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Case Study
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Toxics Use Reduction Case Study

New Coating Technologies Provide Big Payoffs for Kidde-Fenwal, Inc.

Summary

By updating its coating operations with 1990s technologies including computer-programmed spray applications and ultraviolet (UV) curing, Kidde-Fenwal Incorporated reduced its air emissions by 75%, eliminated 20 drums per year of flammable waste, and reduced its production cycle by an entire day. The new system, which also reduced the amount of coating used per printed circuit board by 96%, is expected to save the company $300,000 annually, providing a payback on its investment in less than one year.

Background

Kidde-Fenwal is a manufacturer of automatic fire suppression systems and gas ignition controls for non-residential applications. The manufacturing site in Ashland, Massachusetts employs 470 people. A critical part of the company's production operations is the spray application of a conformal coating to the finished circuit boards. This coating protects the board from potentially degrading external influences such as moisture and dirt.

Prior to installing the new system in 1996, Kidde-Fenwal was using a conventional coating system originally set up in 1974, and operated without modification since that time. In the original process, the printed circuit boards were coated with a high pressure spray application and used a low solids solvent-based coating which required a 24-hour post cure. Additional solvents were used for equipment clean-up. These solvents contained a large portion of toluene, which is a hazardous air pollutant (HAP).

The nature of this high pressure spray application is to coat everything that falls under the oscillating spray pattern. This in turn requires masking critical areas of the board where it is imperative that no coating be applied. Consequently, several worker hours were required to mask these areas by hand, using costly specialized masking materials.

In 1995, the process had actual emissions of 14 tons of volatile organic compounds (VOC), of which 60% was toluene. Because the potential for emission for toluene was greater than 10 tons, Kidde-Fenwal was classified as a major air emissions source and required to file for an air operating permit. Air operating permits are accompanied by triennial permit fees which are substantial. In addition, formulation restrictions may be required which limits the type of coating that can be used.

Toxics Use Reduction Planning

In late 1994, Kidde-Fenwal sought assistance from the Massachusetts Office of Technical Assistance (OTA) as it looked for ways to make its coating operations more efficient and reduce emissions. After walking through the original coating process, OTA technical staff made suggestions including use of a computer programmed spray applicator that would provide precise control over the spray pattern and eliminate the need for masking. OTA also suggested that the company investigate the possibility of using UV-curable coatings. Both of these ideas offered the possibility of significant reductions in HAP and VOC emissions and the conservation of labor and materials.

After reviewing OTA's suggestions, Kidde-Fenwal decided to launch a formal engineering study of acquiring a comprehensive new application system which incorporated a solventless, UV-curable coating coupled with a programmable low pressure spray application process.

Toxics Use Reduction Modifications

Nordson Company of Amherst, Ohio was selected to design and build an application system. Meanwhile, the Kidde-Fenwal engineering staff surveyed more than 15 different coatings and selected a UV-curable polyurethane. The Nordson equipment was subsequently ordered. It was delivered in 13 weeks, took 40 worker hours to install, and required 48 worker hours for production startup.

After the startup period, the coating application system was producing coated boards at the expected rate with better than expected quality. The new system uses 4 gallons of polyurethane polymer to coat 10,000 boards whereas the old system used 125 gallons of epoxy solution polymer to coat an equal number of boards. Further, the epoxy coating required a 24 hour post cure in an oven before the boards could be quality control tested. The UV/urethane coated boards can be tested immediately after exiting the UV light chamber. One whole day has been taken out of the production cycle by elimination of the bake period, and standing inventory and work in progress is expected to be reduced by $50,000 per year.

Results

Reductions Achieved: Kidde-Fenwal anticipates other benefits as well. Because 75% of the actual emissions have been eliminated, the site will be reclassified as a minor air source,

reducing the compliance fee from a minimum of $2,000/year to as low as $150/year. The need to store approximately 4,000 pounds of flammables on site annually, which presented a significant safety issue, has been eliminated. In addition, the cleanup routine of the new system requires almost no solvent use whereas the old system used 400 gallons/year of solvent for cleaning and generated 20 drums/year flammable waste.

Economics: The overall cost of producing a finished printed circuit board has been reduced substantially. A savings of $75,000 per year in materials alone through the elimination of masking is anticipated. Another $75,000 is expected to be saved in the cost of the coating. Indirect and direct labor savings will amount to 14,000 worker hours per year. Cost savings also will be realized in hazardous waste transportation, permit fees, and electric bills. All told, the annual savings are conservatively estimated at $300,000, which means an extraordinary one year pay-back time.