Finisher's Think Tank



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Organic finishes, such as painting and powder coating, have become more popular, based on factors such as:

- Consumer demand;
- · Product styles; and
- Corrosion protection.

Finishing operations, based on the type of coating application, may incorporate these benefits: waste minimization, recycling, and easier waste treatment. The importance of spray cleaning as part of these finishing cycles in the surface preparation of metals has become more evident. If the base metal surface has not been sufficiently cleaned in the first step, subsequent conditioning (*e.g.*, phosphatizing) followed by organic coating, will certainly fall below desired quality. Spray cleaning incorporates the benefits of mechanical action and chem-

Spray Cleaning— Do It the Right Way

ical reaction, effectively removing oils, grease, smuts, and other soils related to the manufacture and fabrication of parts. Doing it right means *spraying it right*, thereby cleaning it right. Let s review some considerations for spray cleaning, with suggestions and troubleshooting tips.

Parts

"Parts is parts"-a sometimes-heard line, is a gross mis-statement. Parts are unique, based on factors such as their make up, alloy, surface condition, or heat treatment. Steels may be hot or cold rolled. Mechanical forming drives oils and metallic shavings into the part surface. Heat treating bakes and burns oil and grease into surface pores, while also forming oxide scale. Mass finishing may leave media residue or compounds from chemical processing on the surface. Storage time of parts and atmospheric humidity may accelerate rusting. These are some concerns with regard to knowing the alloy of metal, method of fabrication or machining, heat treating, and initial surface treatment. Understanding what s been done to the parts we have helps to develop an effective cleaning cycle.

It s common to have a mix of products or variety of parts designated for organic finishing in the same process line, or equivalent cycle. Aluminum, brass, copper alloys, steel, stainless steel, and zinc may be run interchangeably. Often, individual parts may be fabricated using mixed metals or alloys. These concerns affect the chemistry of the cleaner, along with the cleaning demands or requirements.

Fixturing or Racking

Parts are exposed to the impact of mechanical spraying of cleaners, rinses, phosphates, and any other process solutions. Fixturing or racking of parts should be firm, allow full exposure to treatment solutions, provide for complete drainage of solutions, and minimize entrapment and carryover of solutions. The racks or fixtures should be fabricated from materials compatible to the chemistry exposure, coated with appropriate plastic, vinyl, or similar protective coatings. Reconditioning or stripping of rack tips (chemical immersion or oven) should not attack the materials of their construction or coatings.

Spray Cleaner

A variety of ferrous and nonferrous metals, along with alloys and mixed components, are spray cleaned. The critical step of spray cleaning may be conducted off line, to preclean or, as is common, as part of an automatic process line (*e.g.*, three- or five-stage machines). Spray cleaners offer the following benefits:

- Low-foaming cleaning action for displacement of soils;
- Mechanical action, which facilitates cleaning;
- Lower temperature ranges, reducing energy use and cost economizing.

Spray cleaning solutions may range in pH from near neutral (6-8) to high pH (14). This enables the use of selected solutions to clean a mix of metals, including aluminum, brass, copper alloys, steel, stainless steel, and zinc. Displacement of oils and grease is preferred. The sprayed cleaner is recirculated from a separate tank, usually incorporating mechanical skimming devices, overflow weir, coalescer, or membrane filtration. In this way, the soils are continually separated, preventing their redeposition on parts, and lengthening the cleaner service life.

The spray cleaner s active level of surfactants and wetting agents is usually lower than the requirement for an immersion soak cleaner. This is because mechanical spraying significantly helps to remove the soils wetted and loosened by surfactants and wetting agents. The levels of these organic cleaning agents, importance of cloud point (related to surfactants), and incorporating defoamers, contribute to maintaining the important low-foaming characteristics. Water hardness conditioners are very critical to successful spray cleaning. Spray nozzles must be kept free of calcium, magnesium deposits and soap sludges to prevent pluggage. If it doesn t squirt, it doesn t work.

Liquid and powder spray cleaners are effectively used in many applications. Typical operating parameters are given in the accompanying table.

Some troubleshooting items have been mentioned, and these and additional considerations are given in the following breakdown.

Failure to Adequately Clean

- Concentration of spray cleaner underconcentrated. Adjust as required.
- Solution temperature out of range. Adjust accordingly.
- Insufficient residence time for spray cleaner contact. Adjust accordingly. This may affect overall line speed, and

Cleaner Type	Conc. Range	° F	°C	Time, min	Agitation, psi	
Powder	2-5% v/v	100-160	38-71	0.5-3	15-35	
Liquid	*3-6 oz/gal	100-160	38-71	0.5-3	15-35	
*22.5-45 g/L						

other processes, specifically rinsing and phosphate.

- Chemistry of spray cleaner not sufficient for the specific cleaning requirement. Conduct appropriate evaluation to determine if surfactants and wetters or alkalinity should be changed. Consider separate precleaning of troublesome parts.
- Spray nozzle. Insufficient pressure, plugged, or spray pattern. Adjust pressure, replace or clean plugged nozzles, confirm water conditioner blended into spray cleaner, install spray head delivering desired pattern on parts.
- Redepositing previously removed soils. Service mechanical oil removal devices. Determine if cleaner service life has been exceeded and replace with fresh make up.
- Previously applied coating on parts (*e.g.*, anodize, lacquer, phosphate). Determine

optimum stripping method, chemical or mechanical.

There is another problem often overlooked. This is the accumulated buildup of organic coatings (lacquers, paints, powder coats) on racks and fixtures. Failure to remove these agglomerated materials has the effect of slowing the speed of conveyorized lines. This may result in or contribute to overcleaning or etching of parts, and usually a reduction in productivity.

Organic finishes, especially powder coating coating, have become popular for several reasons, including the ones given here. Surface preparation, especially cleaning, critically affects subsequent organic finishing. Spray cleaning is a quick, effective method for removal of surface soils prior to the conditioning step before paint or powder. Spray cleaning—do it the right way. *P&SF*