up Environmental Management Projects

The three main elements to developing an environmental management project are: identifying the person or job position responsible for achieving the environmental objectives and targets in each relevant function and level; establishing the means or action plan for achieving targets and objectives; and implementing timetables. An outline for such a program might include:

- ▶ objective,
- ▶ target,
- ▶ person(s) responsible,
- ▶ budget,
- ▶ date of expected completion,
- ▶ date of actual completion, and
- ▶ performance indicators for measurement.

Let's continue working with the two examples from Module 8:

Recycle used toner cartridges.

Reduce the environmental impact of chemical wastes from cleaning on a printing press. Remember, the

#### **DfE Program**

Experience has shown the importance of setting up measurement criteria to assess how things are going.

environmental aspect is the air vapors released during the blanket cleaning process and the air vapors released at the commercial laundry where the blanket wipes were sent.

The following are example projects for the above two example objectives and targets:

**Figure 12**

<b>Environmental Management Plan:</b>	<b>Date</b> _____
<b>Reducing Waste from Copy Toners</b>	
Environmental Objective: Reduce the waste from used copy toners	
Target: 100% recycling of used toner cartridges in conformance with manufacturer instructions.	
Action Plan: Train persons in charge of replacing toner cartridges. Create a check list for dates cartridges mailed.	
Responsibility: Office Manager	
Budget: One hour training	
Expected Savings: ?	
Completion date: One month	
Review: Monthly by company manager.	
Measurement: Number of cartridges purchased vs number mailed and number remaining in stock in one-year period.	

Figure 13

Environmental Management Plan:	Date _____
<p><b>Reduce the Environmental Impact of Chemical Wastes from Press Cleaning</b></p> <p>Environmental Objective: Reduce the Environmental Impact of Chemical Wastes from Press Cleaning</p> <p><b>Target 1:</b> Reduce air releases of cleaning fluid by 80% in plant and 40% at laundry by end of 12-month period</p> <p><u>Action Plan 1:</u> Substitute Product B cleaning fluid, train printers in new product use</p> <p>Responsibility: Printing Press Manager</p> <p>Budget: Cost of new fluid</p> <p>Expected Savings: Difference in amount used, reduction in penalties by city</p> <p>Completion date: Six months</p> <p>Review: Monthly by company manager.</p> <p><u>Action Plan 2:</u> Substitute best work practice, train printers in best work practice</p> <p>Responsibility: Printing Press Manager</p> <p>Budget: Time for training and evaluation of results</p> <p>Expected Savings: Difference in amount of fluid used, reduction in penalties by city, reduction in amount of laundry required</p> <p>Completion date: One year</p> <p>Review: Monthly by company manager.</p> <p>Performance Measurement: Amount of product B substituted for current product in one-year period and reduction in total product used over one-year period. Reduction in vapor measured at laundry.</p> <p><b>Target 2:</b> Reduce air releases at laundry by 60% after 18-month period.</p> <p><u>Action Plan:</u> Remove excess fluid from wipes prior to sending to laundry; reuse recovered fluid</p> <p>Responsibility: Shop manager</p> <p>Budget: Cost of cyclotron, time to process wipes</p> <p>Expected Savings: Reduction in cost of fluid due to reusing recovered fluid</p> <p>Completion date: 18 months</p> <p>Review: Monthly by company manager.</p> <p>Measurement: Amount of fluid reused; reduction in vapors measured at laundry provided by laundry.</p>	

As you can see from example two, more than one target can be used to accomplish an objective, and more than one action plan to accomplish a target. You need to outline the steps necessary to achieve each target and make sure that the responsibility for completion is assigned, the time frame specified, and a budget given to ensure completion. In the Appendix Tool Kit there is a blank worksheet to assist you in planning your environmental projects.

## Measuring and Achieving Success

The three important steps to achieving your environmental goals and targets are:

- ▶ Measuring results,
- ▶ Determining the cause of problems, and
- ▶ Taking corrective action.


Some of these steps have been described in Module 7. Some material is repeated here to illustrate its application in this context.

### Step 1: Measuring Results

To determine how you are doing in meeting your goals, you need to decide how you are going to measure progress. Identify the key characteristics of the process you are working to improve. As in Module 7, above, your performance indicators should have these elements:

- ▶ be relevant to your goals and targets.
- ▶ be verifiable,
- ▶ be objective, and
- ▶ be simple and understandable,

In the case of toner cartridges, for example, the performance

 **POINTER**  
Measurement and evaluation of environmental performance is an ongoing process.

indicators might be the number of toner cartridges used and the number sent for recycling. In the case of the air emissions from the press cleaning, the following can be measured:

1. amount of volatile fluid used per gallon of ink used,
2. amount of fluid saved over a selected time period,
3. amount of fluid used by each printer compared to gallons of ink used,
4. amount of fluid collected from wipes before sending to laundry,
5. air emissions measured by laundry during cleaning of wipes, and
6. levels in water reported by POTW.

You may be able to think of more. It is important to recognize that each “indicator” measures something different. The first one measures “input” with respect to “output.” This is important because changes in input can be caused by reduced sales of the product as well as more efficient use of the input during the production process. To be sure you are measuring success rather than simply reduced sales volume, be sure to include output in your measurement criteria. You may also need to include more than one kind of measurement to understand the results and be able to evaluate the process.

The second measurement allows you to compare use of the fluid over a time period with previous time periods, which could help to indicate efficiencies in use, such as better work practices. Again, this comparison should not be made without reference to output over the same time period. Number three also gives a comparison between different work practice methods. Number four shows how much fluid is being reused and the reduction in burden on the laundry, and number five shows the success in reducing air emissions at the laundry. In a sense, number five is

the “acid test” of whether your goal is being met. Without success here, the achievement of the targets within your plant would be meaningless because the original problem was the air and water emissions from the laundry caused by the wipes. Each of the other measurements shows success in the achievement of targets that are steps toward your final goal. Also, some of these measures can be used to determine cost savings related to particular steps and to the overall goal. Most important, each measure is an important indicator of where problems may be occurring in the process.

### **Step 2: Determining causes of problems**

It’s important to have a method established to determine the causes of failing to meet a target. In some cases, the cause might not be difficult to understand. Other times, however, the cause might not be obvious.

One method is called “root cause analysis.” This is described in Module 7 and can be applied here to identify causes for not meeting targets.

### **Step 3: Corrective action**

Once you document a problem with respect to meeting targets, the company must be committed to resolving it. Action should be taken as quickly as possible. Assigned responsibilities for action and schedules should be clear. Recognition of need for corrective action and good ideas for solving problems may come from the people in the shop doing the work. Find ways to get employees involved in the improvement process. The following is a checklist to help complete corrective action. Have you:

- ▶ Identified the problem(s)?
- ▶ Identified the cause(s)?
- ▶ Come up with a solution for each?

- ▶ Implemented the solution(s)?
- ▶ Documented the solution(s)?
- ▶ Communicated the solution(s)?
- ▶ Documented the action(s)?

Below is a sample corrective action notice that will assist in documenting the resolution process.

<b>Worksheet 9-1: Corrective Action Notice</b>	
Issue Date:	Solution Due Date:
Requested by:	
Issued to:	
Problem Statement:	
Most Likely Causes:	
Suggested Solutions:	
Action Taken:	
Measured Results:	
Corrective Action Closed by:	Date:
<i>Contact for Notice:</i>	

In addition to the corrective action Notice, which helps to document and track specific actions, it is also helpful to track measurement, problems, and solutions. Below is a sample log that will be useful in integrating the documentation and tracking of your environmental quality control system.

<b>Worksheet 9-2: Measurement and Corrective Action Tracking Log</b>		
Area and Step Measured:		Date:
Person Responsible	Means of Measurement	Results
Person Responsible	Problems Identified:	Solution Due:
Person Responsible	Solutions Identified:	Action Taken:
Person Responsible	Effectiveness Verified:	Date:
<i>Contact person for log:</i>		



# Module 10

## Establishing Continuing Improvement: Your DfE/EMS Program, Audits, and Management Review

It's now time to take a step back to look at the total picture. Your DfE/EMS constitutes an overarching "Environmental Management Program" made up all of the elements we have covered above and a few additional elements that we will cover in this module. The framework of your DfE/EMS Program at this point includes:

- ▶ Company Environmental Policy
- ▶ Environmental Aspects Review Process
- ▶ Operational Controls
- ▶ Measuring Environment Performance and Taking corrective action
- ▶ Objectives, Targets and Environmental Management Programs
- ▶ Communication Plan
- ▶ Stakeholder Strategy
- ▶ Documentation Plan

There are four more steps to accomplish the desired goal of continuing improvement: setting up an annual auditing process, determining program measurement criteria, annual review of aspects and objectives, and establishing an annual management review process.

