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Case Study

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**Office of Technical Assistance
Executive Office of Environmental Affairs
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Toxics Use Reduction Case Study

Alcohol Free Fountain Solutions at Americraft Cartons, Inc.

Summary

Americraft Carton was using large quantities of isopropyl alcohol (IPA) in the fountain solution for the offset printing presses used to print the paperboard cartons for its client's products - food, health and beauty, and children's products. Concern for the health and safety of its employees and the environmental concerns expressed by clients required Americraft to change its processes. Introduction of a \$108,000 new fountain solution delivery system has resulted in the elimination of IPA and brought an end to toxics use reporting. Cost savings yielded full payback in materials costs alone in about 2 ½ years.

Background

Americraft Carton, Inc., in Lowell, Massachusetts, is a \$30 million a year folding carton manufacturer and printer. Health and safety issues and environmental concerns of Americraft clients - makers of health and beauty products, children's toys and games, and food products influenced Americraft's efforts to introduce less toxic printing materials.

Until August 1991, Americraft mixed fountain solution for its presses in the traditional manner. A solution of 15-25% isopropyl alcohol (IPA), tap water, and etch material was measured by hand into a drum and stirred with a wooden paddle. Americraft received bulk deliveries of IPA every two to three weeks, and up to six 55 gallon drums of waste solution were generated monthly by the company's four sheetfed offset presses.

There are significant economic, health and safety, and environmental drawbacks to this method of producing and using fountain solution. Inconsistency in the

costs, and it can require disposal of off-spec, unused, or waste solution at a cost of more than \$2 per gallon. Inhalation of alcohol-laden vapors present health and safety concerns for employees. IPA, an ozone producing volatile organic compound (VOC), also increases the cost and complexity of air emission permitting and reporting.

Toxics Use Reduction Planning

Americraft's Manufacturing Manager Jim Klecak knew that the inconsistency in fountain solution formulation as well as air emission concerns needed to be resolved. Jim Klecak moved quickly to research the available options and, in April 1991, he purchased and installed a Prisco Aquamix Central System at a cost of \$108,000. News of the change was initially received with some trepidation by management because of the expense. Now, because the system has proven cost-effective and efficient, implementation of similar systems is underway at two other Americraft plants, in Memphis, Tennessee, and St. Paul, Minnesota. The St. Paul plant utilizes a modified version of the mixing system and is pleased with early results. In Memphis, "black-box" technology that irradiates the water for the dampening system, enables operation with plain water and fountain concentrate, completely eliminating IPA and its substitutes. In Lowell, when Jim Klecak began introducing non-IPA solution, he had to prove to his pressmen that high quality printing is possible without IPA. He locked the IPA storage area and installed a drum, which was equipped with a hose leading to the presses, and visible through the storeroom window, labeled IPA but filled with water. Ten days later, Jim Klecak told the pressmen that the system was operating without IPA.

Toxics Use Reduction Modifications

Americraft installed the Prisco system and reverse osmosis equipment (because water quality could vary even from hour to hour), to filter incoming water and automatically adjust pH and conductivity. These changes made it possible to use IPA substitutes, which are less tolerant to variations in water quality and parameters than IPA. The reverse osmosis filtration system has five micron carbon prefilters, a reverse osmosis membrane, and a storage and distribution tank. Americraft first replaced IPA with Hi-Tech solution and Alkaless R, a fountain concentrate with 20 percent monoglycol ether, a VOC. Release of VOC was greatly reduced by using a closed loop system, but introduction of the glycol ethers required reporting under SARA (Title III, section 313) and TURA. Prisco Q-11, a new substitute introduced in April 1993, has nearly eliminated VOC and ended the required reporting.

The Prisco system is a closed loop recycling system connected to all the presses, which can release solution at up to 15 gallons per minute (gpm). Recharging of the solution (made up of water obtained by reverse osmosis, the IPA substitute, and used fountain solution) is computer controlled to ensure that pH, temperature,

a return tank, where it is chilled and filtered to 25 microns (contaminants are ink, paper, dust, and paperboard stock). The solution is then returned to the main system for filtering to 10 microns, further chilling and solution recharging. The chiller is a holding tank with a 250 gallon capacity to ensure adequate quantities at all times.

Results

Reductions Achieved: Americraft used high volumes of IPA in the last full year before introduction of the Prisco system. Replacement of IPA with Alkaless R, which contains 20 percent VOC, and the substitution of Q- 11 for the Hi-Tech fountain concentrate resulted in an 88 percent reduction in VOC emissions from the operation. Recirculation also eliminated VOC from the air in the plant and the substitute had reduced flammability as well (flashpoint of 110 F versus 72). The system ran for 11 months before spent fountain solution required disposal; waste solution was reduced 50 percent.

Supplies	8/90-7/91 (old system)	8/91-7/92 (new system)	8/92-7-93 (Q-11, 8 months)	7/93-7/94 (Q-11, full year)	1994 - 95	1995 - 96
Isopropyl (IPA)	\$23,025	\$0	\$0	\$0	\$0	\$0
Alkaless R	\$1,292	\$5,816	\$17,146	\$6,853	\$11,027	\$11,712
Fountain Solution Hi-Tech, Q-11	\$44,907	\$23,188	\$11,277	\$10,325	\$14,013	\$11,867
Total	\$69,224	\$29,004	\$28,423	\$17,178	\$25,040	\$23,579
Savings	\$40,220	\$40,801	\$52,046	\$44,184	\$45,645	

NOTE: Total Materials Purchase Savings = \$222,896 in six years. These calculations do not include substantial additional savings estimated at about \$35,000 per year from decreased paperboard waste on startups, a capacity increase due to reduced down time for system maintenance, reduced hazardous waste disposal costs for spent fountain solution, substantially reduced permit fees as a result of the chemical substitutions and process changes.

Installation of the Prisco Aquamix Central System automatically and accurately mixes fountain solution in a closed loop and has resulted in:

- The end of losses and costs associated with hand mixed solution and the cost and disposal cost of unacceptable solution that also sometimes caused press downtime

and from converting from weekly solution disposal and pan maintenance to an annual schedule

- Significantly reduced use of VOC and VOC emissions through the replacement of IPA. The introduction of PriscoQ-11, which contains no VOC, will result in nearly complete elimination of VOC.

Economics: Americraft invested \$108,000 in the new equipment required to reduce the VOC emissions from its offset printing operations. Payback resulting solely from the reduced cost for materials occurred about 30 months after introduction of the new system. There are substantial additional savings from increased press efficiency, reduced wastes, and reduced or eliminated permit costs.

The cost of the alcohol replacement (Alkaless R) is 5 times greater than IPA; the cost of Q-11 is comparable to that of the Hi Tech concentrate which it replaces. However, because of the improved efficiency of the mixing system and the new chemistry, a reduction of about 75% in Alkaless R use is projected to occur this year, producing the savings (from materials costs alone) shown in the table above.

Other Pollution Prevention Activities

Americraft has introduced other pollution prevention changes. Approximately 85 percent of its products are made from recycled paperboard. Printing on recycled board is technically more difficult, but the introduction of a consistent fountain solution greatly facilitates printing on recycled material. Americraft also uses water-based coatings, instead of UV-based coatings which may make paper non-recyclable. Finally, Americraft switched from petroleum-based ink to soy-based ink. Soy-based inks produce a higher quality print and result in substantial VOC reductions.

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