First Step for a Great Finish is Surface Preparation

The first step in any finishing cycle is to start with a clean surface. Yet at least 75% of process rejects can be traced to failures in surface preparation. Poor cleaning manifests itself in the form of poor adhesion (of plating, paint, chromate, phosphate, etc.) deposit hazes and clouds, all of which qualify as culprits in reducing quality, increasing costly rejects and negatively impacting production schedules.

Here are the top 3 steps for successful surface preparation.

1. **Preliminary Evaluation**

    - Suppliers provide liquid and powder cleaners that have been developed to remove a wide range of oils, grease and shop dirt. But there is always a certain degree of evaluation associated with identifying the best soak cleaner to use in a specific application and operating within certain parameters.
    - In the case of a new cleaning application, you need to know what works for you, and you should confirm the types of oils that must be removed. Similarly, this also applies to situations where something has changed in an existing application that has inhibited the usual reliability of the cleaner.
    - Matching the types of formulations that work best to remove specific soils and contaminants. 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.

2. **Quick, Simple Analysis**

    - Lab testing – observing proper care, safety, and protection – can also be instructive. While results in this case may not be conclusive, they can offer clearer direction in cleaner evaluation and selection.

- 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, denser layer, it could be a chlorinated or mineral type.
- If the previous oil and water, upon mixing, becomes cloudy or tan / white opaque. This would indicate 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 the presence of chlorinated oil.

3. Testing, Testing

- Once a cleaner has been selected, appropriate cleaning tests are conducted. This can be accomplished in the lab, a pilot plant, or on-site trials.
- Having identified the right formulation that provides satisfactory cleaning, the operating parameters can be determined (time, temperature and concentration). Then the selected cleaner bath can be aged through repeated cleaning.
- Maintenance additions made to restore desired cleaning effect can be confirmed. A rule of thumb: The ability to add at least twice the maintenance amount of cleaner compared to the initial make-up is equivalent to cleaner bath dump.
- With the actual cleaner-bath service life established, measure the specific gravity of the solution before dumping it. The specific gravity will indicate how much dissolved soils, emulsified oils and suspended materials are in solution.
- 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 an accurate predictor of service life.
- Cleaning rejects may be avoided, and scheduled downtime can be planned to avoid unwanted line shutdown.

Surface Preparation Tips

1. **Acid Pickling**
    a. Hydrochloric Acid is superior in removing weld scale from parts. It is also an excellent selection for treating high-carbon, hot-rolled steel. Typical operating parameters are 15-50% by volume, 80-120 deg F (27-49 deg C)
    b. Sulfuric Acid is preferred for low-carbon, cold-rolled steel. Typical operating parameters are 5-15% by volume, 75-100 deg F (27-38 deg C).
    c. Plating rejects may also often occur by using the wrong acid or applying it incorrectly. An example is over-pickling, which results in etching, hazing, speckling and pitting.
    d. Pickle Aids are a balanced formulation blend of surface-active agents and inhibitors.

2. **Benefits to conditioning parts**
    a. Exceptional solution wetting of the metal surface to increase action of the mineral acid.
    b. Thin surface foam blanket that minimizes corrosive gassing during pickling.
    c. Allows for reducing the mineral acid concentration by 20-50%.
    d. Inhibited to stop base-metal pickling after scale & rust have been removed.

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1-800-648-3412
or techservice@hubbardhall.com