### **Step 1: Determining program measurement criteria**

Determining measurement criteria will help you evaluate the success of the program elements that will be audited. Select criteria for each program area that will help you and your

### **DfE Program**

Principles emphasize the importance of continuing improvement. Environmental improvement requires work in steps. It will not be achieved overnight, but must be viewed as a long-term, evolving process.

employees decide whether success has been achieved or whether improvement in procedures needs to be made. It is easier for management and staff to understand how things are going if they have benchmarks as guidelines.

It's important to recognize that the purpose of an audit is different from that of an environmental performance evaluation as described in Modules 7 and 8. The focus will be on whether the system for managing achieving objectives is functional rather than on the specifics of how the process works.

The criteria will probably be different for each area. For example, the environmental management projects that were set up to meet specific objectives will most likely have measurements built into the process. How will you measure the success of communication, documentation, stakeholder outreach, or training programs? In general, audits are conducted through interviews, examination of documents, observation of activities and conditions, and reviewing the existing results of measurements and tests.

One approach is to measure the *activities*, for example, number of meetings held with stakeholders, number of documents created, number of employees trained, or number of hours of training. Activity, however, does not always mean results. Consider what the objective of each program element is with respect to your EMS program, and define a way to measure *results* so that you would feel satisfied that the program is achieving the objectives. To measure results effectively, your methods should be:

- simple
- flexible
- consistent

ongoing

usable (i.e., results communicated)

accurate (i.e., reliable data produced)

The worksheet below will help you organize your thoughts.

Worksheet 10-1: EMS Program Measurement Criteria				
Company Name _____				
Measurement Elements Program Areas	Objectives of Program Area	Activity Measures	Results Indicators	Review Period
Communication Plan				
Stakeholders Input				
Environmental or DfE/EMS Training				
Review of Aspects				
Operational Controls				
Environmental Review of New Processes and Activities				
Setting Objectives & Targets				
Environmental Management Project 1				
Environmental Management Project 2				
Documentation				
Regulatory Compliance				
Pollution Prevention				
Other				
<i>Contact person for form:</i>				

Here are some examples of EMS results indicators for various program areas:

- ▶ significant environmental aspects included in environmental projects plan
- ▶ environmental objectives and targets met
- ▶ pounds of VOC emitted per unit of production
- ▶ pounds of hazardous waste generated per unit of production
- ▶ employee sick leave absences related to work environment
- ▶ percentage of employees completing environmental training
- ▶ average time for resolving corrective action
- ▶ energy use per unit of production
- ▶ percentage of solid waste recycled/reused
- ▶ number of complaints from community
- ▶ number of pollution prevention ideas generated from employees

## **Step 2: Setting up an auditing process**

To make sure that your DfE/EMS is achieving the general goals outlined in your Environmental Policy, you will need to establish procedures for an audit process and assign people to be responsible for accomplishing the audits on a regular basis. The purpose of the audit is to develop information for management review and to take corrective action where needed. The audit program and procedures should cover:

- the activities and areas to be considered in audits,
- the frequency of audits,
- the responsibilities associated with managing and conducting audits,
- the communication of audit findings,

auditor competence, and  
how audits will be conducted.

Audits may be performed by personnel from within the organization or by external persons selected by the organization. In either case the persons conducting the audit should be in a position to do so impartially and objectively. The DfE/EMS Program Measurement Criteria Worksheet (above) should be used along with the Audit Tracking Form (below). The Criteria Worksheet specifies some of the factors that will be examined during the audit. Below is a worksheet to help you develop your audit program and tracking procedures.

<b>Worksheet 10-2: Audit Tracking Form</b>						
Audit Elements Audit Areas	Objectives of Audit Area	Criteria for Audit	Person Responsible for Audit	Review Period	Date of Review	Results: Successes, Failures and corrective action
Communication Plan						
Stakeholders Input						
Environmental or EMS Training						
Review of Aspects						
Setting Objectives & Targets						
Environmental Management Project 1						
Environmental Management Project 2						
Documentation						
Regulatory Compliance						
Pollution Prevention						
Environmental Review of New Processes and Activities						
Other						
<i>Contact person for form:</i>						

Certainly this form will not be enough to conduct audits. First, the categories should match what is appropriate for your company. Second, each category will probably require subheadings to fully describe what you need to check about each category to be audited. The worksheet above is more of a summary log with suggestions about what you might want to include. While every part of your DfE/EMS program should be audited regularly, the parts do not need to be done at the same time nor on the same schedule. Make this work to help you ensure that your DfE/EMS program is doing what you want it to do.

### **Step 3: Quarterly review of your company's environmental aspects**

It is important to set up a process to review your company's activities and processes on a regular basis. You may add to the list of environmental aspects and you may wish to re-score the aspects as your activities change and as new information becomes available. Here are some things to check:

New process review — have any changes introduced new environmental aspects?

Worksheets from last year's aspect identification and scoring exercises — is there new information on chemical effects? If so, update your worksheets.

Communication received from stakeholders — do any comments suggest a need for re-scoring your aspects?

Environmental objectives and targets — what new ones will your company set for this year?

Pollution prevention program — has information become available from this effort that would add aspects or objectives?

Audit program — have your audits turned up information on where your DfE/EMS and environmental programs could be improved? Would this information be useful in your aspect identification process or in redesigning your objectives?

The annual review of aspects can be used to change the priorities you set last year, or it can be used to examine a part of your company's activities that you set aside last year. The annual review can be part of a planned "phasing in" process where different parts of your company's operations are reviewed until all your company's activities are included in your EMS. The annual review of aspects is the foundation for your company's continuing improvement.

#### **Step 4: Establishing a quarterly management review process**

To maintain continual improvement, suitability, and effectiveness of your environmental management system, and thereby its performance, your organization's senior management should review and evaluate the environmental management system at defined intervals. The scope of the review should be comprehensive, though not all elements of an environmental management system need to be reviewed at once, and the review process may take place over a period of time. The worksheets in steps 1 and 2 provide information for the management review. Review of the policy, objectives, and procedures should be carried out by the level of management that defined them. Following is a checklist of some of the things that should be included in a review:

- assess the effectiveness of the DfE/EMS,
- results from audits,
- the extent to which objectives and targets have been met,
- the continuing suitability of the environmental

management system in relation to changing conditions and information, and concerns amongst relevant interested parties.

Questions for management to consider include:

- ▶ Is our environmental policy still relevant to what we do?
- ▶ Are roles and responsibilities clear and do they make sense?
- ▶ Are we applying resources appropriately?
- ▶ Are we meeting our regulatory obligations?
- ▶ Are the procedures clear and adequate? Do we need others? Should we eliminate some?
- ▶ What effects have changes in materials, products, or services had on our DfE/EMS and its effectiveness?
- ▶ How effective are our measurement and auditing systems?
- ▶ Can we set new measurable performance objectives?
- ▶ What effects have changes in materials, products, or services had on our DfE/EMS and its effectiveness?
- ▶ Do changes in laws or regulations require us to change some of our approaches?
- ▶ What stakeholder concerns have been raised since our last review?
- ▶ Is there a better way? What else can we do to improve?
- ▶ Create a continual improvement plan and check progress.

Observations, conclusions, and recommendations should be documented for necessary action. Action items should be assigned for follow-up and next year's review scheduled.

**Congratulations! This completes your DfE/EMS. Hopefully, the management system accompanied by the annual process of review and renewed objectives will bring its own rewards in greater productivity, reduced costs and healthier environments!**

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For a full list of DfE Program publications, contact EPA's Pollution Prevention Information Center, 401 M Street, SW (7409), Washington, DC 20460.

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# Appendix A

## Identifying Your Stakeholders: Who They Are; What Role They Can Play

Stakeholders can play an important role in helping your company develop a DfE/EMS. Employees have strong stakeholder interest in your company and can provide strong support for development of an EMS. Customers and neighbors can provide useful input. In addition, establishing partnerships with trade associations, suppliers, professional associations, and community colleges can be very helpful in developing parts of your EMS. This module addresses the kind of stakeholders you may wish to include in the process and the potential benefits of including stakeholders. How far your company wants to proceed with including stakeholders is your decision.

