MINNESOTA TECHNICAL ASSISTANCE PROGRAM

Case Study

UNIVERSITY OF MINNESOTA

Solvent waste cut with spray nozzle selection when cleaning paint straining equipment

Results:

- Reduced solvent waste by 80% or 11,000 gallons per year.
- Saved approximately $13,000 per year on solvent purchase and disposal costs.

Crenlo, Inc., located in Rochester MN, manufactures cabs for agricultural and construction equipment, electronic cabinets and enclosures, and NEMA electrical enclosures from steel and aluminum. Finished products are coated with baked enamel paint and most paint colors are prepared on-site. Unused paint from any prepared batch may be stored for future use. This paint was remixed and strained to remove solids larger than roughly 90 mesh screen size before delivery to the spray booths.

Before the changeover, the straining equipment was cleaned using fresh solvent sprayed from a hose fitted with a nozzle spraying a flat fan of solvent from a 0.172 inch diameter orifice. This nozzle was rated for 4.3 gallons-per-minute (gpm) flow at a 30 pounds-per-square-inch (psi) supply pressure. Annual cleaning of the straining equipment produced about 14,000 gallons of waste costing at least $16,000 per year. The cleanup solvent was a recycled blend that was distilled off-site and returned to Crenlo. A single charge covers both purchase and processing costs. The 4.3 gpm nozzle was originally selected because it was already in use on an aqueous spray wash line at the plant, and therefore a supply was available on-site. The idea to evaluate other nozzles came from a U.S. EPA-funded waste assessment that identified this equipment cleaning operation as a major source of solvent waste at Crenlo; it was concluded that nozzle size was a key factor affecting the volume of solvent used.

Waste Reduction Technique

Three nozzles were purchased and tested in the cleaning system. Flow rates for these nozzles ranged from 1/4 to 1/50 of the original nozzle flow rate. The smallest of these nozzles (orifice 0.026 inch) cleaned the equipment acceptably in 60 to 90 seconds at 30 psi, and also used 80% less solvent than the original nozzle. Waste accumulation from this source was monitored for the next two months and confirmed the effect of the lower flow nozzle.

Implementation Problems

Foreign particles

Foreign particles (rust, etc.) in the solvent feed line plugged the nozzle orifice frequently over the first two weeks of operation. Plugging was eliminated by installing a small in-line basket filter to remove solids before they reached the nozzle.

Cleaning time

Cleaning time with the low-flow nozzle was doubled or tripled compared with the original nozzle. The new 60 to 90 second cleaning time was judged acceptable although it was moderately annoying to operators. This cleaning time was reduced to 30 seconds by instituting a presoak step. The presoak used a dirty solvent bath to remove or loosen most of the paint. The equipment was then sprayed with fresh solvent for a final rinse. The presoak resulted in additional waste reduction which is not quantified in this case study.

Economic Benefit

No capital investment was needed. Supplies included the purchase of three nozzles for testing ($70) and a small, in-line basket filter (approximately $50). Six hours of labor was needed to test the nozzles, and an estimated four hours was spent unclogging the nozzle orifice over the first two weeks of operation and installing the filter. Total implementation cost was approximately $270.

Waste reduction from using the lower flow nozzles was about 11,000 gallons per year. Savings were about $13,500 per year.

Implication/Application to Other Companies

Nozzle selection is an important factor in raw material use and waste generation whenever the sprayed material is used once and discarded. Other common applications are pressure washing or a spray wand use. When nozzles are used in a spray-to-waste application ask, “Is there a better nozzle for this application?” This is

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612.624.1300 • 800.247.0015 (Minnesota only) • FAX 612.624.3370 • www.mntap.umn.edu

especially true if a nozzle was chosen because of availability rather than performance. In the Crenlo, Inc. case study the nozzles were borrowed from a different cleaning system in the plant. Whenever equipment has been borrowed from another application, stretched, or jerry-rigged, further examination may uncover waste reduction opportunities.

Because nozzles come in a wide variety of sizes and spray patterns, the low cost of nozzles usually makes testing nozzles for optimal performance practical. Assistance in selecting nozzles is available from a number of nozzle manufacturers including: Spraying Systems Company, who can be reached at 952.944.7202 or by vising their website at <www.spray.com>; and Lechler, Inc., who can be reached at 800.777.2926 or by visiting their website at <www.lechlerusa.com>.

For More Information

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