

A cooperative project  
between the U.S.  
Environmental  
Protection Agency  
and Industry

April 2001

EPA 744-F-01-002



# design FOR THE ENVIRONMENT

Environmental Management System Case Study 1

## What Is an IEMS?

An Integrated Environmental Management System (IEMS) combines continuous improvement management tools and principles with proven environmental assessment methodologies — including risk and substitutes assessment and full-cost accounting. IEMSs assist companies in making sound environmental decisions as part of daily business practices. As a result, an IEMS can help a company to

- reduce cross-media impacts,
- use energy and other resources efficiently,
- better manage the risk associated with using hazardous chemicals (both regulated and unregulated),
- practice extended product and process responsibility, and
- integrate environmental and worker safety and health requirements.

For more information on  
Gillespie Decals, visit their  
website:

[www.gillespiedecals.com](http://www.gillespiedecals.com)



## Using an Integrated Environmental Management System (IEMS) to Manage Environmental Concerns

**Questions on managing your company's environmental concerns?  
One company found some answers by developing an IEMS.**

Gillespie Decals, Inc. is a small screen printing company with about 40 employees, located in Wilsonville, OR. The company, founded in 1921, specializes in the manufacturing of custom screenprinting, digital imaging, cut vinyl, and hotstamp graphics. Products include fleet markings, original equipment markings, advertising and point-of-purchase graphics, custom decals, large full-color output, and in-house design services.

Gillespie's President, Kerry Gillespie, was Vice Chairman of the Environmental Committee for the Screenprinting & Graphic Imaging Association International (SGIA). In January 1999, SGIA teamed up with EPA's Design for the Environment (DfE) Program. Together, they decided to conduct a pilot project with seven screenprinting companies that wanted to develop IEMSs. Kerry Gillespie volunteered his company for the EMS pilot project, even though recent company growth and simultaneous construction of an addition to the facility presented challenges to participation.

## Steps Gillespie Took to Develop its IEMS

*The steps discussed here are some of the important ones Gillespie took. Depending on your company, you may decide to include others. Remember, this is not intended to be a comprehensive list of every step in developing an IEMS.*

### 1. Organizing the IEMS Development Process

*The way a company organizes to complete its IEMS is important to the long-term success of the IEMS. Best results are achieved when a wide spectrum of employees participate in the process and when a champion is selected to keep it on track.*

The first step for Gillespie Decals was to reorganize its Safety and Health (S&H) Committee (which dealt with OSHA issues) into a Safety, Health & Environment (SH&E) Committee, keeping the same head. This was done partly because the existing S&H Committee already had plenty of work to do, so more people were needed to address the IEMS. Also, the broader issues of the new committee required a wider focus and people with different areas of expertise. This "IEMS Team" led the IEMS development process.



Recycled/Recyclable

Printed with vegetable oil based inks on paper that contains at least 50% post-consumer recycled fiber.

One person from each department (including prepress, printing, finishing, sales, customer service, and administration) was assigned to the IEMS Team. To make sure that IEMS development stayed on track, one person (not the committee's head) was selected to lead (and "champion") the IEMS process. The IEMS Team agreed to meet once a week. All Team members received the *IEMS Implementation Guide* and saw a video on EMSs (*Environmental Management Systems for Printers: It's a Bottom-Line Benefit*, EPA #744-V-99-001).

One of the Team's first tasks was to write a new company mission statement that included environmental concerns. The mission statement helped to focus the Team's work. Toward the end of the pilot project year, the company hired a consultant to plan and facilitate IEMS meetings, because committee members were overloaded with production work. The committee found it extremely useful for someone not involved in daily production activities to plan meetings. SGIA and DfE also provided assistance with organizational, environmental, and technical aspects of IEMS development, through regular conference calls with participants.