### Stakeholder Roles

It is important to consider why you would want to include internal and external stakeholders and what roles they can play. It's important to be clear before engaging stakeholders on what you expect their role to be. What do you want from them? What do you intend to tell them? Consider the following:

- ▶ Internal stakeholder participation can facilitate implementation of environmental projects as employees “take ownership” of the EMS process;
- ▶ Participation by all types of stakeholders can add credibility, transparency and value to your EMS;

- ▶ Different stakeholders bring useful perspectives to identifying environmental issues, often identifying issues that might otherwise have been overlooked;
- ▶ Involving internal stakeholders, such as equipment operators, can help gain their acceptance and reduce their opposition to changes in work practices. Similarly, involving external stakeholders can help them understand your business operating constraints;
- ▶ Sometimes being an environmental leader can gain customer recognition and loyalty, and involving customers in your EMS helps them recognize your leadership.

## Identifying Stakeholders

Almost every organization will have a wide array of internal and external groups that may be interested in and helpful partners to that organization. These groups will not be homogenous. Each will have its own priorities and perspectives, and each will have something different to contribute in support of your EMS.

The following list provides types of stakeholders:

### Internal:

- ▶ Employees
- ▶ Shareholders
- ▶ Customers
- ▶ Suppliers
- ▶ Investors & Insurers
- ▶ Trading Partners

### External:

- ▶ Neighbors
- ▶ Community
- ▶ Organizations
- ▶ Environmental Groups
- ▶ Larger Companies
- ▶ The Media

## **DfE Program**

Experience has found it valuable to include a variety of stakeholders in each project, including industry, government, labor, environmental groups, and others. This has ensured both a mix of viewpoints and a wealth of different experience and training that contributed to a project. While this level and breadth of stakeholders may not be available to a small company, opening your EMS planning process to a variety of stakeholders will improve results.

- ▶ The Public
  - ▶ Local Government
- Other

You may want to start with those stakeholders who have expressed interest in your operations. However, if you wish additional input, here are some sources to consider when making an effort to locate suitable stakeholders:

- ▶ asking your organization's own employees, including plant/site managers and public relations personnel;
- ▶ contacting local officials for suggestions;
- ▶ contacting a local planning agency for suggestions;
- ▶ contacting local schools, community colleges, or universities; and
- ▶ contacting a national advocacy group to elicit suggestions as to local or national groups that may be interested/suitable.

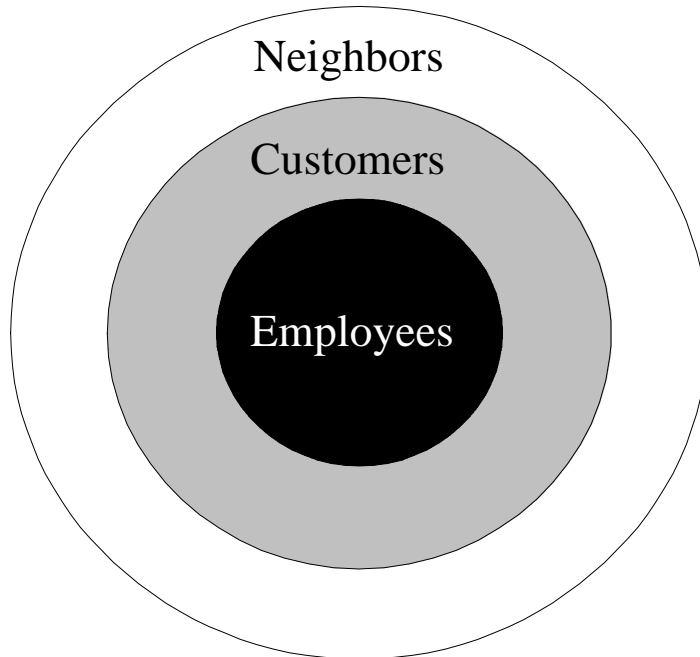
## How to Work With Your Stakeholders

The next stage of the process is to establish dialogue with the stakeholders you have chosen to include. You may view this as an opportunity to further refine your understanding of the various interests of the groups.

It's important to develop stakeholder participation in stages and learn as you go. You might think about the different kinds of stakeholders as forming ever broader circles around your business (see diagram). Begin with the inner circles and work outward.

 **POINTER:**

Remember, your stakeholders' concerns may be very different from what you expect, and even less difficult to resolve than you may think. The only way to find out is to talk with them.



**Figure A-1**

You can consider many methods of communication when attempting to inform stakeholders about your company and what you are doing, or plan to do, to protect the environment. These methods may include:

- ▶ articles in company newsletter; notices on employee bulletin boards;
- ▶ discussion in company meetings;
- ▶ scheduling tours of your facility;
- ▶ producing a fact sheet about your company's activities, the EMS program, and why and how your company would like to include stakeholders;
- ▶ establishing a phone line to answer questions, record concerns, etc.;
- ▶ going to local schools, community colleges, universities, or civic organizations, such as Rotary, that may provide a focal point of interest about your company; and
- ▶ holding public meetings when you feel it is appropriate.

You should ensure that this dialogue is a two-way participatory process with any stakeholders you choose to include. The stakeholders will want to know that their comments and concerns are being listened to and taken into account. It is important to convey that your organization is genuinely and actively including them.

The following is a worksheet to help you plan your stakeholder participation.

<b>Worksheet A-1: Identification of Stakeholders</b>			
<b>Your Stakeholders</b>	<b>What you want to tell them:</b>	<b>What you want them to tell you:</b>	<b>How to communicate with/tell them:</b>
(Example) Employees	Environmental policy	How to get it done	Memo, bulletin board, meetings, suggestion box
(Example) Neighbors	Environmental policy and EMS plans	Their environmental concerns	Meetings, open house, flyers, suggestion box
Customers	Environmental policy and EMS plans	Their environmental concerns	Above, plus inserts in direct mail advertising
Date Completed: _____		Contact Person: _____	

To complete this worksheet, think about ways to use your current means of communication to begin your dialogue. Consider which methods will work to convey your message **to** each group, and which will work to obtain the information you want to get **from** each group. The means that you choose may be different for each stakeholder group.

In addition to communicating with your stakeholders, it is important to track their communication to your company and the response made to that communication. A procedure for documenting and responding to stakeholder communication should be established and a person appointed to be responsible

for carrying it out. Below is a worksheet to assist you in setting up and documenting a procedure.

<b>Worksheet A-2: Stakeholder Communication Response Tracking</b>						
Stakeholder	Type Communication	Content of Communication	Action Taken		Communication/Response	
			Action	Person Responsible	Date	Person Responsible

Tracking Person Responsible \_\_\_\_\_

Case Study 4, below, shows how “Company B” set up a process to train and then use its internal stakeholders to identify environmental concerns and some of the benefits achieved.

An example of how one very small company solicited the opinions of its neighbors and incorporated their comments into an environmental program is included in the Appendix.

**Stakeholders: Appendix A**

**Case Study 3: Copy Plus Services**

Sam Worth was attending a conference on issues affecting small businesses. The conference was the first of this type that Sam had attended. As the owner of a copy center business, Sam realized that he needed to stay in tune with issues affecting small service businesses like his. Copy Plus Services has five centers located in the western suburbs of Chicago. Each center provides a full range of copy services including fax, binding, computer usage, video conferencing, and blueprint service. The centers are run 24 hours a day and seven days a week. Sam grew the business from a simple copy center located in Elgin, Illinois, five years ago and is planning to go national with the business.

During one of the small group sessions, Sam and five other attendees were discussing how their businesses affected the environment. One of the presentations had mentioned a new standard — ISO14001 Environmental Management Systems — which applies to service businesses as well as manufacturers. None of the people in Sam's small group was familiar with the standard. They decided to share with one another what they'd been doing in their businesses to protect the environment and then review the ISO 14001 standard.

Naturally Sam's five copy centers recycled the paper that they used. However, beyond that Sam had never thought of other environmentally conscious programs that they could implement. He was a bit embarrassed that he had not really given it much thought. He has had complaints of odors bothering the people in stores adjacent to his centers. In an attempt to appear as if he had given it some thought, Sam told the group that he had a good quality program and policy (see Attachment 1) which he thought addressed environmental issues, and that one of his centers had received an ISO 9001 quality award for doing quality work.

