A Cooperative Project between the U.S. Environmental Protection Agency and the Printing Trade Associations Nationwide

design FOR THE ENVIRONMENT

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FLEXOGRAPHY PROJECT CASE STUDY 2

Case Study Highlights

- Facilities' Experiences in Achieving VOC Emissions Reductions
- Lessons Learned

Also in This Case Study

- Planning Ahead to Avoid Regulatory Pressure
- The Important Role of Ink Suppliers and Trade Associations

A CASE STUDY

Learning From Three Companies That **Reduced VOC Emissions**

This case study presents the steps that three wide web flexographic printers took to reduce their VOC emissions. Their experiences may help you plan a successful reduction of your VOC emissions. This case study presents:

- factors considered in management decisions and how the decisions were implemented
- the two methods tried: switching to water-based inks, and installing an oxidizer

The Goals: Compliance and Reducing VOC Emissions

Three printers volunteered to participate in this case study: Emerald Packaging in Union City, California; Packaging Specialties in Fayetteville, Arkansas; and Firm X (this company requested anonymity) in New York. All three flexographers made changes in their ink systems to reduce VOC emissions, primarily to comply with VOC regulations. However, while all three printers shared a similar motivation, the timing of their decisions varied.

Emerald Packaging believed that VOC regulations would eventually become more stringent. Even though Emerald Packaging was not faced with immediate regulatory pressure, the company took a proactive approach to reduce VOC emissions.

Packaging Specialties, however, faced immediate compliance pressure from the state regulatory agency. The company needed to reduce their VOC emissions in a very short period of time.

Company Profiles

Emerald Packaging
Union City, California

97 Employees
Annual sales:
$15-20 million

Main product:
Produce packaging

Current primary ink:
Water-based ink

Current primary substrate:
Polyethylene

Packaging Specialties
Fayetteville, Arkansas

85 Employees
Annual sales:
$15-20 million

Main product:
Food and beverage packaging

Current primary ink:
Solvent-based ink

Current primary substrates:
Polyvinyl chloride (PVC), polyethylene, and Cryovac

Firm X
New York

50 Employees
Annual sales:
$20-30 million

Main product:
Pattern-coated polyolefin films

Current primary ink:
Water-based ink

Current primary substrates:
Film and paper

Like Packaging Specialties, Firm X had to comply with existing regulations within a reasonable time period. However, Firm X was not faced with the same immediate pressure.

The Options Considered

Each of the three companies considered two options for reducing VOCs:

- install an oxidizer
- replace solvent-based inks with water-based inks

All three companies decided that the best option for them was to switch to water-based inks, based on several factors. They believed:

- The capital cost of a water-based ink system would be lower than the capital cost of installing an oxidizer.
- Water-based inks would have lower energy costs than an oxidizer.
- In the event of a facility move or expansion, water-based inks would be a more cost-effective choice over the long run.

Making the Change

Emerald Packaging first started using water-based inks in 1988. Working with their ink supplier, the company researched different inks using trial and error. Emerald Packaging converted from solvent-based inks to water-based inks over the course of four years. By 1992, the company used water-based inks on all its presses. When Emerald was using solvent-based inks and two presses, the company emitted over 50 tons of VOCs a year. **Today, using water-based inks on four presses, Emerald emits between 14 and 15 tons of VOCs per year.**

Packaging Specialties emitted 702 tons of VOCs in 1989, exceeding permitted levels. The immediate regulatory requirements did not leave Packaging Specialties very much time or flexibility for experimenting with water-based inks. The company switched to water-based inks on all of their flexo presses. However, Packaging Specialties could not develop a water-based ink that would print successfully on polyvinyl chloride (PVC) or Cryovac, two of the company's primary substrates. Customers complained, and up to 5% of all finished products were returned. After 14 months of trying the water-based inks, Packaging Specialities installed an oxidizer and went back to using solvent-based inks. **With the oxidizer and 100% room capture, the company reduced annual VOC emissions by approximately 95% and now emits between 35 and 40 tons of VOCs per year.**

Firm X first attempted to switch to water-based inks in 1990, but the results were disappointing. In 1992, the company tried again. It contacted 14 ink manufacturers to find a suitable water-based ink. Firm X also hired a consultant knowledgeable about printing technology and environmental compliance. Unlike Emerald Packaging

and Packaging Specialties, Firm X was not producing packaging. Its substrates required a matte finish, so the company did not have to worry about gloss. With the help of their ink supplier and consultant, Firm X successfully converted from solvent-based inks to water-based inks within nine months. **Firm X currently emits less than half of their permitted level of 25 tons of VOCs per year.**

Lessons Learned

Plan your VOC reductions now. Emerald Packaging and Firm X found that planning ahead gave them enough time to successfully phase-in water-based inks. If facilities do not plan ahead, they may not have enough time to research and optimize the process. Such facilities often find the transition to water-based inks difficult or unsuccessful. By taking action to reduce VOCs, your company can make an efficient and successful change. Remember, regardless of what the regulations are, reducing VOCs will always benefit worker health and the environment in your community.