### The Value of an IEMS

*One project participant said that "Gillespie Decals has experienced the beginnings of a change in the company culture regarding environmental concerns. We're starting to see you can be bottom-line oriented and environmentally conscious at the same time."*

## 2. Developing the Environmental Policy

*Developing an Environmental Policy statement that reflects the company's commitment to environmental improvement is one of the important first steps in developing an IEMS.*

The IEMS Team wrote the company's environmental policy over the course of four meetings. After approval by

the President, the policy was posted in the office building that housed administrative and sales staff and on the chalk board in the lunchroom of the production building.

## 3. Identifying Environmental Aspects of the Company

*An environmental aspect is any way in which the company interacts with and has an impact on the environment. One of the first tasks in developing an IEMS is to identify the company's environmental aspects. A "process map" shows all the activities, processes, and products in the company, as well as the inputs and outputs to those activities, processes, and products. Creating a process map is important to identifying a company's environmental aspects.*

The IEMS Team started its analysis with an existing process map that had been developed for quality tracking purposes (see box below). Through a whole-group brainstorming exercise, the committee then identified 45 environ-

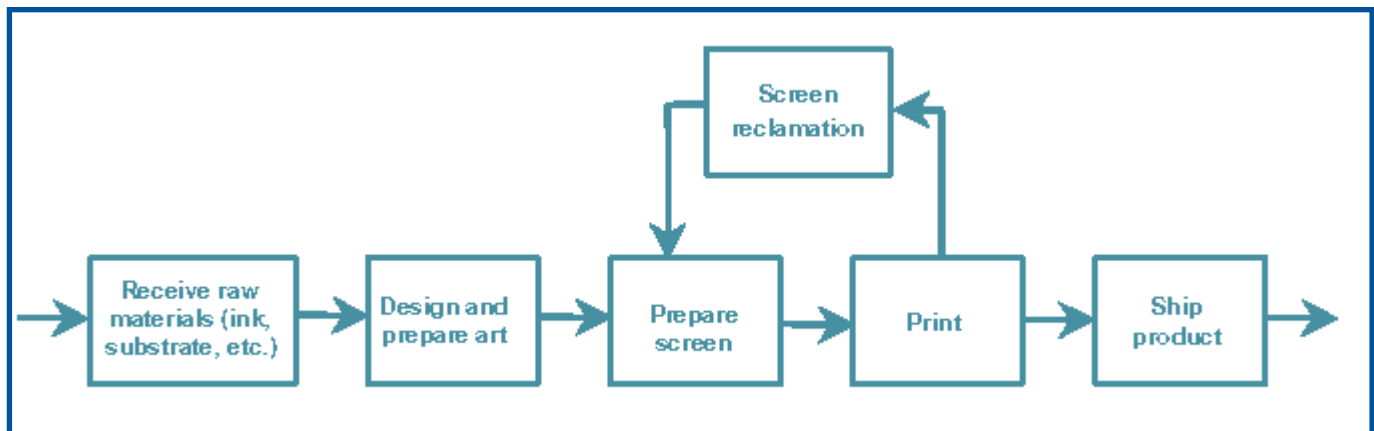
mental aspects. Gillespie learned that the more people they included in brainstorming, the more good ideas came out of it.

## 4. Identifying Significant Environmental Aspects

*A company generally has many environmental aspects, but they are not all equally significant. To determine which aspects need improvement, the company must prioritize them and select **significant environmental aspects (SEAs)**.*

Gillespie's IEMS Team ranked the health risks and regulatory requirements associated with each environmental aspect on a scale of 1-10. Then it chose the three highest-scoring aspects as SEAs: Waste Ink, Haze Removal, and

### Overview Process Map for a Screen Printing Shop



Water Use. (These SEAs are described under Results of Gillespie's IEMS, which follows.)