For the most part, the other members of the group had also not given environmental

programs much thought. They didn't have any specific issues confronting them and were somewhat concerned about embarking on a program for which they could not see any beneficial return and that might be a big cost to the business. Since they had never dealt with the EPA, they were leery of the possibility that EPA might come into their business if they participated in the ISO 14001 program.

One of the group members said that, from what she had read on environmental programs in *Business Week*, there were benefits to be derived by undertaking such a program. Since these programs had to be integrated into the overall business plan, it seemed important that top management provide the leadership in incorporating environmental stewardship. She cited some examples of this from case studies she read in a Chicago trade journal, as well as from her personal experience. One of the examples was an ice cream business in Chicago, which increased its overall productivity by focusing on energy efficiency. In addition, a major international clothing distributor used the environment as a major selling point for its product.

After Sam returned home from the conference, he sat down and thought about what had been discussed in the small group session. He wanted to start an environmental program in his business but was not quite sure how to proceed. He decided to draft an environmental policy for his Copy Plus Service before going to bed, (Attachment 2) and present it to his staff at their weekly meeting the following Tuesday.

At the meeting Tuesday, Sam presented his environmental policy to his staff. Sam's staff was composed of the managers of the five centers, a finance manager, and himself. The reaction from the group was split. Two of the managers felt that, other than recycling the paper, there wasn't anything of significance that they could do within their business. The other three seemed to think that this was something worth pursuing. The finance manager was on the fence. While she acknowledged that there might be some ideas for them to pursue, she was concerned that it would add cost to the business. The copy business was a low margin business and competition was increasing.

Although Sam knew that everyone wasn't equally committed, they all agreed to pursue the idea further. The finance manager and the two managers who were enthusiastic would review Sam's environmental policy to determine whether it was appropriate for the business. If so, they would help figure out how could it be incorporated into the business. Sam suggested that they might want to talk with someone else in the copy business to see

what they are doing about environmental programs. The finance manager said that she knew someone from The Body Shop, also in the mall, who had worked on a committee to develop their environmental program. They all agreed that the friend should be invited to join them for a meeting as an outside observer and advisor.

When the three managers met, Laura Witherspoon from The Body Shop, a neighboring store in one of the malls, was able to attend. She agreed to provide her perspective and ideas in establishing an environmental management system. The first order of business was for them to explain their operation to her (Attachments 3 and 4).

### **Copy Center Operations**

Each copy center produces a million copies per year using premium grade paper. Of that output, 70% is single-sided copies. Each copy center also does a significant amount of blueprint business. There are fifteen employees per center. Each center's energy bill is \$50,000 per month. The majority of the work is done during 9 AM to 6 PM business hours. They recycle approximately 100,000 pieces of paper per year in each center. Each center uses 400 toner cartridges and two gallons of ammonia per month. Supplies are stored on shelves in a back room and chemicals are stored either in metal cabinets or next to the machines (for easy access). Copy Plus Center customers come both through newspaper advertising and pamphlets, and through their Web site.

**Equipment:** The copy machines and computers are three to five years old. They are typically left on 24 hours a day. The managers are not sure if any of the chemical products used in the copy and blueprint equipment have an impact on the environment.

**Location:** The Copy Plus centers are in shopping malls and residential areas. Businesses in the area such as restaurants have expressed concern over the odors coming from the centers.

**Delivery Service:** Each center has vans providing customer pickup and delivery. In addition, the vehicles are used to pick up supplies for the centers.

**Cleaning Service:** Each center contracts with a cleaning service that cleans the facilities. A waste disposal company handles the waste, and recycling is subcontracted.

**Training:** Employee training focuses on running the equipment and administrative procedures, including paper recycling.

Considering this information, Laura suggested that they approach environmental management system implementation not just from the standpoint of the copy center operation but from a total systems approach. Laura presented a simple input/output model to begin the process of understanding the environmental aspects of the business. The three managers immediately recognized the possibility and benefits of this approach. They asked Laura if she would be willing to prepare a rough plan which described this approach in more detail, and outlined a typical copy center environmental management system. Laura agreed because she remembered how difficult it was to get the synergy in her own organization. She felt that she could assist them with this.

**Stakeholders: Appendix A**

**Case Study 4: Company B**

Company B is a 30-person company that manufactures sangrita and chile salsa. With strong senior management backing and support from a local consultant, Company B focused initially on building environmental consciousness among its employees. To all of its workers and managers the company offered general environmental awareness training as well as more specific training on how to identify specific environmental issues. Employees then split into 10 teams, each charged with identifying the environmental issues associated with a specific area of operation, from the acquisition of raw materials through to product delivery. Based on the work of these teams, Company B developed a list of its most important environmental issues and concrete objectives and plans for improvement.

The key to Company B's success lay in using participatory teams to define new environmental problems and develop solutions. For example, the company identified waste of raw materials as an environmental issue, and teams from several areas found ways of reducing waste. Company B now requires its suppliers to use stronger containers to avoid materials spoilage. More significantly, the team from the mixing area realized that by using a spray nozzle to clean out left-over orange juice concentrate (a key ingredient in sangrita) from large supply containers, it can recover an additional 3,000 pounds of concentrate (6% of its total consumption, valued at \$4,200) per year. Company B gained an even greater economic benefit by revising its process for cleaning and sanitizing its stainless steel tanks, reducing use of an iodine-based cleaning fluid by 11,000 liters per year, or 90%, at an estimated yearly savings of \$7,000.

Other benefits the company has realized include improved compliance; a safer work environment; and reduced emissions from its transport vehicles thanks to improved maintenance. The environmental awareness of all employees has increased significantly, with some workers extending their new-found environmental consciousness to their homes. The company has also publicized its participation in the EMS project to the local community in an effort to improve its community relations and to help improve the environmental awareness of the community.

# Appendix B

## Communicating Your Work and Training to Get the Job Done

This module is presented in two parts: developing a communication plan and developing a training plan. There will be explanatory material, discussion questions, and worksheets for each section.

### Communication

#### General Points

Good communication, at the right time, to the right people, is critical to the success of most projects. Developing a DfE/EMS is no exception. If you consider communication to be an integral part of the project, rather than something tacked on at the end, your ability to implement the DfE/EMS successfully will be greatly improved.

Following the simple rules of effective communication, you will want to:

#### **Begin early in the process.**

Let people know what you are doing. In most cases, you will need the cooperation of several people within your company to gather information and develop a DfE/EMS that will work. In small and large organizations alike, early communication will pay off in better acceptance of the resulting system.

#### **DfE Program**

Experience has proven the importance of regular and clear communication in keeping participants engaged in the project and informed so they can provide useful input.

#### **POINTER:**

Its important to revisit the communication plan at various stages of your EMS development to add any additional communication needs for each piece of your EMS.

**Set your communication objectives.**

Decide what you want to achieve in your communication. This will help you get the right message across without overwhelming people with too much information, spending too much time, or missing the mark.

**Target your communication.**

You will want to identify what to communicate and to whom. In many cases these two aspects — the what and the who — are nearly inseparable. Consider which individuals or functions in the organization will need detailed information, and which need only general concept information. For example, prospective members of the development team will need considerably more input than the sales department, which may be only peripherally involved.

**Communicate regularly.**

To build support for the DfE/EMS, try to communicate on a regular basis. Some simple means of regular communication can usually be accomplished without straining resources – for example, a bulletin board posting, E-mail messages, or articles in the organization newsletter. Don't forget to consider direct word-of-mouth communication, particularly in smaller organizations. Talking directly with key individuals at intervals may be the best mechanism for ensuring good communication.

**Integrate EMS communication.**

Use existing channels of communication to get the message out on your EMS activities.

**POINTER:**

Create and maintain a list of everyone you can think of who would be interested in your company's environmental activities. Include how you could reach them. You can then make a decision about where to begin. You could start with staff and later add other audiences if that suits your capabilities and needs. It is helpful to make your communication list as complete as possible to start with and pare it down as you decide what you want to accomplish..