Consider your options. These three facilities reduced VOC emissions by switching to water-based inks or installing an oxidizer. Consider your options for reducing VOC emissions at your facility. Ultraviolet-cured coating and ink technologies are drawing attention for their low-VOC applications. Also, think about other sources of VOCs in your facility, such as cleaning agents. Through materials substitution and reduced overall use, these VOCs can be reduced as well.

Use your resources:

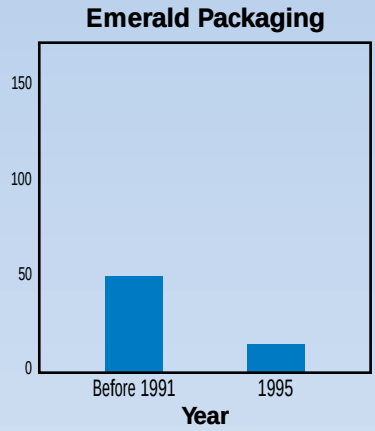
- **Ink suppliers** played an important role in the successful development of water-based inks at Emerald Packaging and Firm X. Initially, the water-based inks at these companies did not dry quickly enough, and the ink density was unsatisfactory. Through close cooperation, both companies and their ink suppliers were able to develop inks that printed successfully. In addition, both Emerald and Firm X modified press equipment and drying systems to improve print quality.

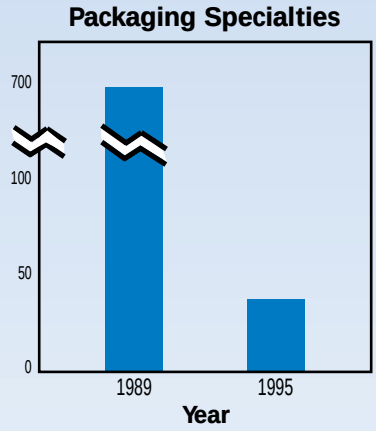
  Packaging Specialties also worked closely with their ink supplier, but they could not develop a successful water-based ink. In fact, management could not find any ink supplier that had successfully printed water-based inks on PVC or Cryovac.

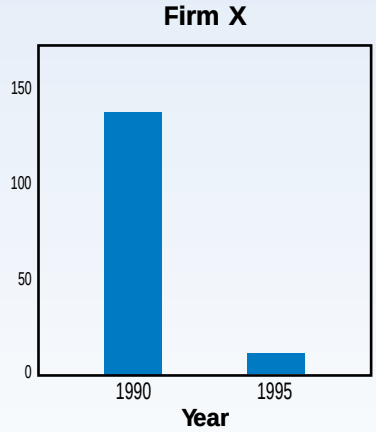
- **Trade associations** are valuable resources for printers trying to reduce VOC emissions. The California Film Extruders and Converters Association (CFECA) gave Emerald Packaging information and feedback from other members. The Flexographic Technical Association (FTA) provided Firm X with up-to-date information about different ink technologies.

Reductions In VOC Emissions

units are in tons of VOCs per year







- **Experienced consultants** are another source of help. A consultant knowledgeable about printing technology and environmental compliance was instrumental in the successful switch to water-based inks at Firm X.

- **Oxidizer suppliers** can also be a valuable resource. When water-based inks didn't work for Packaging Specialties, an oxidizer supplier helped install a catalytic oxidizer and 100% capture system.

For More Information

The information in this case study was taken from the report, *Pollution Prevention Experiences in Three Flexographic Printing Facilities* (EPA 744-R-96-001), prepared for U.S. EPA by the Center for Business and Environmental Studies at California State University, Hayward. See the box below for ordering information.

About the Design for the Environment Flexography Project

The goal of the Design for the Environment (DfE) Flexography Project is to provide flexographers with information that can help them design an operation which is more environmentally sound, safer for workers, and more cost effective.

The partners of the DfE Flexography Project, in a voluntary cooperative effort, are evaluating three different ink technologies: solvent, water-based, and UV-cured. Information is being gathered on the performance, cost, and health and environmental risk trade-offs of several inks within each technology.

In addition to the Flexography Project, similar DfE projects are currently underway with both the screen printing and lithography industries.

Partners in the DfE Flexography Project include: California Film Extruders and Converters Association (CFECA), Flexible Packaging Association (FPA), Flexographic Technical Association (FTA), Industrial Technology Institute (ITI), National Association of Printing Ink Manufacturers (NAPIM), Plastic Bag Association (PBA), RadTech International, N.A., National Institute of Standards and Technology (NIST), Tag and Label Manufacturers Institute, Inc. (TLMI), University of Tennessee (UT), Western Michigan University (WMU), and individual printers and suppliers.

Mention of trade names, companies, or commercial products does not constitute endorsement or recommendation for use by either the U.S. Environmental Protection Agency or other firms, organizations, or individuals who have participated in the preparation of this publication.

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