## 5. Developing Programs to Achieve Environmental Goals

*The next step is to develop programs to decrease the company's impacts on the environment in accordance with goals set forth in its environmental policy. This may start with determining the underlying causes of each SEA. When these have been determined, means of correcting the causes should be developed. Two ways to address an SEA are (1) developing operational controls and (2) making changes in chemical products, processes, or activities so as to reduce environmental impact.*

### Analyzing Causes of SEAs

*A root cause analysis is one way for companies to develop a deeper understanding of the causes of an SEA.*

Gillespie's IEMS Team members conducted a root cause analysis for each SEA. They found that a root cause for all three SEAs was lack of worker training, particularly among temporary employees.

### Developing Operational Controls

*One way to correct causes of SEAs and thereby reduce environmental impact is to develop operational controls. This means developing written standard operating procedures for each step in a process and every piece of equipment, posting those standard procedures, and providing appropriate training.*

Gillespie developed operational controls as follows.

- ◆ Separate teams were formed to work on each SEA. One IEMS Team member was put in charge of developing improvements for each SEA.
- ◆ Production employees drafted standard procedures and training protocols.



- ◆ Each SEA team worked with the appropriate production supervisor to make sure the procedures would work and would be used. The SEA teams felt that the procedures had to be fully understood before the guidelines could be finalized. Therefore, they met with the people who worked on the process under review, to get their input. The process included sorting through everyone's ideas — for example, how to clean a screen or mix ink colors.

### Involving All Employees

*Involving all employees is important to the success of your IEMS. Employees not only have ideas to contribute, but also will be responsible for implementing the activities.*

At Gillespie, the IEMS champion presented the IEMS project at an all-employee meeting. The champion asked for volunteers to work on the IEMS team and also solicited ideas on how the company could improve its environmental impact.

The process of developing operational controls took longer than expected, but the IEMS Team believes that Gillespie ended up with a better process and buy-in of the final results among staff and supervisors.

### Making Changes

*For some SEAs, reduction of environmental impact may require greater changes than can be achieved with operational controls alone. To*

*choose between alternative chemicals, processes, or products, a company should conduct an evaluation that integrates cost, performance, and environmental impact.*

Gillespie determined that for one SEA (haze remover, which is discussed in the Results section that follows), the company could achieve improvement by using a lower-risk solvent. The team made a cost, performance, and environmental risk comparison of alternative products and selected a less caustic product.



## 6. Evaluating the IEMS

After a company has put its IEMS programs in place, it should continue to evaluate the differences they are making. Changes in processes, technologies, and learning from experience can all mean continued opportunities to improve both environmental impact and the bottom line. The IEMS Team should continue to meet on a regular basis and coordinate evaluation efforts and documentation.

Once Gillespie's IEMS was up and running, the company began to identify the benefits for each SEA. These are highlighted in the next section.

## Results of Gillespie's IEMS

### Waste Ink SEA

A large quantity of solvent-based ink was being kept in a company storeroom. The root cause analysis showed several causes. First, the company did a large percentage of repeat business. To ensure color consistency on repeat jobs, workers would mix a large batch of ink and save the remains for a possible repeat job.

Second, waste ink was generated due to lack of worker training in color mixing. A worker would experiment with batches of ink until the right color was achieved. In addition, the team determined that the company owned a color matching unit that few staff knew how to operate. Because of the company's crowded production schedule, training on the color matching unit had been postponed.

*Gillespie took the following actions:*

- ◆ Developing a procedural document for training on ink mixing.
- ◆ Using the computer to record colors and mixes for repeat jobs and keeping a printed copy of the color rather than keeping samples in the form of batches of ink.



- ◆ Training one person to do the color mixing, rather than allowing anyone to do it.
- ◆ Recycling the seven 55-gallon drums of solvent waste ink by having it burned for electricity.
- ◆ Making a greater commitment to use ultraviolet-cured (UV) ink, which does not contain traditional solvents. The company expects that using more UV-cured inks will reduce both VOC emissions and risks to health and environment that accompany solvent use.

**Benefits:** One-time recycling of waste ink. Ability to use storage room for other purposes. Less exposure to solvent chemicals. Lower risk of health and environmental concerns.