**Discussion Questions**

1. What are the means of communication in your company?

How often? To whom? Does it reach:

- ▶ Employees
- ▶ Managers
- ▶ Customers
- ▶ Suppliers
- ▶ Neighbors
- ▶ Local and state government
- ▶ Environmental groups
- ▶ Trade Associations
- ▶ Other groups, e.g., Boy Scouts, Lions Club, Church
- ▶ Public

<b>Worksheet B-1: Communication Channels</b>			
	<b>What</b>	<b>How Often/When</b>	<b>To Whom</b>
	Newsletter	/	
	Bulletin Board	/	
	Information Meetings	/	
	E-mail	/	
	Pay Check Inserts	/	
	Advertising	/	
	Other:	/	

2. What would you like to communicate to any or all of these groups about the environmental interests and activities of your company?

3. What do you need to communicate about your EMS and to whom?
4. What advantage do you see in communicating about your EMS?

**Worksheet**

The following is a worksheet to help you set up and track a communication plan. Add anything else that will be relevant to your company's needs.

<b>Worksheet B-2: Communication Work Plan</b>					
<b>Target Audience</b>	<b>What to Communicate</b>	<b>Mode of Communication</b>	<b>When</b>	<b>Budget</b>	<b>Who is Responsible</b>
Sample: Staff	Environmental Policy	Newsletter	Monthly	?	?
		Staff Meetings	Weekly	?	?

Date Completed: \_\_\_\_\_ Contact Person: \_\_\_\_\_

A full-page version of this worksheet is included in the Appendix Tool Kit. Consider what kind of message you can convey for each mode of communication. There may be many ways to communicate with a particular target group, and different modes of communication may be best suited for particular kinds of messages. Some may allow for two-way communication and some only for one-way communication. Consider also that you may want to talk differently about the same point to different groups. For example, you may wish to convey detail about, and ask for input regarding, the Environmental Policy from your

staff. With respect to customers, you may wish to let them know only about your Policy and that you are working on an EMS. The information you convey to your customers may have less detail than that which you convey to your staff. You may also wish to ask your customers for general suggestions, and in so doing find out whether they have any environmental concerns.

## Training

There are two kinds of training:

- ▶ competency (i.e., technical training to accomplish a task) and
- ▶ awareness (i.e., of specific issues).

Each of these types of training can play a role in EMS development and implementation. For example, competency training may be useful for the person who identifies regulatory and legal requirements to which your company is subject. Awareness training may be useful for all employees, so that they can become prepared to participate in and support the development of your EMS. Your communication plan for employees may be closely related to your awareness training of employees. Review both activities together to take advantage of overlap opportunities.

In addition to environmental or worker health and safety training that your company may currently carry out, there will be specific training requirements associated with controls applied to environmental concerns as your DfE/EMS develops. The training for that phase of your EMS is discussed in Module 7 below. Training plans developed during completion of that module should be integrated with the training identified in this module.

Go through the Action Steps listed below and use the attached worksheet to help you identify your training needs.

### Action Steps

1. Identify all job functions that affect the environment. If this is a small company, you may wish to identify individuals. Identify who is responsible for employee health and safety.
2. Identify what training these people receive that relates to environmental, including health and safety, concerns. Determine when this training is given.
3. Determine if EMS education could be included in this training or whether there should be special EMS training, at least in the beginning.
4. Identify training materials or programs available outside your company. Some places to check include:
  - ▶ Trade Association
  - ▶ Small Business Association
  - ▶ EPA materials
  - ▶ State Department of Environmental Protection
  - ▶ Suppliers
  - ▶ Certified Contractors
  - ▶ Others

#### FLAG!

Revisit your training plan after developing the environmental program (Module 11) when you have a better idea of who needs training related to significant environmental aspects.

#### FLAG!

It is helpful at this point to review how the development of your EMS is going. The Took Kit in Appendix B contains a set of questions to facilitate this review.

<b>Worksheet B-3:</b>		<b>Training Plan</b>				
Jobs Affecting Environment	Training Needs	What Vehicle	When/ Length	Budget	Completion Date	Who is Responsible
Sample: Staff EH&S Person	Environmental Policy	Staff Training Session	Once/ Two hrs.	?	?	?

This worksheet is included in the Appendix Tool Kit. The purpose of this table is to help you identify, plan for and track the training needs of your employees to assist in developing and putting your EMS in place. You will probably be able to identify some general training needs now, but will need to return to this module to add specific technical training needs that may be identified as you proceed with the EMS.

# Appendix C

## Documenting Your Work

When undertaking a new activity like DfE/EMS development, documenting discussions, plans, targets, and programs is crucial. Documentation ensures that no information is lost, and lets you track your performance. Thus, documentation contributes significantly toward continuous improvement efforts. In developing new processes, your company, management and staff will learn from mistakes. Documentation assists in that learning process. It also aids your EMS development when you communicate with stakeholder groups and work with partners. Documentation is important to the success of your EMS for several reasons:

- ▶ Word-of-mouth information is rarely communicated consistently, whereas written information is more likely to be constant from person to person and over time.
- ▶ Creating documentation helps you assess the progress of your EMS. Some inconsistencies show up only as you commit your ideas to paper, and having a record allows you to check on progress and evaluate results.
- ▶ Documentation is vital to maintaining consistency in an EMS over time and from department to department. In most companies, change is a fact of life: new products are developed, the company grows, employees change positions or leave the company. Accurate documentation will make it much easier to maintain an effective and flexible EMS during these changes.

### **POINTER:**

While documentation is usually the single most overlooked administrative procedure in most companies, it can play a very important role in EMS development. Determining what you need from your documents, both for future reference and to teach procedures to others, will help you understand the overall needs that you want your EMS process to meet.

### **DfE Program**

Experience has proven the value of documenting meetings, decisions, and study results, and of making that documentation accessible to those who need it.

## What is Documentation?

The term “documentation” has many different interpretations.

The term can refer to any or all of the following:

- ▶ instructions for doing something;
- ▶ records of what was done;
- ▶ policies developed;
- ▶ printed matter that is given or sent to clients, regulatory agencies, customers, and the public; and
- ▶ any electronic copy of the items above.

How a company interprets “documentation” will depend on its particular experience. For example, documentation would include environmental impact statements, process manuals, or even the local newspaper that reports your company’s activities. Other examples might include environmental training records and OSHA manuals.

Consider what kinds of documentation and planning tools you already have, and how documentation for your EMS can make use of or be incorporated into them. Your EMS documentation does not have to be a completely new effort if you have existing records on which to build. An example of existing documentation might be a quality plan or training reports.

If you plan your documentation in advance, you can eliminate redundancies and build a more useful document system. When the documentation is “process-focused” rather than “regulation- or program-focused,” people who use the documents will better understand their jobs and how they dovetail into the rest of the company.

## How to Develop Your Documentation

The four basic steps to preparing documentation to support your EMS include the following:

### **Determine how EMS documentation can be integrated into existing documents.**

Before you dive into your documentation, learn how deep the water is. Find out what documentation already exists, what its purpose is, and whether it works. The goal of this search is to locate materials you can use to begin your EMS implementation and documentation. Many companies use the same format for all their documents.

### **Tailor the documentation to your organization's individual needs.**

Most likely, no one solution exists for your organization. You will probably have to compromise in producing documentation that meets your needs while also meeting your budget. The scope and depth of your documentation depends on how necessary and usable a particular subject is. Here are some questions to help you determine what fits your needs:

- ▶ How can you extend those documents that already exist rather than creating new ones?
- ▶ Does your business operate in a single location or many? This will affect who creates some of the documents and where they were located. It may also affect how many versions of a document might be necessary to cover different circumstances.
- ▶ What is your current computer capability? Many companies use an electronic system to maintain documents.

#### **POINTER:**

Remember that you will not finish most of the modules in this manual the first time through. You will probably overlook items that will be useful for your EMS documentation during your first search. Simply add items as you think of them later in the process. Whoever is in charge of documentation will therefore need to plan for later additions.

- ▶ What security precautions do you need? As a computer system becomes larger and can be accessed by more people, electronic information can more likely be edited and destroyed. Security, or at least restrictions on who can change data, can be a critical issue for many companies.

### **Determine a format for all documents.**

Before developing your EMS documents, plan the format (document and page appearance) for the documents to be created. If a company standard exists, use it. If not, the need for EMS documentation provides an opportunity to create a standard company format. Consider whether pages are single- or double-sided and why; and choose margins, header, footer, typefaces, text, headings, etc. Include plans for bulleted and numbered lists, tables, and even paragraph spacing. Once you have a consistent format for documents, anyone who writes one will use the established electronic format and fill in the necessary text. All documents will look like part of an organized, integrated system. Most important, this will make it easier to read and understand!

