

Paint stripping: reducing waste and hazardous material

Reducing waste by finding alternatives to paint stripping is smart business. Benefits include:

- Improved working environment, health, and safety for employees
- Reduced regulatory compliance burden
- Savings on materials and disposal costs
- Marketing advantage of the “environmentally friendly” label.

Preparing or restoring old surfaces for coatings often requires stripping existing paint to ensure a good bond exists between the surface and the new coating. This fact sheet provides information to help businesses evaluate paint stripping methods; it also identifies hazardous material alternatives and waste reduction options for paint stripping operations.

Currently, many paint stripping operations use chemical strippers that contain methylene chloride (MeCl), a suspected human carcinogen that has been shown to cause cancer in laboratory animals. To safeguard against these hazards, regulations require businesses to examine paint stripping operations closely. For example, OSHA limits exposure to MeCl to 25 ppm in an 8-hour period. This standard requires employers to monitor staff exposure. The Environmental Protection Agency (EPA) recently approved National Emission Standards for Hazardous Air Pollutants (NESHAP) that require paint stripping businesses reduce their use of paint stripping formulants containing MeCl. More information can be found by visiting www.epa.gov/ttn/atw/eparules.html.

In Minnesota, rinse water from MeCl stripping is a listed hazardous waste. This wastewater can only be discharged to a sanitary sewer system after proper notification is given and approval is received. In the Twin Cities area, no wastewater containing MeCl can be discharged unless Metropolitan Council Environmental Services (MCES) guidelines are met. For more information about MCES, visit www.metrocouncil.org/environment/industrialwaste.

Assessing the Need for Paint Stripping

In some operations, paint stripping is required to restore products to bare surfaces. Unless this is the goal of your operation, you may be requiring unnecessary paint stripping. Therefore, you should identify why paint stripping is done in your operation. If not required, paint stripping

can be a sign of one of these problems in your process:

- Parts are improperly cleaned or dried prior to painting/coating
- Rejects are caused by poor coating technique, either in the application of the coating or in the curing process
- Faulty equipment is used or coating equipment maintenance/cleaning is poor
- Product damage results from improper handling, assembly, storage, or distribution

If paint stripping is being used in your operation, but not required, you should investigate why it is necessary and how the problem can be solved to reduce the need for paint stripping.

Paint Stripping Alternatives

Stripping techniques vary based on the surface being refinished and the complexity of the technique being used. Be sure the stripping method being used is compatible with the part, especially for parts made from plastic, wood, and some metals. Then, determine if the part can handle the stress of the techniques used. Mechanical removal procedures eliminate the use of hazardous chemicals, but can damage the part during the removal process. A combination of techniques may work best.

Scraping, sanding, and wire brushing. These methods are good for small areas of non-detailed surfaces. They can be labor and time intensive.

Tumbling. Parts are placed in a mixer and tumbled with stones or other abrasive material. Tumbling is hands-off and can save labor time and costs. A drawback is that parts must be separated from the abrasive material, which can be time consuming if parts are small. Tumbling is also used for deburring, metal finishing, and polishing.

Abrasive blasting. Sand, glass or plastic bead, shell, metal shot or grit, sodium bicarbonate,

or frozen carbon dioxide is used with air or water pressure to remove paint. Evaluate the type of blast media for the appropriate aggressiveness on the coating and on the part. Use the most durable abrasive to maximize its repeat use and generate the least amount of waste per part stripped.

Freezing/cryogenic. A liquid nitrogen immersion at approximately -200°F causes paint to crack and breaks the adhesive bond.

Burn-off ovens/pyrolysis. Paint is burned off the substrate at high temperatures. This method is effective with some substrates, but extra time is needed to bring parts to the correct temperature and cool them. Ash residue also needs to be removed from the part.

Molten salt baths. Parts are immersed in a molten salt bath at a temperature between 550°F and 900°F. This method typically removes paint in several seconds, leaving an ash residue which can be removed by rinsing. Salt stripping is corrosive and can potentially damage equipment and buildings. Air emissions, wastewater and sludges associated with this process may require additional environmental controls and/or treatment.

Fluidized sand beds. Heated sand or other granulated material vaporizes the coating while the mechanical action gently removes ash from the part. This is a fast, gentle way to remove paint. The configuration of parts within a fluidized bed of sand or salt must be given special consideration to achieve maximum efficiency.

Laser. A laser beam is used to decompose the coating. This procedure works best on flat materials and can be slow.

Chemical Stripping Alternatives

Alternative chemicals for stripping paints and coatings are frequently marketed as alternatives to chlorinated solvents, particularly MeCl. These alternatives are generally heated aqueous solutions or unheated organic solvents. Some alternatives are considered volatile organic compounds (VOCs) and can be flammable or combustible. Potential health hazards and environmental problems associated with using corrosive or flammable materials should be considered.

In some cases, alternative chemicals require more time or stronger physical action to remove paint. Effectiveness may vary from paint to paint. Heat may be needed to achieve adequate paint removal. The chemicals may not be compatible with the composition of the part. For example, some may attack plastic components just like they attack paint. Special formulas of chemical strippers are versatile enough to remove difficult coatings without damaging the part.

Aqueous stripping solutions. The most common solutions are alkalines with a pH of 13 to 14. These strippers are called hot strippers, because heat is commonly added to improve stripping. Aqueous strippers destroy the bond that holds paint resins together. Potassium hydroxide or sodium hydroxide (lye) are often used in these stripping solutions. Although these strippers are not flammable, they can cause severe skin burns making protective clothing very important. Metals such as aluminum and zinc will react vigorously in alkaline solutions, dissolving parts and endangering employees.

Solvent strippers. Solvent strippers are often used at room temperature and called cold strippers. They can be applied by immersion, brushing, or flowing. Solvent strippers remove paint by dissolving, softening, or both. Solvent strippers can include ketones, glycols, esters, phenols, and other hydrocarbons. In addition to being VOCs, many of the solvent strippers contain hazardous air pollutants (HAPs) and chemicals subject to reporting under the U.S. EPA Toxic Release Inventory (TRI) regulations.

Biochemical-based stripping agents. Biochemical-based stripping agents are an alternative to petroleum-based chemical strippers. Biochemicals are derived from natural, renewable resources such as fruits, vegetables, trees, and other crops. Although they are considered VOCs, the chemicals are not listed on EPA's TRI list or considered HAPs. Biochemical-based strippers may include terpenes from pine or citrus; lactic acids from corn sugars; dimethylsulfoxide from wood pulp and paper by-products; or soy oil from soybeans.

Additional Resources

For information about regulations for paint and paint stripping waste disposal, contact the Minnesota Pollution Control Agency (MPCA) at 651.296.6300 or 800.657.3864. You may also contact your county hazardous waste program.

For a complete list of coating-related resources, please request the checklist, Resources for Minnesota's Coating Industry [#35]. Resources can also be found on the Painting and Wood Finishing page on MnTAP's Web site <www.mntap.umn.edu>.

For More Information

For more information on efficiencies and preventing painting and stripping waste in manufacturing, contact Paul Pagel, MnTAP coatings specialist, at 612.624.4638.



For More Information

MnTAP has a variety of technical assistance services available to help Minnesota businesses implement industry-tailored solutions that maximize resource efficiency, prevent pollution, increase energy efficiency and reduce costs. Our information resources are available online at <mntap.umn.edu>. For personal assistance call MnTAP at 612.624.1300 or 800.247.0015.