### Haze Removal SEA

In screenprinting, parts of the screen that should not receive ink are covered with emulsion. After each printing job, the emulsion is cleaned off, but some residue (haze) often remains. This must be completely removed so as not to interfere with the next design. (See Step 8 of the SGIA Process Map on the next page.)

Gillespie's SEA root cause analysis showed that high humidity caused the haze by preventing the emulsion from curing completely. Without the technical guidance in DfE's IEMS methodology, the IEMS Team feels it probably would not have thought of this cause. Also, the analysis showed that workers removing haze were being exposed to a caustic chemical.

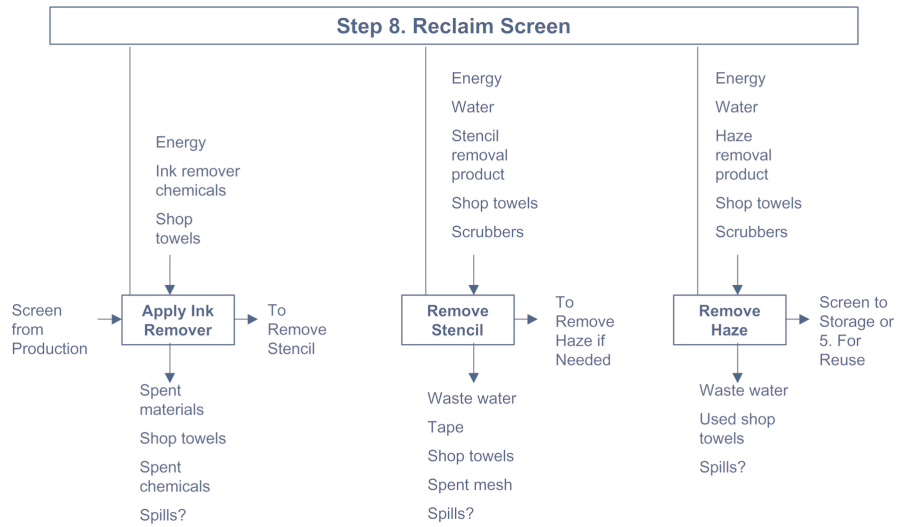
*Gillespie took the following actions:*

- ◆ Custom-building a drying cabinet with a dehumidifier for the curing area to prevent haze.
- ◆ Converting the solvent-based ink storage room into a screenwashing room. This kept moisture contained, so that it would not affect other operations in the facility.

**Step 8 of the process map created by the Screenprinting & Graphic Imaging Association International (SGIA)\***

An overview of a process map showing the main steps appears on page 2. This detail from a more developed map shows several important points about process mapping:

1. It shows how a process map might look as employees fill it in.
2. It shows the quantity of inputs and outputs a company may have, all of which will have some kind of environmental aspect. The quantity of aspects that SGIA identified demonstrates the need to prioritize before developing projects.
3. It shows that a process map can be created by hand as the IEMS team brainstorms inputs and outputs for each step in the process. The map does not need to be fancy.



\*For further information about SGIA, visit their website at [www.sgia.org](http://www.sgia.org).



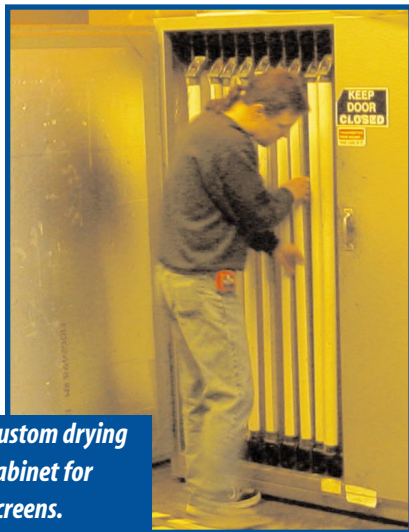
- ◆ Looking into two haze removal solvent alternatives. In the rare cases when solvent is needed, the company has switched to a less caustic haze removal solvent.
- ◆ Drafting a training document on haze removal.