### **Prototype each document.**

Prototyping means visualizing what you will need in the document and creating an outline for it before you actually have information to fill in. This is useful not only for document preparation, but for the EMS process as a whole. As you visualize what you will need in the document, you will gain understanding about what you will need from the process of developing your EMS. It's a way of "outlining" your EMS process as well as designing documents.

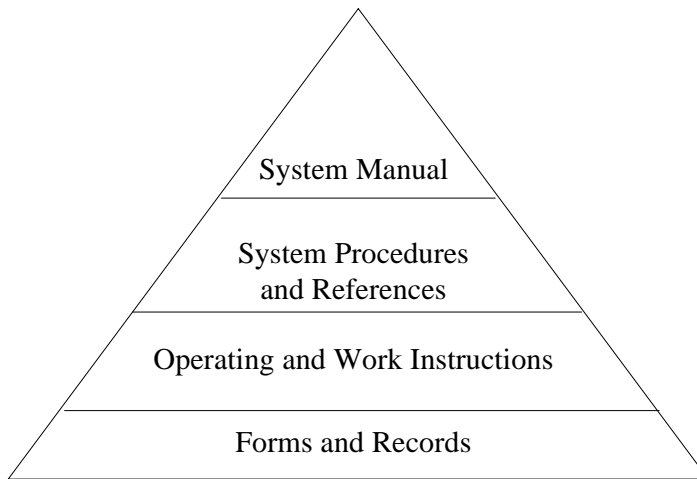
Who should do the prototyping? The best people to do this are the people who will use the document. Involving them in the process gives document users the power to develop documents they will actually use – effective documents.

The following questions will help your “prototypers” design documents. Consider these questions for each document you identify as necessary for your company.

- ▶ What is the purpose?
- ▶ Who will use it, and how will they use it?
- ▶ How long should the document be?
- ▶ What must be included in the document? Which information is most critical?
- ▶ How is the information best arranged? Will the user read sequentially or randomly?

### **One approach: a tiered system**

The tiered documentation system consists of four “levels” of documents. The system is typically shown as a pyramid with the environmental management system manual at the top and environmental management system records at the bottom (see Figure 2).

**Figure C-1: Documentation Levels**

The pyramid shape was chosen because it illustrates a hierarchy in which the amount of detail, degree of specificity, and number of pages all increase as you progress from the top to the bottom of the figure.

### **Creating Your DfE/Environmental Management System Manual**

An EMS manual (sometimes called an Environmental Manual, EM) explains how your company's EMS is organized. It documents your approach to EMS components such as training, communication, documentation, audits, and review processes. It also contains EMS documents such as your environmental policy. If you decide that you would like to develop an EMS manual, you will need to decide several questions in order to get started.

- What is the overall goal for your company to have a manual?
- What requirements or standards should the manual meet?
- Who will prepare the manual?

What other departments or personnel will contribute to the manual?

How will the manual be maintained and controlled?

How will the manual be structured?

Will other management systems be integrated into the manual, such as Worker Health and Safety?

Will relevant documents be incorporated by reference?

Below is an example of a table of contents used by SGS-Thomson Microelectronics Inc.<sup>5</sup> You may want to use this or you may want use only parts of it. It is just an example to get you started.

<b>Section</b>	<b>Description</b>
1)	Purpose
2)	Reference Documents
3)	Definitions and Roadmap
4)	Site Information
5)	Environmental Strategies, Policy, Objectives, and Program
6)	Environmental Management Review
7)	Responsibility, Authority, and Management Representative
8)	Personnel Training
9)	Communication Program
10)	Environmental Review
11)	Operational Controls

<sup>5</sup>*The ISO 14000 Handbook*, edited by Joseph Cascio, Chairman, US Technical Advisory Group to ISO/TC 207, CEEM Information Services, Fairfax, Virginia, 1996 (p.228).

<b>Figure C-2: Environmental Manual Table of Contents</b>	
<b>Section</b>	<b>Description</b>
12)	Environmental Management Records
13)	Environmental Audit
	Figures
	Tables

### **Document Control**

Documents must be easy to find and kept up to date. Consider the following points regarding your document control. Two worksheets follow this section. One will help you develop documents and the other will help you manage your documents once they have been created.

Sound document management ensures that:

- they can be located;
- they are periodically reviewed, revised as necessary, and approved for adequacy by authorized personnel;
- the current versions of relevant documents are available at all locations where operations essential to the effective functioning of the system are performed;
- obsolete documents are promptly removed from all points of issue and points of use, or otherwise assured against unintended use; and
- any obsolete documents retained for legal and/or knowledge preservation purposes are suitably identified.

<b>Worksheet C-1: Documentation</b>							
<b>List Existing Documents</b>	<b>Determine Format: Who/ Date Completed</b>	<b>Develop Prototype (Content): Who/ Date Completed</b>	<b>Assign Writing: Who/ Date</b>	<b>Review Writing/ Compare to Prototype Who/ Date</b>	<b>Added to Document List/ Date</b>	<b>Who has access</b>	<b>Where Located</b>
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
<b>List Documents to be Created</b>							
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
Date Completed: _____ Contact Person: _____							

This table is designed to help you plan for and track the development of your EMS documentation. Even for those documents that already exist, some reformatting work may need to be done, and they will need to be placed in the overall system.

<b>Worksheet C-2: Document Control</b>				
<b>Document</b>	<b>Who Will Use It</b>	<b>Permanent Location</b>	<b>Periodic Review Schedule/ Who</b>	<b>When Can Be Destroyed</b>
			/	
			/	
			/	
			/	
			/	

Date Completed: \_\_\_\_\_ Contact Person: \_\_\_\_\_

# Appendix D

## More Tracking Help

The additional ideas contained in this section may help you track your progress.

### Mid-Course Review

It is worthwhile to pause in the development of your EMS to evaluate how things are going and to make any needed corrections. The following are questions designed to help this review process.

Was the environmental policy developed in a manner that reflect the issues and priorities of all parties?

Did the company successfully communicate its message and learn about the interests/concerns of others?

Have potential partners or stakeholders been identified and contact initiated to determine their potential role in helping with your EMS?

Has the group developing the EMS become an effective team, established goals and schedules for the EMS, and developed a means of getting the necessary support and input from management and fellow employees?

If not, why not?

How can lessons learned be applied in the future?

### Compliance Tracking

If your company does not already have a method in place for tracking regulatory compliance activities, this EMS Program provides the opportunity for developing one. A tracking system will help you integrate this aspect of environmental control into your EMS Program, future planning, and your annual management review. Below is a sample worksheet.

<b>Worksheet D-1: Regulatory Compliance Tracking Log</b>					
<b>Person Responsible</b>	<b>Regulation</b>	<b>Compliance Check Date</b>	<b>Results</b>	<b>Corrective Action/Date</b>	<b>Compliance Verified/ Date</b>
<i>Contact for form:</i>					

## **Pollution Prevention: Ideas and Tracking**

Pollution prevention is another environmental management tool that is important to integrate with your company's business activities. Pollution prevention means reducing or eliminating waste at the source. The focus is more on waste than on environmental risk. There is a hierarchy of solutions for pollution prevention:

- 13) source reduction,
- 14) reuse/recycle, and
- 15) treatment.

Before deciding on major changes, an evaluation of alternatives, as described in Modules 9 and 10, should be completed. There are, however, many different ways in which your company could successfully implement pollution prevention activities, especially if employees are encouraged to think about how to implement pollution prevention in their work practices. Some examples would include reuse and recycle of office paper, turning off lights/equipment when not in use, and keeping the lid on solvent containers.

You may develop specific programs that incorporate pollution prevention, such as the toner cartridges example above, and you may also want to encourage pollution prevention practices across the company. Measuring pollution prevention achievements is different from, and often more difficult than, measuring environmental achievements in general. Simply measuring the reduction in a waste stream might mean only that the waste has been transferred to another medium, not reduced. It is therefore important to measure the reduction at the source of waste generation. It may also be important to measure the activities that your company directs towards pollution prevention. The following are existing sources of information that your company may have that would help you track pollution prevention:

- ▶ Permit applications
- ▶ TRI reports
- ▶ Purchasing records
- ▶ Utility bills
- ▶ Hazardous waste manifests
- ▶ Material Safety Data Sheets.

