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Toxics Use Reduction Case Study

KORBER HATS ELIMINATES HAZARDOUS AIR POLLUTANTS

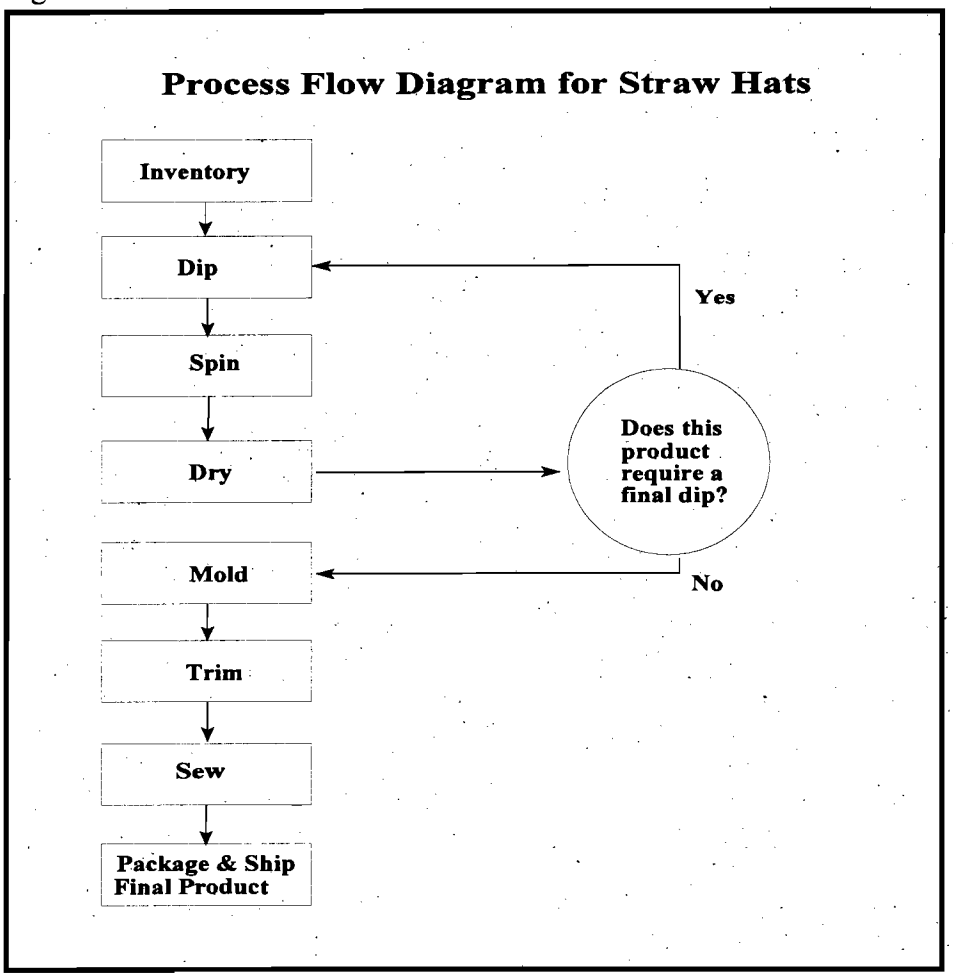
SUMMARY

Korber Hats of Fall River, Massachusetts, a maker of custom straw and felt hats, has reduced emissions of volatile organic compounds (VOCs) by 80,000 pounds, 44,000 pounds of which was eliminated through process changes and chemical reformulation. The company, which was using 52,000 pounds of toluene and 17,200 pounds of methyl ethyl ketone in 1994, permanently eliminated the use of these hazardous air pollutants in 1995. Korber has successfully substituted a water-based stiffening process in its straw hat dipping operation. Once the company and its vendor reformulated a stiffener to a water-based acrylic lacquer, Korber was able to eliminate the use of a solvent thinner which consisted of 30% methyl ethyl ketone and 60% toluene. Korber worked with its supplier to analyze existing coatings and create a new formulation which would replace the solvent coating. The company has since successfully switched to an entirely water-based process with some process changes and minimal capital investment. After adjustments are made for production levels, this project has saved Korber a minimum of $36,000 annually in reduced chemical purchases and permitting costs.

BACKGROUND

Korber Hats, which employs 50 people, produces more than one million hats per year. The major operations performed at the Fall River plant are stiffening, molding, sewing, and trimming. Korber receives the hats into inventory woven and roughly formed. The hats are first dipped into coating baths to stiffen and impart water repellency to the final product. They are then mechanically molded into shape. The hats are trimmed and sewn to specifications to give them their final shape (See Figure 1). The coating step, which is necessary for straw but not felt product lines, comprises the majority of chemical use at the facility, so the company's toxics use reduction efforts were focused on this process.

