

CASE STUDY

#1 Reducing VOCs Voluntarily

What can happen when just five Ontario screen printing companies decide to minimize their air emissions? A 53 percent aggregate reduction in VOCs for starters, along with production gains and reduced regulatory requirements. As the first group of participants in the Environmental Performance Agreement between Environment Canada and the Specialty Graphic Imaging Association (SGIA), these five companies are tracking emissions, and making changes to their processes and practices in order to reduce their use and releases of volatile organic compounds (VOCs).

This is the first in a series of case studies that will track the activities and results of screen and digital printers that participate in the SGIA/Environment Canada Environmental Performance Agreement over a 5-year period. For each year of the agreement,

it is anticipated that another five to eight printers will join so that by year 2008 there will be more than 25 participating companies. This case study focuses on VOCs, including their sources in screen and digital printing, and opportunities for reducing their use and emissions.

Background

Ground-level ozone (smog) has been an increasing concern in Canada for several years. As a precursor of smog, VOC emission reductions have been addressed via a variety of government voluntary initiatives including codes of practice, memorandums of understanding, and most recently, Environmental Performance Agreements.

The printing industry uses and emits VOCs through its printing processes. In the mid to late 90s, according to the SGIA, there were approximately 4,000 screen printers in Canada, split equally between graphics and textile printers. Collectively, their VOC emissions for that period were approximately 46,000 tons per year, according to SGIA.¹

In early 2003, SGIA approached Environment Canada about working together on a VOC reduction project. By July 2003, the first group of five screen printing companies began to implement the

requirements of the Environmental Performance Agreement.

The first five companies to participate in the SGIA/Environment Canada are Artisan Complete, Brampton Screen Print, Ellis Studios, North American Decal and Technograph. Each company is profiled at the end of this case study. Through the process of developing and implementing an environmental management system (EMS), these companies have each identified VOC emissions as a significant environmental aspect, and have set objectives and targets for VOC reduction.

VOC Reductions for the First Year of the Agreement

In tracking VOCs, the first step was for the participating companies to calculate their VOC emissions for the year 2000, the baseline year. The next step was to calculate emissions for 2003, the first year of the agreement. Chart 1 shows baseline year total VOC emissions of 15.8 tons per year, dropping to 7.5 tons in 2003. This represents a 44 percent reduction over a three year period.

Looking at overall numbers, however, does not account for changes in production because when production volumes are up, it's reasonable to expect VOC emissions to increase. Therefore, it was critical to identify a unit of production

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“The search continues, deeper and deeper, until you achieve success.”

to normalize emissions. Several options were considered including sales volume and amount of substrate printed. In the end, the group agreed to use ink mileage as the unit of production, assuming the following:

Type of ink	Amount	ft2 of substrate printed
Solvent-based	1 gallon (3.79 liters)	2,000
UV-curable	1 gallon (3.79 liters)	3,500

VOCs emitted per unit of production for the baseline year and 2003 are shown in Chart 2. In 2000, 3.18 grams of VOC were emitted for every ft2 of substrate printed. By 2003, this number had dropped to 1.67 grams — a 53 percent decrease in VOC emissions.

Sources of VOCs in Screen and Digital Printing

VOCs are used throughout the screen printing process. They are found in screen and platen

adhesives, on-press solvents, inks, and screen reclamation systems. Because there are no control devices used, 100 percent of the VOCs used are emitted. Chart 3 shows the sources of VOCs among the participating companies to be 82

percent from solvent-containing materials with the remaining 18 percent from ink. These percentages did not change between the baseline year 2000 and 2003.

