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Office of Technical Assistance
Executive Office of Environmental Affairs
 Commonwealth of Massachusetts

Toxics Use Reduction Case Study

ALCOHOL FREE FOUNTAIN SOLUTIONS AT AMERICRAFT CARTON, 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 of its clients required Americraft to change its process. Introduction of a \$108,000 new fountain solution delivery system has resulted in the elimination of IPA, cost savings that will yield full payback (in materials costs alone) in less than two-and-one-half years, and a likely end to toxics use reporting.

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 solution can cause press downtime; it increases labor and material costs, and it can require disposal of inadequate, 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. And IPA, an ozone producing volatile organic compound (VOC), increases the cost and complexity of air emission permitting and reporting.

TUR PLANNING

Americraft Manufacturing Manager Jim Klecak knew that inconsistency in fountain solution formulation as well as air emission concerns needed to be resolved. Jim moved quickly to research the available options and, in April 1991, to purchase and install 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. St. Paul 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 began introducing no-IPA solution, he even had to prove to his pressmen that high standard printing is possible without IPA — he locked the IPA storage area and installed a drum, visible through the storeroom window, labeled IPA but filled with water with a hose leading to the presses. Ten days later, Jim told the pressmen that the system was operating without IPA.

TUR MODIFICATIONS

Americraft installed the Prisco system and (because water quality could vary even from hour to hour) reverse osmosis equipment 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 is 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 VOCs 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 VOCs and will likely end 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, IPA substitute, and used fountain solution) is computer-controlled to ensure that pH, temperature, and conductivity are all precisely maintained. From the press, the solution goes to 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 and for further chilling as well as 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 VOCs, 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 VOCs from the air in the plant and the substitute had reduced flammability as well (flash point of 110 F versus 72). The system ran for 11 months before spent fountain solution required disposal; waste solution was reduced 50 percent.

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 — the cost and disposal cost of unacceptable solution that also sometimes caused press downtime;
- Reduced costs for waste removal by internal recycling of the solution and from converting from weekly solution disposal and pan maintenance to an annual schedule, and
- Significantly reduced use of VOCs and VOC emissions through the replacement of IPA. The introduction in April 1993 of Prisco Q-11, which contains 0 percent VOCs will result in nearly complete elimination of VOCs.

Supplies	8/90-7/91 (old system)	8/91-7/92 (new system)	8/92-7/93 (Q-11, 8 months)	7/93 to 7/94* (Q-11, full year)
Isopropyl (IPA)	\$23,025	-0-	-0-	-0-
Alkaless R	1,292	\$5,816	\$17,146	\$3,877
Fountain Solution, Hi-Tech, Q-11	44,907	23,188	10,986	14,610
Total	\$69,224	29,004	28,132	18,488
Savings		\$40,220	\$41,092	\$50,736

*PROJECTED

NOTE: Total Materials Purchase Savings = \$132,048 in three 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, and finally, no, or substantially reduced permit fees as a result of the chemical substitutions and process changes.

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 will occur about 30 months after introduction of the new system — there are substantial additional savings from increased press efficiency, reduced wastes, and reduced and eliminated permit costs. Americraft has also found that alcohol substitutes cause the need to maintain and/or replace rollers at a higher rate, but also require lower durometer meaning they may last longer.

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; and Americraft recently switched from petroleum-based ink to *soy-based ink*. Soy-based inks produce a higher quality print and result in substantial further VOC reductions. Finally, Americraft is exploring ways in which to cleanse and recycle its cloth filter bags to reduce its overall waste load and improve disposal methods of the filtered-out hazardous material.

This Case Study is one of a series of such documents prepared by the Office of Technical Assistance for Toxics Use Reduction (OTA), a branch of the Massachusetts Executive Office of Environmental Affairs whose mission is to assist industry in reducing the use of toxic chemicals and/or the generation of toxic manufacturing byproducts. OTA's non-regulatory services are available at no charge to Massachusetts businesses and institutions that use toxic chemicals. For further information about this or other case studies, or about OTA's technical services, contact: Office of Technical Assistance, Executive Office of Environmental Affairs, Suite 2109, 100 Cambridge Street, Boston, Massachusetts 02202, (617) 727-3260, Fax - (617) 727-3827.

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