



Crest Foam

Toxics Use Reduction Case Study

Elimination of Methylene Chloride Use in Manufacturing Process

Summary

Crest Foam of Newburyport, Massachusetts recently embarked on an ambitious program to eliminate the use of volatile organic compounds (VOCs) in the firm's polyurethane foam process. The company eliminated the use of 190,000 lbs./year of methylene chloride by installing an innovative foam manufacturing process called the "Cardio Process". The Cardio Process uses CO₂ instead of methylene chloride or CFC-11 as the auxiliary blowing agent. By making this change, Crest Foam avoided the need to install costly air pollution control equipment or reduce its production of foam products, either of which would have threatened the long-term survival of the facility.

Background

Crest Foam is a Leggett & Platt Company employing 85 people in the manufacture of flexible polyurethane foam for furniture, cushioning applications for the home, packaging and medical applications. The foam is manufactured in slabstock form via the "One Shot" process. The One Shot process is a continuous operation where all of the separate ingredients that go into the reaction for synthesizing the foam are metered to a central mixing chamber, mixed and then dispensed onto a conveyor as a froth. Because of the action of the blowing agents, the froth expands quickly to form a large bun of partially polymerized polyurethane foam. After the foam is fully expanded, the polymerization progresses in seconds to reach a fully cross-linked, solid state. In the early days of the One Shot process a common blowing agent was trichlorofluoromethane (CFC-11) which is an ozone depleting substance. It was replaced by methylene chloride, a volatile organic compound (VOC), as a result of the regulations prompted by the Montreal Protocol. The Montreal Protocol is an international agreement that called for restricted production of chlorofluorocarbons (CFCs).

Methylene chloride or other volatile organics suitable to act as auxiliary blowing agents serve two purposes in the foam making process:

- To act as an expanding gas to help expand the polymer mass into a matrix of open cell foam
- To cool the foam during the final stages of polymerization when there is considerable heat being generated from the urethane reactions.

Toxics Use Reduction

Acting on the company's concerns for the environment and recommendations from the Department of Environmental Protection (DEP) to reduce VOC emissions, Crest Foam invited the Office of Technical Assistance to tour its manufacturing facility. After the tour, OTA made several suggestions for process

changes that ultimately led to the elimination of methylene chloride as an auxiliary blowing agent in the foaming process.

The first step was to replace the ozone depleting CFC-11 with methylene chloride as a blowing agent in their foam formulation as an intermediate step. Converting to methylene chloride was relatively simple and uninvolved. The second step was the change to the Cardio Process, which required a year of planning and \$1.5 million in capital investment. This process calls for the CO₂ to be injected directly into the mixing chamber along with the other ingredients. An elaborate new foam production line was needed to handle the gaseous CO₂. The CO₂ used in the process does not cool the reaction as methylene chloride did, therefore equipment was installed to effect cooling.

Results

Reductions: The elimination of methylene chloride from the foam formulation reduced Crest Foam's VOC and hazardous air pollutant emissions by 190,000 lbs/year. Further, methylene chloride is listed on EPCRA 313 as a reportable substance on EPA Form R and DEP Form S. Eliminating its use means the company no longer is subject to these reporting requirements.

Economics: The planning and installation of the Cardio Process cost \$1.5 million. Since CO₂ is three times more efficient than methylene chloride and 80% less expensive, there was a raw material cost savings of approximately \$50,000/year. But the real benefit from the installation of the new process was the elimination of the methylene chloride; if it had not been eliminated, Crest Foam would have been required to install costly air emission control equipment or reduce the type and amount of foam products it manufactures. According to Crest Foam officials, those expenses would have threatened the viability of the facility.

This case study is one in a series prepared by the Office of Technical Assistance (OTA), a branch of the Massachusetts Executive Office of Environmental Affairs. OTA's mission is to assist Massachusetts facilities with reducing their use of toxic chemicals and/or the generation of toxic manufacturing byproducts. Mention of any particular equipment or proprietary technology does not represent an endorsement of these products by the Commonwealth of Massachusetts. This information is available in alternate formats upon request. OTA's **non-regulatory** services are available at **no charge** to Massachusetts businesses and institutions that use toxics. For further information about this or other case studies, or about OTA's technical assistance services, contact:

Office of Technical Assistance, 251 Causeway Street, Suite 900, Boston, MA 02114-2136
Phone: (617) 626-1060 Fax: (617) 626-1095 Website: <http://www.mass.gov/ota>