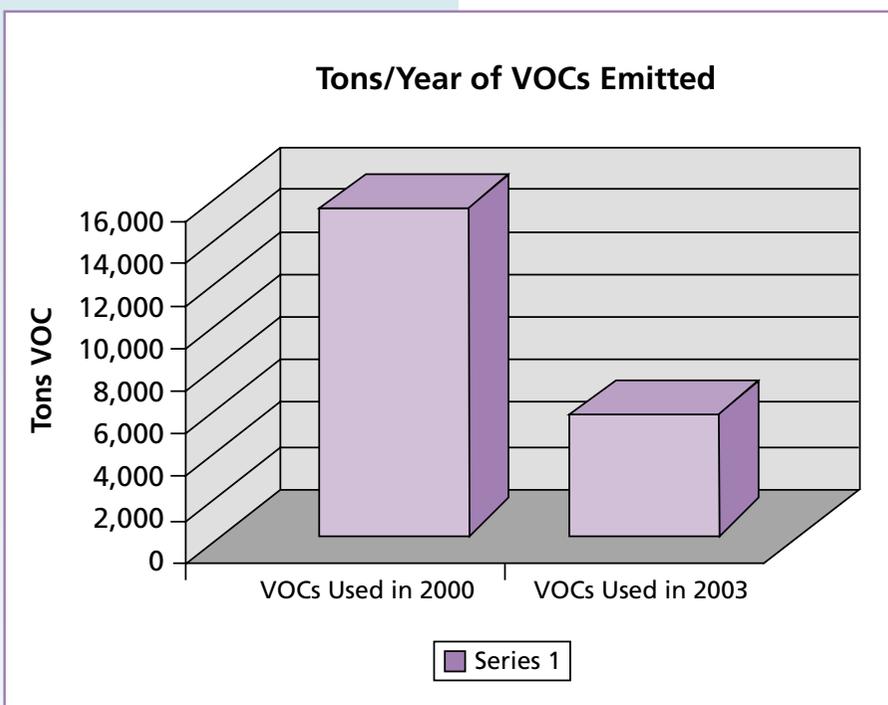
INKS

Graphic printers, comprising 50 percent of the screen printing community in Canada, have traditionally used solvent-based ink systems that can contain up to 60 percent solvent. The industry, however, is quickly turning to UV curable ink systems that are cured with an ultra violet light source, rather than relying on a fast evaporating solvent component. UV inks contain less than 1 percent VOC. By changing ink systems, graphic screen printing facilities can dramatically affect their VOC emissions.

Textile printers primarily use plastisol inks. These inks contain less than one percent VOC. Some textile printers use water-based inks that can contain about 30 percent VOCs.

In digital printing, inks used to print on plastic substrates and materials designed for outdoor display contain up to 90 percent VOC. Materials used for indoor graphics and printed on paper substrate typically use low VOC, water-based inks.

Chart 1



SCREEN RECLAMATION SYSTEMS:

Irrespective of the ink system used, all screen printers use solvent-containing chemicals to reclaim their screens. Differences in the VOC content from one manufacturer to another are minimal. The biggest gains to be made in reducing VOCs associated with screen reclamation are related to technology and best practices, such as using high-pressure wash systems and modifying how chemicals are applied to the screens.

Other Benefits of Reducing VOCs

In addition to environmental protection, the participating companies found many other benefits to reducing VOCs:

- The use of UV inks provides a higher quality product.
- While UV ink costs more than solvent-based ink, the ink mileage is 75 percent greater.
- Without airborne solvent in the workplace, employee exposure to harmful vapors is significantly minimized.
- Minimizing VOC usage and emissions can result in eliminating or reducing the regulatory requirements to report VOC usage and emissions, both at the provincial and federal levels.

What's Next?

Each of the companies profiled in this case study is committed to continual improvement. VOC reduction will be an ongoing goal as they implement and refine their environmental management systems. In subsequent years

of the Agreement, the participants will set other environmental objectives and targets including reducing and recycling of solid waste.

As other screen and digital printing companies join the project, we will be reporting additional reductions in VOCs, along with the progress all companies are making toward their environmental objectives and targets.

For more information about the SGIA/Environment Canada environmental performance agreement, including how to become a participating company, contact:
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Company Profiles

Following is a brief introduction to the companies that are highlighted in this case study.

Artisan Complete specializes in screen printing large format, high quality process color work on a wide range of substrates for point of sale advertising. Screen printing UV curable inks since 1986 and having gradually converted to using these almost exclusively, Artisan Complete also installed enclosed and automated screen reclaiming in 1996, and upgraded to digital computer-to-screen imaging with fully automated screen stencil developing in 2003. Mr. Frank Greenway, research and development specialist and screen printing

