1

What is the flexo ink study about?

The objective of the CTSA was to develop as complete, systematic, and unbiased a picture as possible of different flexo ink technologies, thereby helping industry incorporate environmental and health information into their ink decisions.

This booklet summarizes the key findings of the Flexography Partnership's recent technical report, *Flexographic Ink Options: A Cleaner Technologies Substitutes Assessment (CTSA)*. The complete CTSA documents a detailed research study comparing the environmental impacts, health risks, performance, and costs of the three main flexo ink systems (solvent-based, water-based, and ultraviolet [UV]-cured).

Where the CTSA details performance, cost, and environment, this booklet focuses on the environmental and health findings of the study, for two reasons:

- First, printers often tend to be less familiar with health and environmental concerns than with cost and performance issues.
- Second, the study found a wide range of environmental, health, and safety concerns for all three ink systems, and it is important for printers to become more familiar with these concerns so that they can reduce exposure and related risks to flexo workers, the surrounding community, and the natural environment. Furthermore, taking such steps has the potential to conserve materials and resources, with the potential to reduce costs.

Flexographic Ink Options: A Cleaner Technologies Substitutes Assessment (CTSA) can be downloaded from the DfE website (www.epa.gov/dfe). For printed copies, contact EPA's National Service Center for Environmental Publications (NCEPI). Ask for:

Vol 1: EPA EPA 744-R-02-001-A
Vol 2: EPA EPA 744-R-02-001-B

This booklet, which summarizes important findings of the flexo ink study, was developed for managers of flexo printing facilities and ink formulators, as well as for other decision-makers about flexo ink products. The booklet, as well as other materials published about the flexo ink study, can help flexo professionals to:

- understand more about comparative chemical risks in inks, including identifying concerns for unregulated chemicals in inks that present opportunities for proactive, voluntary risk management,
- facilitate the use and formulation of cleaner inks, and
- encourage adoption of workplace practices that minimize health and environmental risks from exposure to chemicals of concern, and may reduce the burden of regulatory compliance.

How the Flexo Partnership began

Because flexo facilities use so much ink, collectively they have a major environmental impact. Historically, most flexo inks have been solvent-based, with high levels of volatile organic compounds (VOCs) and other toxic chemicals. The industry has made great progress in addressing environmental and health concerns of inks through reformulation, add-on pollution control devices, and other improvements to operations and materials. However, for the benefit of flexo workers, the surrounding community, and the environment, we need to gain a better understanding of the possible health and environmental concerns of ink chemicals.

Flexo professionals can benefit from a better understanding of the possible health and environmental concerns of ink chemicals.

Because of such concerns, the Design for the Environment (DfE) Program at the U.S. Environmental Protection Agency (EPA) joined forces with the flexo industry on a comprehensive, comparative assessment of environmental and health impacts, cost, and performance of a cross-section of inks.

In designing the study, DfE formed the "flexo partnership" with over 60 participants representing flexo associations, printers, ink suppliers, and universities. The partnership elected to focus on inks because they are a major use and cost category for printers, and because the many small flexo firms might not have the resources or expertise to research the environmental implications of inks. The overarching goal of the partnership was to obtain a broader understanding of the environmental and health impacts of ink chemicals, as well as to encourage the innovation and use of even cleaner, safer inks.

Planning the Flexo Ink Study

The partners agreed to perform a cleaner technologies substitutes assessment for flexo inks. The objective of the CTSA was to develop as complete, systematic, and unbiased a picture as possible of different flexo ink technologies, thereby helping industry incorporate environmental and health information into their ink decisions.

The study compared environmental and health impacts, performance, and cost of the three primary flexo ink systems when printing film substrates on wide-web presses. Because of their long-standing use by flexo printers, solvent-based inks were used as the "baseline," and water-based and UV-cured inks were compared to the baseline inks. When the study began, some project participants wanted to learn whether any ink system showed clear advantages in terms of health, safety, or environmental aspects. Thus, the study looked at the ink systems, as well as analyzing the chemicals and chemical categories of the inks within those systems. The project focused on inks used on film because flexography — particularly the packaging sector — prints a wide variety of products on nonporous substrates. The partners hoped that this choice would help make the findings more directly useful to as many flexo printers as possible.

The research focused specifically on inks printed on film, because of the special technical and environmental challenges for printers presented by this combination, including chemical emissions, worker health and safety issues, and some hazardous waste concerns. The three types of film were chosen because they correspond to important flexo market segments:

- LDPE (low-density polyethelene), used for shopping bags and bread bags,
- PE/EVA (polyethylene/ethyl vinyl acetate) co-extruded film, used for frozen food bags, and
- OPP (oriented polypropylene), used for snack food bags and candy wrappers.

Partners volunteered information about forty-five different ink formulations, which then were analyzed to give a comparative, screening-level assessment of the chemical toxicity, exposure, and health risks across the three ink systems. Altogether, the proj-

What Is Flexo?

Flexography is a large, vibrant industry creating many products that are used every day by virtually everyone. Take a look at these facts about flexo:

- U.S. flexo firms had annual sales of approximately $50 billion in 1999. [1]
- The sector employs about 30,000 people. [2]
- More than 80% of all flexo firms have fewer than 50 employees.
- Flexo has an annual growth rate of about 6%. [3]
- Flexo printing consumed more than 513 million pounds of ink in 2000. [4]
- Flexible film packaging accounts for nearly 20% of the flexo market and is valued at $20 billion annually. [5]

Flexography is used primarily for printing on paper, corrugated paperboard, and flexible plastic materials. Flexo is well suited to printing on flexible and non-uniform surfaces (such as plastic films and corrugated board). Many common products are printed using flexo, such as snack food and frozen food bags, labels for medicines and personal care products, newspapers, drink bottles, and cereal containers.

When the study was conducted, UV-cured inks were not being used commercially to a significant extent to print film substrates on wide-web presses.

ect identified and studied more than 100 chemicals that were found in these ink formulations. The formulas chosen were considered typical ink formulations used in each system. The costs of buying and using these inks were studied, as was the energy consumed in printing with these inks. Also, printed test samples were subjected to 18 distinct performance tests that covered a wide variety of conditions important to many flexo printers. However, the study was not meant to cover every possible ink formulation, performance category, or substrate type. Rather, it gives an in-depth "snapshot" of flexo inks. Nonetheless, the completed study is thought to be the most comprehensive research available on flexo inks, and it is an important resource in undertaking changes that could benefit workers, the environment, and the bottom line.

Notably, the Partnership designed the Flexo CTSA as a *comparative* study, rather than as an *optimization* study, because Project Partners saw optimization as the purview of individual printers. Partners recommended conducting the performance demonstrations at 500 feet per minute, a speed that they felt all three systems could run at with acceptable performance. Printers who run their presses at faster speeds are likely to experience lower operating costs and higher ink use, emissions, worker exposure, and risks than those found in the CTSA. In this sense, the flexo ink study should be considered a conservative assessment.