Figure 1



TOXICS USE REDUCTION PLANNING

Korber managers first recognized in 1994 through a self-auditing program that the firm was using a substantial volume of coatings containing the hazardous air pollutants (HAPs) toluene and methyl ethyl ketone. The company then began intensive research efforts to determine if there was a substitute for the solvent-based products used to coat and stiffen the straw hats. Korber contacted its supplier, Technical Coatings, and the two companies began to work together to develop a low VOC substitute lacquer. Korber Hats worked with Technical Coatings for two years to develop and implement the new stiffening process. Technical Coatings made a staff person available to Korber to research alternate coating formulations and to spend time at the facility troubleshooting the new process. Because of Korber's commitment to eliminating the solvent coating through reformulation, it successfully eliminated use of toluene and methyl ethyl ketone (MEK) in 1995.

TOXICS USE REDUCTION MODIFICATIONS

Reformulation: Korber's process generally consists of two steps, a pre-dip and a final dip. For some products, a third dip is added to impart additional water repellency. The hats are dipped in a polymeric coating and then mechanically rotated to remove excess solvent. They are then placed on a conveyorized rack and processed through a hot air oven to dry and cure the coatings. Starting in 1993 and continuing through 1995, intensive reformulation efforts significantly reduced solvent use in the pre-dip. In the autumn of 1994, two new water-based coatings for the Panama natural straw hat product line were introduced into production. The solvent-based pre-dip which emitted 630 pounds of VOC for every 100 gallons used was successfully replaced by a reformulated pre-dip which emits only 54 pounds of VOC per 100 gallons used. This eliminated 20,000 pounds of HAP emissions to the atmosphere.

Once the company had successfully reformulated the pre-dip, it focused on the search for a water-based final dip. Working with its supplier, Technical Coatings, Korber developed a process for the Panama straw hat product line that used only water-based coatings for both the pre-dip and final dips. In the past, Korber had used a solvent-based final dip followed by a repellant coating. The repellant coating, when prepared for use, was diluted using a ratio of one part product to seven parts water. When the company successfully switched to water-based final dip, it found it could combine the repellant and final dips into one coating bath, thus eliminating a process step. With the entire stiffening process reformulated, Korber was able to reduce its emissions significantly. Now that the company has converted completely to water-based coatings, emissions for 1996 have been reduced to approximately two tons annually.

Process Modifications: Korber had to make modifications to drying ovens, including cure times, materials process flow and the pressure used in the molding presses in order to continue manufacturing certain product lines at the facility. The company's paper yarn hat product line, which consisted of woven recycled paper, deformed when coated with the water-based stiffener. Ultimately these hats were converted to water-based coatings, but this product line had to be outsourced to a facility with a flat bed drying oven. The change was much more trouble-free for hats made of natural straw, the product line on which the new coating was piloted. There were, however, several production problems which had to be resolved regarding the finishing of the product once it was stiffened. Several changes had to be made to the drying process, including incorporating a longer curing time. Fans were also added within the drying oven to enhance the curing process of the new coatings. Additionally, the pressing operation which follows the coating step required some alteration. As a result of the new coating, the amount of time and pressure needed to form the hats was increased. In fact, the pressure on the molding machines had to be more than doubled to successfully mold the hats.

Because of differences in the flow of materials on the factory floor, there were also some improvements made in the configuration of the factory. Additionally, the company had to work with its union to reset hourly rates for each of the newly reworked processes. All of these adjustments took roughly 12 months to complete. The company has also resorted to outsourcing some of the work for those products which needed additional drying, rather than purchasing new, larger capacity drying ovens. Korber worked with customers to inform them of the changes to their product and found most companies receptive to the change.

RESULTS

Reductions Achieved: The direct savings from changing the stiffening solvent to water was immediate. Accounting for current changes in production, the savings in reduced chemical costs are estimated at $12,000 annually. Korber has eliminated annual costs for handling and storage of five to six drums of these hazardous air pollutants. Permitting and engineering costs for companies which are major sources of hazardous air pollutants can be conservatively estimated at $20,000 annually. Korber has successfully avoided these fees. The company also no longer reports under the TURA program for toluene and MEK, saving them more than $4,000 annually in fees. Although some percentage of the product line had to be outsourced, these products were also successfully converted to water-based coatings. Korber's facility-wide emissions have been cut by 22 tons annually.