Chart 2

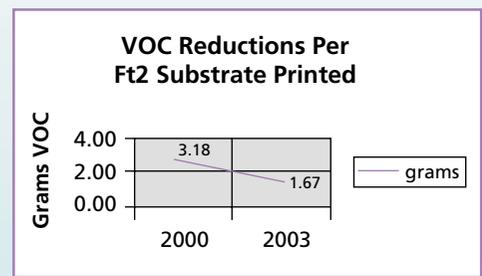
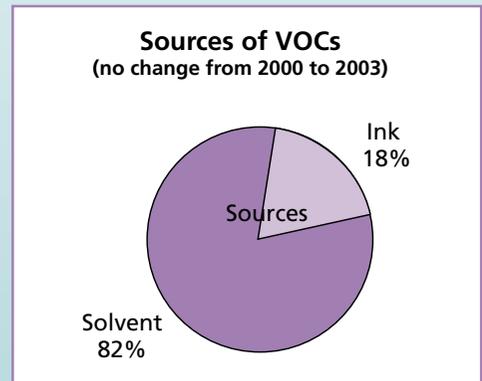


Chart 3



industry veteran, is a member of the Artisan Complete staff who works to ensure continuing adoption of appropriate best state of the art equipment, processes and products.

Brampton Screen Print Inc. specializes in providing educational services within the screen printing industry. Using his 50 years of experience, Mr. Jim Meikle, owner of Brampton Screen Print and former screen printing instructor at George Brown College, teaches "students" sent from screen printing companies across the greater Toronto area. Along with teaching the specific skills required by the companies, Jim educates his industry students on methods to reduce chemical usage and to substitute low VOC products where possible.

Ellis Studios, founded in 1947, is a full-service, point-of-sale design and manufacturing organization. Mr. Bill Ellis, the company's fourth president, has embraced UV technology, both to decrease the company's environmental impact and to improve the working environment for Ellis Studio employees. Bill is also looking at making changes to how employees work in order to minimize the amount of chemicals used.

North American Decal is a graphics screen printing company offering original equipment manufacturer decals, fleet graphics, overlays, nameplates and point-of-purchase materials. Mr. Mehul Upadhyaya, Operations Manager, has focused on switching the plant from solvent-based ink systems to UV technology. He has also tested several different screen reclamation systems to find one with both good production value and environmental performance.

Technograph provides the complete range of prepress products and services to the screen printing industry. Mr. Peeter Leppik, president of Technograph, has incorporated product substitution to control the use and emissions of VOCs from his screen preparation processes. As an ISO 9001 registered company, Peeter sees the environmental management system (EMS) he's developing via the SGIA/Environment Canada agreement as a complementary system.

Endnote

¹ In the report prepared for Environment Canada, entitled *Status of Solvents, Inks, VOC Emissions & Controls at Commercial & Industrial Printing Facilities*, CHEMinfo Services Inc., January 1995, the number of screen printing establishments in 1993 was estimated to be 1,250, with VOC emissions of less than 40,000 tons. SGIA's estimates for that time were 4,000 printers with VOC emissions of 46,000 tons per year.

THE SGIA/ENVIRONMENT CANADA ENVIRONMENTAL PERFORMANCE AGREEMENT

An Environmental Performance Agreement is one of the tools Environment Canada uses to seek voluntary reductions of volatile organic compounds. In the case of this Agreement, SGIA has committed to assist screen and digital printers in implementing an environmental management system (EMS) in order to produce verifiable reductions of volatile organic compounds (VOCs) by 20 percent by 2008. This represents an aggregate reduction amongst all participating companies. For its part, Environment Canada has agreed to provide resources for training participants, tracking reductions and recruiting additional screen and digital printing partners. The full text of the agreement is available on the Internet at <http://www.ec.gc.ca/epa-epe/en/agr.cfm>.

One of the most interesting aspects of Environment Canada's Environmental Performance Agreements is that they are used as a complement, a precursor or an alternative to new regulations. In fact, while there is currently no regulation restricting the use of VOCs by screen and digital printers, Canada's commitment to meeting its ozone standards will necessitate VOC regulations. By participating in this Environmental Performance Agreement, screen and digital printing facilities are staying ahead of the regulatory agenda. The Environmental Performance Agreement between Environment Canada and SGIA helps support the Clean Environment business line. EPAs are voluntary agreements negotiated among industry, government agencies and non-government organizations to achieve specified results.

Environment Canada's vision is to see a Canada where people make responsible decisions about the environment and where the environment is thereby sustained for the benefit of present and future generations.

The Ontario Region of Environment Canada delivers national programs tailored to respond to regional and local issues; implements Great Lakes 2000 and the Canada-Ontario Agreement (COA) Respecting Great Lakes; and represents Environment Canada corporately, in binational, national, regional and local partnerships.