Commonwealth of Pennsylvania  ·  Department of Environmental Protection

$uccess $tory

Raw Materials Substitution in the Women’s Shoe Industry

<table>
<thead>
<tr>
<th>COMPANY</th>
<th>Kinney Shoe Corporation, Mfg. Division - Carlisle, Pa.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCT/INDUSTRY</td>
<td>Women’s non-rubber footwear</td>
</tr>
<tr>
<td>WASTE STREAM/CHEMICAL</td>
<td>Solvent-based adhesive</td>
</tr>
<tr>
<td>PROCESS</td>
<td>Cement construction method</td>
</tr>
<tr>
<td>POLLUTION PREVENTION COST</td>
<td>$5,000.00</td>
</tr>
<tr>
<td>SAVINGS/OTHER BENEFITS</td>
<td>Annual cost savings of approximately $10,000</td>
</tr>
<tr>
<td></td>
<td>Return-on-investment in about six months</td>
</tr>
<tr>
<td></td>
<td>Reduced air emissions of more than 23 tons of VOCs</td>
</tr>
<tr>
<td></td>
<td>Reduction in hazardous waste</td>
</tr>
<tr>
<td>POLLUTION PREVENTION METHOD</td>
<td>Product substitution and process change</td>
</tr>
</tbody>
</table>

Background

The Kinney Shoe Corporation built its Carlisle plant in 1966. At this site, Kinney Shoe manufactures women’s non-rubber footwear using the cement construction method. With this method, the shoe parts are cut from textiles, leather, pressed fiber, plastics and composition rubber. Then, the upper parts are sewn together and fitted. The shoe parts are formed on the plastic mold of a foot. The soles are then attached to the shoes by coating both the outsole and the upper part of the shoes with an adhesive. Each section is allowed to dry, then both are heat reactivated before being placed in a sole press. For some 25 years, Kinney Shoe used solvent based adhesives, gaining a broad base of knowledge about using this adhesive on various footwear raw materials.

Process Change

In keeping with its policy to reduce all types of waste and working toward a goal of zero discharge, Kinney Shoe changed the process involving solvent based adhesives. Kinney Shoe:

1. set a goal to replace the original solvent-based urethane adhesive containing 80 percent volatile organic compounds (VOCs), including acetone, methyl ethyl ketone and toluene

2. considered other adhesives as possible replacements for the urethane adhesive and, with the cooperation of various vendors, conducted experiments on shoe materials

3. placed adhesives on shoe materials, testing aging, flexing, wear, tensile strength and exposure to water

4. included employees responsible for product manufacturing throughout the testing process to find problems, suggest answers and generally critique the procedures

5. selected and uses the most effective adhesive for Kinney Shoe products

After three years of experimentation, Kinney Shoe found a rubber-based emulsion to be the most effective adhesive for its footwear. This emulsion consists of rubber particles suspended in solution by a physical-chemical method that requires six percent VOCs to emulsify the rubber particles. This water-based adhesive proved to be just as effective in adhering the shoe parts as the solvent-based adhesive, and actually improved product quality. In April, 1994 Kinney’s Carlisle Plant started full production with the water-based adhesive. The Kinney Shoe staff continues to learn more about how compatible the water based adhesive is with various footwear substrates.
ENVIRONMENTAL RESULTS

Reduced Solvent Purchases, VOC Emissions and Hazardous Waste Disposal

This pollution prevention effort resulted in a 66 percent reduction in VOC emissions and made Kinney Shoe the first factory in Pennsylvania to use water-based adhesives on 80 to 90 percent of shoe uppers in regular production. In addition, the water-based adhesive is resistant to solvent cleaning. Therefore, any stray glue must be “rubbed-off” with a natural crepe rubber eraser, which further reduced the use of solvents at the Carlisle facility. Cleaner air inside and outside the factory has resulted in better working conditions for employees. Kinney Shoe found VOC reduction beneficial because it allowed the firm to apply for a synthetic minor permit. The owners of Kinney Shoe voluntarily limited the amounts of air pollutants emitted; therefore, the company will not be required to comply with more restrictive federal and state air quality requirements.

COST SAVINGS

Financial Benefits and Other Improvements

The change from a solvent-based adhesive to a water-based adhesive produced an estimated savings of $10,000 annually for Kinney Shoe. Other bonuses include:

1. a reduction in hazardous waste and in-plant handling requirements
2. decreased fire hazard
3. and safer working conditions for employees

Kinney Shoe found that the process change was more efficient because ‘in-plant’ handling procedures were minimized when the solvent-based adhesive was changed to a water-based adhesive. For example, the new water-based adhesive eliminated potential fire hazards. The new water-based adhesive does not require specialized equipment such as safety cans and metal pipe which transported adhesives directly to machinery. In addition, plastic instead of metal piping can be used which is easier to repair and install.

POLLUTION PREVENTION GOAL

This case illustrates how industry can use raw materials substitution to reduce pollution while at the same time improving product quality and containing costs.

The goal of pollution prevention is to eliminate the generation of waste at the beginning of an industrial process or by modifying the process so the amount of materials used are reduced. Kinney Shoe, reduced a significant portion of its VOC emissions by changing adhesives. Kinney Shoe is now expanding its search for further pollution prevention methods to reduce its wastes and increase profits. The efforts of Kinney Shoe resulted in significant waste reduction and earned the company the Governor’s Waste Minimization Award in 1995.

For more information about pollution prevention, contact:

DEP’s Office of Pollution Prevention and Compliance Assistance
P.O. Box 2063
Harrisburg, PA 17105-2063
(717) 783-0540
FAX: (717) 783-8926

This fact sheet and related environmental information are available electronically via Internet. Access the DEP Web Site at http://www.dep.state.pa.us (choose Information by Environmental Subject/choose Pollution Prevention).