In addition, administrative procedures can be set in place that support pollution prevention activities. Below is a checklist to help you consider opportunities for your company:

- Establish procedures in each company area for identifying pollution prevention opportunities,
- Have a chemical or raw material inventory system in place, and
- Assess how many objectives have been met through pollution prevention.

Below is a tracking log for pollution prevention in your company.

<b>Worksheet D-2: Pollution Prevention Tracking Log</b>					
<b>Area of Company</b>	<b>Pollution Prevention Activity</b>	<b>Date Started</b>	<b>Results</b>	<b>Measurement Method</b>	<b>Person Responsible</b>
<i>Contact for form:</i>					

# Appendix E

## DfE/EMS Tool Kit

This tool kit contains blank copies of all the worksheets presented in the manual, for your use. The worksheets are identified by the same numbers used in the manual. For example, Worksheet 6-1 would be the first worksheet found in Module 6.

<b>Worksheet 2-1: Costs and Benefits of Developing and Implementing a DfE/EMS</b>	
<b>Costs</b>	<b>Benefits</b>

<b>Worksheet 4-1: Identification of Stakeholders</b>			
<b>Your Stakeholders</b>	<b>What you want to tell them:</b>	<b>What you want them to tell you:</b>	<b>How to communicate with/tell them:</b>
Date Completed: _____		Contact Person: _____	

Note: This worksheet is the same as worksheet A-1



<b>Worksheet 4-3: Documentation</b>							
<b>List Existing Documents</b>	<b>Determine Format: Who/ Date Completed</b>	<b>Develop Prototype (Content): Who/ Date Completed</b>	<b>Assign Writing: Who/ Date</b>	<b>Review Writing/ Compare to Prototype Who/ Date</b>	<b>Added to Document List/ Date</b>	<b>Who has access</b>	<b>Where Located</b>
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
<b>List Documents to be Created</b>							
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
Date Completed: _____ Contact Person: _____							

Note: the is worksheet is the same as worksheet C-1.

<b>Worksheet 4-4: Persons Responsible for DfE/EMS Development</b>			
<b>Roles</b>	<b>Individual Responsible</b>	<b>% of Time Designated</b>	<b>Budget</b>
Appointing a “management representative” with responsibility for implementing the EMS (in a small business, this person could be the owner).			
Identifying and determining significance of environmental aspects.			
Identifying and determining applicability of legal and other requirements.			
Competency-based training.			
Operational controls.			
Emergency preparedness and response.			
Monitoring and measurement of “key characteristics” of operations and activities that can have significant environmental impacts (i.e., the “significant environmental aspects.”).			
Periodic evaluations of environmental compliance.			
Handling and investigating non-conformance with the EMS.			
Records management.			
Internal EMS audits.			

<b>Worksheet 4-5: DfE/EMS Development Schedule and Resources</b>			
<b>Module</b>	<b>Participants</b>	<b>Budget</b>	<b>Target Completion</b>
Planning the Process: Decision Points, Leadership & Participants, Schedule & Plan			
Intermediate steps: (Fill in)			
Understanding What Your Company Does and Its Possible Impacts: Identifying environmental aspects			
Intermediate steps:			
Determining Significant Aspects: Prioritizing and Setting Objectives			
Intermediate steps:			
Making Improvements: Evaluating Alternatives and Setting Targets			
Setting Standards: Developing Operational Controls			
Intermediate steps:			
Intermediate steps:			
Setting Up Environmental Management Projects; Measuring and Achieving Success			
Intermediate steps:			
Establishing Continuing Improvement: Your EMS Program, Audits, and Management Review			
Intermediate steps:			
Date Completed: _____		Contact Person: _____	

<b>Worksheet: 5-1</b>		<b>Regulations</b>	
<b>Agencies that can help</b>	<b>Regulations that apply to my business</b>	<b>Business Activities affected</b>	
<b>Date Completed:</b> _____		<b>Contact Person:</b> _____	

<b>Worksheet 5-2: Identifying environmental aspects</b>		
<b>Input/Output</b>	<b>Environmental Aspect</b>	<b>Environmental Impact</b>
<b>Office Operations</b>		
<b>Manufacturing Operations</b>		

Worksheet 5-3: Health, Safety and Environmental Concerns Information										
Work Activity/Chemical	Information Sources	carcinogen? <sup>a</sup>	OSHA Exposure limit? <sup>a</sup>	VOC? <sup>a</sup>	Human Health Effects			Effects on wildlife <sup>c</sup>	Other environmental effects <sup>c</sup>	Safety Concerns
					Inhalation effects <sup>b</sup>	Dermal effects? <sup>b</sup>	Ingestion effects? <sup>b</sup>			

a Information for these columns can usually be found on the MSDS

b Partial information for these columns might come from the MSDS, but other resources may be needed

c MSDSs usually do not include environmental effects

<b>Worksheet 6-1 Exposure Scoring Summary</b>			
<b>Pathway</b>	<b>Occupational</b>	<b>Nearby population</b>	<b>Environment (e.g., aquatic organisms)</b>
<b>inhaling</b>			
<b>skin contact</b>			
<b>ingesting</b>			
<b>TOTAL</b>			
<p><b>Note: Refer to consolidated scoring, Figure 8, which shows how to combine your judgement about frequency and severity into one score for exposure.</b></p>			

Complete for each chemical in each process step.



<b>Worksheet 6-3: Criteria to Select Environmental Projects</b>					
<b>Aspect</b>	<b>Criteria</b>	<b>Time Frame</b>	<b>Cost</b>	<b>Technical Feasibility</b>	<b>Total Feasibility</b>



<b>Worksheet 6-5: Overall Criteria Scoring Summary</b>					
<b>Process Step</b>	<b>Criteria</b>	<b>Aspect Total</b>	<b>Feasibility Total</b>	<b>Benefits Total</b>	<b>Significant Y/N</b>
<b>Aspect I</b>					
Toner (In)					
Used Toner					
Chemicals					
Chemical Waste					











<b>Worksheet 7-6: Corrective Action Notice</b>	
Issue Date:	Solution Due Date:
Requested by: Issued to:	
Problem Statement:	
Most Likely Causes:	
Suggested Solutions:	
Action Taken:	
Measured Results:	
Corrective Action Closed by:	Date:
<i>Contact for Notice:</i>	

Note: This worksheet is the same as worksheet 9-1.

<b>Worksheet 7-7: Measurement and Corrective Action Tracking Log</b>		
Area and Step Measured:		Date:
Person Responsible	Means of Measurement	Results
Person Responsible	Problems Identified:	Solution Due:
Person Responsible	Solutions Identified:	Action Taken:
Person Responsible	Effectiveness Verified:	Date:
<i>Contact person for log:</i>		

Note: This worksheet is the same as worksheet 9-2.





<b>Worksheet 8-2: Alternative Products Environmental Effects Comparison</b>					
<b>Chemical Product</b>	<b>Known Effects<sup>1</sup></b>	<b>Management of Effects<sup>2</sup></b>	<b>Cost of Mgmt.<sup>3</sup></b>	<b>Resource use</b>	<b>Effects Score</b>
Chemical Product A (Baseline) Chemical 1 (list main chemicals in product)					
Product B					
Product C					
Product D					

**Notes:**

<sup>1</sup> Return to the “Environmental Concerns Worksheet” in Module 5 for the “known effects.”

<sup>2</sup> List protection required for each effect.

<sup>3</sup> Identify cost items.

<b>Worksheet 8-3: Performance Comparison of Alternatives</b>				
	<b>how well does it work</b>	<b>how long does it take</b>	<b>how easy is it to use</b>	<b>total</b>
Product A				
Product B				
Product C				
Product D				

<b>Worksheet 8-4: Regulatory Comparison of Alternatives</b>				
	<b>Regulations Required (list)</b>	<b>Controls Required (list)</b>	<b>Cost of Regulations</b>	<b>Total</b>
Product A				
Product B				
Product C				
Product D				

<b>Worksheet 8-5: Cost Comparison of Alternatives</b>						
	<b>raw material</b>	<b>labor</b>	<b>disposal</b>	<b>total cost</b>	<b>savings <sup>1</sup></b>	<b>net cost</b>
Product A						
Product B						
Product C						
Product D						

<sup>1</sup>Savings might include reduced product consumed, reduced controls to manage, ability to reuse product, etc.

