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The Importance of Surface Preparation

Any process only provides optimum performance if the contributing parts are satisfactorily functioning. A common phrase linked to computers highlights the importance of programming or entering data. If quality is entered, a quality outcome can be expected. Likewise, if poor information or "garbage" is entered, the same can be the outcome. Metal finishing processes exemplify this because each step or treatment is critical to achieving the preferred end result. In this respect, I have always acknowledged the importance of surface preparation, especially cleaning, to be the first big critical step in any finishing cycle. At least three quarters of process rejects can be traced to failures in surface preparation. Poor cleaning manifests itself in the form of: poor adhesion (plating, paint, chromate, phosphate, etc.), deposit hazes and clouds. Any of these conditions reduce quality, result in costly rejects and affect desired production schedules. By focusing on cleaning, let's review some pertinent information that can keep this first step a successful one.

There is always some degree of evaluation associated with identifying the best soak cleaner to use in a specific application, operating within certain parameters. Suppliers provide liquid and powder cleaners that have been developed to remove a wide range of oils, grease and shop dirt. A new cleaning application may require help to identify or confirm the types of oils that must be removed. This also applies to situations where something has changed, thus inhibiting the usual reliability of the cleaner. Manufacturers submitting parts to the finisher can provide samples of the oils or technical data information. This helps when selecting a cleaner or related modification. Suppliers have a very good background in what types of cleaner formulations work best to remove specific soils, or groups thereof. Even the types of parts for processing can be helpful to selecting candidate cleaners. Examples would be extruded parts that may contain molybdenum disulfide additives, or steel stampings filmed with chlorinated paraffins. Supplier's or local labs equipped with appropriate instrumentation, such as gas chromatography or UV spectrophotometry, may be able to identify unknown oils. Simple, quick, qualitative analysis can also be very helpful. The following lab testing, using proper care, safety and protection, can also be considered. Results may not be conclusive, but can give a direction in the cleaner selection and evaluation.

- Add equal volumes of the oil and water to a test tube. Shake well. If there is a separation, either the oil or water is the surface layer. If the oil is the bottom layer (denser), it could be a chlorinated or mineral type.

- The previous oil and water, on mixing, becomes cloudy or tan / white opaque. This would indicate a water soluble or emulsifiable oil.

- Pour some oil into a test tube. Add a few drops of dilute hydrochloric acid and gently heat. An odor of sulfur (rotten eggs type) indicates a sulfurized oil.

- Pour an equal volume of the oil and water into a test tube. Mix well. There is a distinct separation of the layers. Add a few drops of liquid caustic. Mix again. The oil has now become soluble or emulsified in the water layer. The result indicates a fatty acid in the initial oil sample.

- Pour some oil into a test tube. Add a few drops of liquid caustic and mix well. If the solution thickens, gels or congeals, this would indicate presence of chlorinated oil.

Once candidate cleaners have been selected, appropriate cleaning tests are conducted. This can be accomplished in the lab, a pilot plant or in on-site trials. Once the formulations that provide satisfactory cleaning have been identified, the optimum cleaning operating parameters can be determined (time, temperature and concentration). Once these have been established, the selected cleaner bath can be aged, through repeated cleaning. Maintenance additions made to restore desired cleaning effect can be confirmed. This evaluation also confirms how much contaminant soil the cleaner can accept, and the anticipated economy of cleaner bath service life between dumps. A rule of thumb is the ability to add at least twice the maintenance amount of cleaner compared to the initial make-up.

Once the actual cleaner bath service life has been established, measure the specific gravity of the solution before dumping it (Product concentration should be equivalent to the initial make-up.). The specific gravity will indicate how much dissolved soils, emulsified oils and suspended materials are in solution. Repeat this measurement for the newly prepared cleaner. As the cleaner bath is analyzed (most likely a titration procedure), also measure the specific gravity. This may serve as a useful precaution for tracking the effective service life of the bath, especially where conventional analysis may not be a sufficient predictor of service life. In this way, cleaning rejects may be more readily avoided and scheduled downtime can be planned to avoid unwanted line shutdown. Selecting the right cleaner and properly maintaining it with respect to operating parameters will go a long way to insure that the first big step is successful.

Acid pickling tips

Hydrochloric acid is excellent for removing weld scale from parts. It is also an excellent selection for treating high carbon, hot rolled steel. Typical operating parameters are 15 to 50 vol%, 80 to 120°F (27 to 49°C)

Sulfuric acid is preferred for low carbon, cold rolled steel. Typical operating parameters are 5 to 15 vol%, 75 to 100°F (27 to 38°C).

Plating rejects may also often occur by using the wrong acid or applying it incorrectly. An example is overpickling, which results in etching, hazing, speckling and pitting. *P&SF*

Test Your Plating I.Q. #427

By Dr. James H. Lindsay

Electrocleaning

1. In ___________ electrocleaning, more gas is evolved on the part.
2. _____________ electrocleaning tends to passivate the surface.
3. Work that is susceptible to hydrogen embrittlement should avoid ________ _____ electrocleaning.
4. In reverse-current cleaning, the workpiece is __________.
5. Why is direct-current electrocleaning used to clean buffed nickel prior to chromium?

Answers on page 38.