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## CASE STUDY: Moen Incorporated

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Location:	Sanford, NC (Lee County) and New Bern, NC (Craven County)
Industry:	Plumbing components and plastic faucets (SIC: 3432)
Pollution Prevention Application:	Solvent Substitution, Hazardous Waste Reduction, Water Conservation, Process Modification
Annual Savings:	\$2,745,000 plus Title V regulatory fees
Payback Period:	Not calculated
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### Background

Moen Incorporated's facilities produce components for kitchen and bath plumbing products. Processes at the facility include plastic molding, screw machining, degreasing, brazing, brite dipping, buffing, die casting, and metal finishing (including decorator plating and powder coating, copper-nickel-chrome plating, and physical vapor deposition). Moen has used a team approach to implement several innovative waste reduction projects over the past 14 years. Also, in 1995, Moen developed an environmental strategic plan that aggressively focused on establishing and achieving waste reduction goals in air emissions, process water, and wastes.

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### Waste Reduction Activities

#### Vapor to Aqueous Degreasing

Moen machines leaded brass rods into fittings. The oily machined fittings require degreasing before further processing, and this was previously achieved with vapor degreasing using methylene chloride. In 1993, Moen converted its degreasing process to a five stage aqueous cleaning line in response to pending air quality regulations and concerns over future liabilities associated with the disposal of methylene chloride still bottoms. The aqueous cleaning line eliminated all toxic air emissions, but increased hazardous waste generation by about 700,000 pounds per year since the resulting aqueous waste was hazardous due to its lead content.

Moen's waste reduction team focused on the aqueous wash waste stream due to its size and the expense of its disposal as a hazardous waste. The team chose to install an ultrafiltration membrane system for the in-process removal of oil from the aqueous cleaner. Although the membrane system experienced problems due to the elevated temperature of the cleaner, it was successful in extending the cleaner life, and reduced aqueous wash waste by approximately 45% in 1995. The waste reduction team continued to pursue other strategies for reduction of the 400,000 pound per year aqueous wash waste stream. In the first quarter of 1996, the membran filter was replaced with a chemical called "Oil Split," which was added to the cleaner to separate the oil in the coalescer, a nonagitated area. Now only a portion of the aqueous wash waste stream remained, and the team worked with air and hazardous waste regulators to eliminate it. An evaporation system was installed that successfully evaporated the water from the aqueous wash waste, leaving only a used oil for disposal.

#### Hazardous Wastes

Moen worked with Carolina Environmental Associates, an environmental service and consulting company, to find facilities that could directly reuse Moen's hazardous wastes. Materials that are directly reused without pretreatment are

exempt from hazardous waste regulations. The proposals were approved by the NCDENR Hazardous Waste Section prior to disposal by the new methods. The buffing by-product, the floor sweepings from the brass screw machining area, the oil filtration waste (diatomaceous earth-based and now cellulose-based), and the wastewater treatment sludge are directly reclaimed by a smelter.

Additionally, Moen is working to find metal removal methods to reduce the amount of metal-contaminated hazardous waste generated. The New Bern facility uses electrowinning (plating) to remove copper from the pre-dip tank to prolong the life and improve the control of the Brite Dip plating process. The facility is also exploring other metal removal technologies.

### Other Waste Reduction Activities

- Cyanide brass plating was eliminated in 1996 and replaced with a metal plating process called physical vapor deposition (PVD). This process is cleaner and reduces the scrap rate on decorator parts by over 10%.
- Moen has implemented counter-flow rinse tanks and efficient water use practices on the plating lines at the recently expanded Sanford facility.
- The facility has eliminated the use of underground storage tanks, and new above ground tanks were constructed in buildings and with containment areas to prevent accidental environmental releases.
- Wooden pallets and cardboard are now recycled at both facilities. The previous cardboard baler was under-capacity for the volume of cardboard generated by the New Bern facility, and was replaced in 1996 with a high-density compactor for cardboard.
- Moen received a 1997 Governor's Award for Excellence in Waste Reduction for Significant Achievement in the Large Business Category.

### Waste Reduced and Annual Savings

The following table shows the wastes reduced and the associated cost savings of the waste reduction programs implemented at Moen's facilities.

Waste Reduction Process	Waste Reduced	Annual Savings
Vapor to Aqueous Degreasing	50,000 lbs./year, to 0 lbs./year air emissions	Avoided Title V designation
Addition of "Oil Split" and evaporator to aqueous degreaser	728,000 lbs./year, to 0 lbs./year hazardous waste (Payback period of 2 mos.)	\$350,000
Hazardous Waste	1,000,000 lbs./year (>90% overall reduction)	\$145,000
Conversion to PVD	Scrap waste reduced 10%	\$2,000,000
Process Water Use Reduction	40,000,000 gal./year (54% water use reduction)	\$200,000
Recycling of wooden pallets and cardboard	1,800,000 lbs./year solid waste (42% reduction)	\$50,000
<b>Total Savings</b>		<b>\$2,745,000</b>