Pretreatment & Organic Finishing

R.W. Phillips Jr. (Left) • MarRich Associates
P.O. Box 3072 • Lynchburg, VA 24503

R.W. Phillips III • Madison Chemical Co., Inc.
(Madison, IN 47250) • Burlington, NC 27215

This month's column is the second in a series about establishing and operating a cleaning and phosphating process. Some basic steps can help avoid problems.

Teamwork is one of the most important ingredients for establishing successful production techniques, so it is important for management to insist on a team approach. It is also important for everyone involved to get the "whole picture" when establishing a chemical process from scratch. It has been my observation that many problems can be avoided by involving everyone in the process from the start.

Let's begin with soils that typically cause problems that lead to failures in finishing operations.

Common Soils

Oils—"Greasy kids stuff," such as mineral oils, hydrocarbon, animal, and vegetable oils. These stick to a surface because of a phenomenon known as surface tension, or "sticking energy," that allows the oil and surface to attract each other.

Oils polymerized to provide special applications have a tendency to oxidize with age on a metal surface, and may act as a varnish coat, requiring heavy-duty cleaning similar to stripping paint.

Sulfurized oils are usually poor-quality mineral oils. The sulfur content will oxidize, requiring a solvent cleaner, or special additive to a cleaner, and create problems with disposal, as well as increased costs.

Carbonized oils, caused by heating or aging, can create magnetic carbon smuts or oxides, requiring heavy-duty alkaline plus solvents, or acidic solvents for cleaning.

Animal and vegetable oils can be cleaned with most alkaline/surfactant cleaners in spray operations. They can, however, cause problems in tank soaking operations. Fish oils can cause many problems with cleaning and rinsing, without the use of high-detergent additives or solvents, and should never be allowed.

Semi-solids—Greases, waxes, tars, asphalts, natural soaps, mineral soaps, stamping and buffing compounds. These appear on the surface as oily textured films that create slippery or water-resistant conditions.

They can oxidize and form varnish-like surfaces that resist cleaning in normal solutions. In most cases, the presence of semi-solids will require pre-cleaning before going to a paint line operation, because of the difficulty involved in cleaning them to an acceptable condition. They often cause contamination in finishing solutions.

Solids—Oxides, such as rust and scale; heat treatment oxidation with carbonized oils and greases; smuts with carbon or hydrocarbons; varnishes or resins; and shop dust from parts sitting in heavy traffic areas, or airflow patterns.

Sanding rejects from the painting process will cause a build-up of solids in solutions, unless they are blown or wiped off before being returned to the process. Never allow parts to sit in areas where high humidity can cause oxidation (sometimes not seen with the eye). This can cause adverse effects in the pre-paint treatment process.

Rust prevention oils and formulas can become polymerized and act as a varnish. Sometimes, the varnish is partially removed in handling or storage, which leads to oxidation in areas.

Welded areas, including spot-welds, will lead to oxidation on surfaces and cause blemishes under the finish. They require special cleaning.

The most acceptable types of oils and rust preventives are:

1. Mineral oils (hydrocarbon oils). These are mostly petroleum types, refined to a clean, free-flowing liquid, without any cloudy or muddy appearance. Additives can and should be used to aid rust or oxide protection.
2. Water-soluble, or water-miscible oils, with rust protection additives, such as amines (no aliphatic, fatty or paraffin derivatives), emulsifiers and alkalines.

Examine the volume of work to be processed. Examine the shape and size of parts to ensure complete coverage of all areas when a spray washer is the choice of process. Review each step of the process before the part arrives at the finish line. Review storage methods, storage areas, and how parts are transferred. Review the handling process of the parts.

The substrate(s) should be considered. Will there be one alloy, or multiple alloys of metals? Are there going to be castings, roll-formed parts, welded and drawn parts, or all flat sheets from stamping and shearing? If multiple metal alloys are involved, will they be processed separately or in a mixed random schedule? Do not hesitate to question every step in the manufacturing process to determine if there are any conditions that require special cleaning consideration.

Remember, it is better to establish a process that exceeds requirements in the beginning, because it will probably be needed in the future. Most modern processes include a pre-cleaner, followed by a cleaner that can be counterflowed to reduce contamination of the main cleaner, and reduce the cost (by as much as half) over a single cleaner. This also allows for handling unexpected soils and gives a longer solution life. Counterflow systems are important for working toward a zero discharge process. The use of counterflow rinses and double cleaning can reduce water consumption by 65–70 percent.

Next month's column will cover rinsing and water recycling. o