<b>Worksheet 8-6: Alternative Products Evaluation Worksheet</b>					
<b>Chemical Product</b>	<b>Performance</b>	<b>Regulations</b>	<b>Cost</b>	<b>Effects<sup>1</sup> Score</b>	<b>Overall Score<sup>2</sup></b>
<b>Chemical Product A (current baseline)</b>					
<b>Product B</b>					
<b>Product C</b>					
<b>Product D</b>					
Date Completed: _____			Contact Person: _____		

<sup>1</sup> Take score from Environmental Effects Comparison Table above (last column).

<sup>2</sup> Score on a scale of low to high to reflect the desirability of each product. This is a judgment call.

Note: For more information on the methodology for comparing alternatives, refer to both the DfE/EMS Website and the Cleaner Technologies Substitutes Assessment, A Methodology Resource Guide, DfE, U.S. EPA 744-R 95-002, Dec. 1996.

This worksheet corresponds to Figure 13 in Module 9.

<b>Environmental Management Plan:</b>	<b>Date</b> _____
Environmental Objective 1:	
Target:	
<u>Action Plan</u>	
Responsibility:	
Budget:	
Expected Savings:	
Completion date:	
Review:	
Performance Measurement:	
Environmental Objective 2:	
Target:	
<u>Action Plan</u>	
Responsibility:	
Budget:	
Expected Savings:	
Completion date:	
Review:	
Performance Measurement:	
Environmental Objective 3:	
Target:	
<u>Action Plan</u>	
Responsibility:	
Budget:	
Expected Savings:	
Completion date:	
Review:	
Performance Measurement:	
<i>Contact Person for Chart:</i>	

<b>Worksheet: 9-1</b>		<b>Corrective Action Notice</b>	
Issue Date:		Solution Due Date:	
Requested by: Issued to:			
Problem Statement:			
Most Likely Causes:			
Suggested Solutions:			
Action Taken:			
Measured Results:			
Corrective Action Closed by:		Date:	
<i>Contact for Notice:</i>			

Note: this worksheet is the same as worksheet 7-6.

<b>Worksheet 9-2: Measurement and Corrective Action Tracking Log</b>		
Area and Step Measured:		Date:
Person Responsible	Means of Measurement	Results
Person Responsible	Problems Identified:	Solution Due:
Person Responsible	Solutions Identified:	Action Taken:
Person Responsible	Effectiveness Verified:	Date:
<i>Contact person for log:</i>		

Note: this worksheet is the same as worksheet 7-7.

<b>Worksheet 10-1:</b>		<b>EMS Program Measurement Criteria</b>		
<b>Company Name</b> _____				
<b>Measurement Elements Program Areas</b>	<b>Objectives of Program Area</b>	<b>Activity Measures</b>	<b>Results Indicators</b>	<b>Review Period</b>
Communication Plan				
Stakeholders Input				
Environmental or DfE/EMS Training				
Review of Aspects				
Operational Controls				
Environmental Review of New Processes and Activities				
Setting Objectives & Targets				
Environmental Management Project 1				
Environmental Management Project 2				
Documentation				
Regulatory Compliance				
Pollution Prevention				
Other				
<i>Contact person for form:</i>				

<b>Worksheet 10-2: Audit Tracking Form</b>						
<b>Audit Elements</b> <b>Audit Areas</b>	<b>Objectives of Audit Area</b>	<b>Criteria for Audit</b>	<b>Person Responsible for Audit</b>	<b>Review Period</b>	<b>Date of Review</b>	<b>Results: Successes, Failures and Corrective Action</b>
Communication Plan						
Stakeholders Input						
Environmental or EMS Training						
Review of Aspects						
Setting Objectives & Targets						
Environmental Management Project 1						
Environmental Management Project 2						
Documentation						
Regulatory Compliance						
Pollution Prevention						
Environmental Review of New Processes and Activities						
Other						
<i>Contact person for form:</i>						

<b>Worksheet A-1: Identification of Stakeholders</b>			
<b>Your Stakeholders</b>	<b>What you want to tell them:</b>	<b>What you want them to tell you:</b>	<b>How to communicate with/tell them:</b>
Date Completed: _____		Contact Person: _____	

Note: This worksheet is the same as worksheet 4-1



<b>Worksheet: B-1: Communication Channels</b>			
	<b>What</b>	<b>How Often/When</b>	<b>To Whom</b>
	Newsletter	/	
	Bulletin Board	/	
	Information Meetings	/	
	E-mail	/	
	Pay Check Inserts	/	
	Advertising	/	
	Other:	/	

<b>Worksheet B-2: Communication Work Plan</b>					
Target Audience	What to Communicate	Mode of Communication	When	Budget	Who is Responsible
Date Completed: _____			Contact Person: _____		

Note: this worksheet is the same as Worksheet 4-2.

<b>Worksheet B-3:</b>		<b>Training Plan</b>				
Jobs Affecting Environment	Training Needs	What Vehicle	When/Length	Budget	Completion Date	Who is Responsible

<b>Worksheet C-1:</b>		<b>Documentation</b>					
<b>List Existing Documents</b>	<b>Determine Format: Who/ Date Completed</b>	<b>Develop Prototype (Content): Who/ Date Completed</b>	<b>Assign Writing: Who/ Date</b>	<b>Review Writing/ Compare to Prototype Who/ Date</b>	<b>Added to Document List/ Date</b>	<b>Who has access</b>	<b>Where Located</b>
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
<b>List Documents to be Created</b>							
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
	/	/	/	/	/		
Date Completed: _____ Contact Person: _____							

Note: the is worksheet is the same as worksheet 4-3.

Worksheet C-2:		Document Control		
Document	Who Will Use It	Permanent Location	Periodic Review Schedule/ Who	When Can Be Destroyed
			/	
			/	
			/	
			/	
			/	

Date Completed: \_\_\_\_\_ Contact Person: \_\_\_\_\_





## Glossary

**ancillary material** - Material input that is used by the unit process producing the product, but is not used directly in the formation of the product.

**aspect, environmental** - Element of an organization's activities, products, and services that can interact with the environment.

**certification** - Procedure by which a third party gives written assurance that a product, process, or service conforms to specified requirements.

**continual improvement** - Process of enhancing the environmental management system to achieve improvements in overall environmental performance, in line with the organization's environmental policy. Note - The process need not take place in all areas of activity simultaneously.

**corrective action** - An action taken to eliminate the causes of an existing nonconformity, defect, or other undesirable situation in order to prevent recurrence.

**environmental audit** - A systematic, documented, periodic and objective review by regulated entities of facility operations and practices related to meeting environmental requirements.

**environment** - Surroundings in which an organization operates, including air, water, land, natural resources, flora, fauna, humans, and their interrelation.

**pollution prevention** - Pollution prevention means reducing pollution or waste at the beginning of a process. The underlying theory to this approach is that if you don't generate waste in the first place, there is nothing to treat or dispose of.

**environmental management system (EMS)** - Organizational structure, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy.

**environmental performance** - The measurable results of the environmental management system, related to an organization's control of its environmental aspects, based on its environmental policy, objectives, and targets.

**environmental policy** - Statement by the organization of its intentions and principles in relation to its overall environmental performance, which provides a framework for action and for the setting of its environmental objectives and targets.

**impact, environmental** - Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products, or services.

**interested party** - Individual or group concerned with or affected by the environmental performance of an organization.

**life cycle** - consecutive and inter-linked stages of a product system, from raw material acquisition or generation of natural resources to the final disposal.

**life-cycle assessment (LCA)** - Compilation and evaluation, according to a systematic set of procedures, of the inputs and outputs of materials and energy and the potential environmental impacts of a product system throughout its life cycle.

**objective, environmental** - Overall environmental goal, arising from the environmental policy, that an organization sets itself to achieve, and that is quantified where practicable.

**procedure** - A specified way to perform an activity.

**risk** - This is the probability that something undesirable will happen from exposure to a hazard.

**risk assessment** - Risk assessment is the process of gathering data and making assumptions to estimate short- and long-term harmful effects on human health or the environment from exposure to hazards associated with the use of a particular product or technology.

**stakeholders** - Those groups and organizations having an interest or stake in a company's EMS program (e.g., regulators, shareholders, customers, suppliers, special interest groups, residents, competitors, investors, bankers, media, lawyers, insurance companies, trade groups, unions, ecosystems, cultural heritage, and geology).

**target, environmental** - Detailed performance requirement, quantified wherever practicable, applicable to the organization or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.

**waste** - Any output from the product system that is disposed of.