**Benefits:** Less exposure to solvents by workers and community. Lower exposure to caustic agents by workers.

Reduced pinholing and press downtime. Reduced formation of haze and need for haze remover, due to lower moisture in the plant. Less water marking on screens and printed materials because of reduced moisture.

**Water Use SEA**

Water shortage is a concern in Wilsonville, OR, where Gillespie Decals is located. To receive building permits for the addition to the facility, Gillespie had to reduce its water use, although the company was experiencing an increase in business.



Custom drying cabinet for screens.



Screenwashing room to contain moisture.

*Gillespie took the following actions:*

- ◆ Requesting information from two other companies on their water recycling systems, to prepare for implementing its own recycling system.
- ◆ Reducing the use of city water by purchasing bottled drinking water for employees and replacing toilets with low-flush models.

**Benefits:** Less use of water. Improvement in employee morale, because city water quality had been a concern and employees were very happy to have water from another source.

## Continuous Improvement

*Commitment to continuous environmental improvement is an important part of an IEMS.*

*Gillespie took the following actions:*

- ◆ Working with utilities to cut energy usage.
- ◆ Deciding to develop other SEAs in coming years.
- ◆ Working on the darkroom process in order to reduce water usage.
- ◆ Flagging new products (with help of the purchasing staff) to make sure that new items are evaluated before being used.

## Gillespie's Challenges in Developing its IEMS

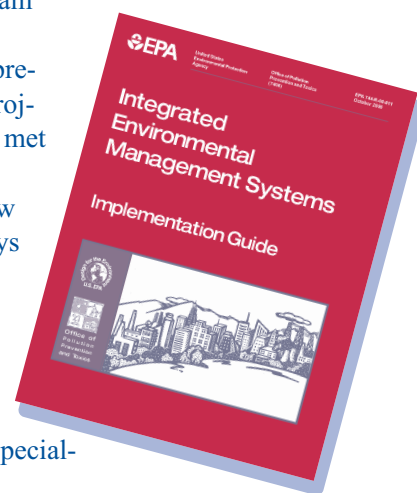
The Gillespie Decals IEMS Team made impressive progress in spite of several significant challenges.

The biggest problem in developing and implementing the IEMS was time management. The company's growth required higher-than-usual work effort, which initially delayed the progress of the IEMS Team. In addition, much of people's time was absorbed by the construction activity. On the other hand, this provided an opportunity for the IEMS Team to look at environmental concerns associated with the new addition.

The IEMS Team struggled with how to document their IEMS, until the *IEMS Company Manual Template for Small Business* was developed by EPA for use by pilot project participants. The template provides examples of how to document the IEMS and how to organize the information into an individual company's IEMS Manual.

Gillespie's IEMS Team sometimes had trouble moving to the next step because they could not think of what to do. However, the IEMS materials developed by DfE were very useful in helping the Team maintain momentum.

Gillespie's company representative for the pilot project stated, "Whenever I met a stopping point and couldn't think about how to proceed, I have always been able to go to the *IEMS Implementation Guide* to get an idea or example of how to get started again. The blank worksheets are especially helpful."



### What the DfE Program Brings to the IEMS Process

EPA's Design for the Environment (DfE) Program has over eight 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 approaches that help businesses minimize and better manage their environmental "footprints" and improve their competitiveness. DfE is in the Economics, Exposure, and Technology Division of EPA's Office of Pollution Prevention and Toxics.

For more information on IEMS or to download IEMS materials, visit the DfE Program website at [www.epa.gov/dfep](http://www.epa.gov/dfep) or call DfE at 202-260-1678

To order hard copies of IEMS materials such as the *IEMS Implementation Guide* and *IEMS Company Manual Template for Small Business*, contact the Pollution Prevention Information Clearinghouse (PPIC) at

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202-260-1023