



Case Study

Outboard Marine Corporation (OMC)

Elimination of Methylene Chloride Usage

Standard Industrial Classification (SIC)	Marine Engine Components/3519
Type of Waste	Methylene Chloride
Strategy	Material Substitution
Company Background	Outboard Marine Corporation (OMC)-Milwaukee employs 400 people and manufactures many of the components used in the production of the Evinrude and Johnson outboard engines. The Milwaukee manufacturing facility has roots in the Milwaukee area dating to 1921. The manufacturing operations include machining, heat treating, investment casting, polishing and electroplating operations. However, the operations with the most impact on hazardous waste generations and the greatest potential for reductions are the electroplating and chemical coating operations. The OMC-Milwaukee facility has an aggressive hazardous waste reduction program in place and OMC subscribes to EPA's "33/50" voluntary toxics reduction program. Methylene chloride is one of the 17 high priority chemicals listed under this program.
Original Process	Masking of connecting rods for selective silver plating using an ambient temperature wax type requires methylene chloride as a solvent/thinner to attain the required consistency. Removal of the wax after the deposition of the silver plating used a vapor degreaser charged with methylene chloride.
Scale of Operations	Over 600,000 connecting rods are produced annually using this process.
Motivation	The company set project goals to improve its work environment and reduce its hazardous air emissions. The project was initiated as a facility project for pollution prevention because of the dual impact of workplace and environmental stewardship and a high probability of success.
Pollution Prevention Process	For the masking operation, a wax substitution using heat/temperature to attain the desired consistency required no solvent use. Hot water with an alkaline cleaner is used for the removal of the masking after silver plating.
Development	Silver plating is critical to the service life of the engine and a small prototype system was purchased and tested off-line to demonstrate the feasibility of the process technology and provide a means of testing various process parameters. Based on the results of the pilot plant, a production system was installed in June, 1994, and is currently in use.
Material/Energy Balance	<p>Original Process</p> <p>Feedstock Wax and Methylene Chloride</p> <p>Waste Methylene Chloride</p> <p>Disposal 57,000 lbs/year Air Emissions 17,000 lbs/year Hazardous Waste Solvent (F001)</p>

	<p>Pollution Prevention Process</p> <p>Feedstock Reformulated masking wax and alkaline cleaners</p> <p>Waste Masking wax 600 lbs/month.</p> <p>Disposal Wax disposed of as solid waste</p> <p>Common To Both Processes Water and energy usage was not calculated but would appear to be similar for both processes. Wax type changed, but the quantity use remained the same.</p>
Economics	<p>Capital Costs Installation of preheat oven and wax melting tank for the coating line: \$91,000. Modification to the silver plating line to include the removal of the existing vapor degreaser and installation of the alkaline strip tank: \$74,000.</p> <p>Operating Costs Annual operational cost savings for the process modifications totaled \$26,800, which in part included reduced hazardous waste transportation and disposal costs. These savings also included fees that had been paid for hazardous air emissions and generating hazardous wastes.</p> <p>Payback Period 6.1 years</p>
Benefits	<p>This project resulted in reduced labor costs related to handling Methylene Chloride hazardous wastes, thus freeing up employees' time for other tasks. It resulted in releasing critical additional floor space previously used for storage of this hazardous waste. Reduced RCRA and Hazardous Air Pollutant (HAP) requirements have also alleviated workload. The improvement in the work environment has reduced the risk to employees associated with the HAP and RCRA wastes.</p>
Problems Encountered	<p>No major problems were encountered during project implementation.</p>
Technology Transfer	<p>Wax formulation was modified to provide optimum properties for the process. Both the wax melting/coating line and the cleaning system were tailored to utilize existing conveyer lines. The wax and the alkaline soap cleaner are commercially available.</p> <p>The use of wax as a masking material for electroplating operations could be transferred to other electroplates that require selective plating masking.</p>
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Company Contact	<p>Mr. Jim Nawrocki, Sr. Mfg. Engineer Phone 414/438-5107</p>
Pollution Prevention Resources	<p>Free, On-site Technical Assistance University of Wisconsin Extension Solid and Hazardous Waste Education Center Milwaukee area: 414/475-2845 Remainder of state: 608/262-0385</p>

Pollution Prevention Information Clearinghouse
Wisconsin Department of Natural Resources
Cooperative Environmental Assistance
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