Analysis, Observation and Maintenance

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Metal finishing processes, based on the make up and operating requirements, are subject to depletion of chemical constituents. Cleaners react with surface oils and grease, either by displacement or emulsification. Acids remove oxides, scales, and rusts. Plating baths promote the deposition of preferred metals and alloys. Post finishes are used to apply protective topcoats, such as chromates or lacquers. These are examples of processes that to varying extents are depleted upon use, either by immersion or electrolytically. There are many other baths and processes that are similarly affected when in use. Appropriate replenishment is the critical factor to maintain the desired operation of any process bath, be it surface activation, finishing, or post finishing. This is typically accomplished by adding specified quantities of bath components. Individual salts, additives, or product concentrates, may comprise what is needed to keep any particular system at optimum. As such, the bath will perform with the desired effect, adhering to the prescribed operating parameters. Let us review some of the procedures that should contribute to satisfactory performance of most baths.

Analysis

Proprietary surface preparation baths and generic blends (cleaners and acids) are normally controlled by a titration analysis. The alkalinity or acidity is converted to a concentration of the proprietary product or additive. Maintenance additions are based on the requirement to re-establish the initial make up or bath charge. This can be in the form of adding a product concentrate or specific additive (e.g. caustic or acid). Routine analysis may confirm a fairly consistent consumption pattern. Therefore additions can be made on a specified basis, such as by working shift.

Plating baths present a more complex analysis procedure. This can be separated into wet analysis, instrumental analysis, and plating test. Chemical constituents of the bath (salts and additives) change on an ampere-hour basis. An appropriate schedule for the bath analysis is related to its production use, results of past checks, and vendor recommendations. Wet analysis consists of determining the concentrations of bath components (such as metal, salts, acids or bases, some plating additives) by titration. Instrumental analysis may include determining metal contaminants (atomic absorption), brighteners and other plating additives (chemical separation and UV or visible spectrophotometric). Surface tension is used to measure the concentration of anti pitting agents or fume suppressants, using an appropriate tensiometer. Hull cell testing provides a profile of the deposit by covering all the plating current densities, brightness, leveling, ductility, coverage, and throwing power. Deposit faults or defects may be confirmed by a lack of or excess of any constituents that were analyzed beforehand. Additions of salts, brighteners, or other additives can initially be made to the hull cell, confirming expected improvements, adjustments, or purification. This is especially critical when the desired additions or treatments are first checked in the hull cell volume (267 or 500 milliliters) before implementing in a production plating tank. Analysis and control of the plating bath is not as

complicated or time consuming as it may seem. Many plating shops maintain and operate a control lab. Suppliers of proprietary systems provide on site technical assistance and the services of their regional labs.

Observation

The quality or lack thereof in the surface preparation or plated finish can be readily seen. A problem in the appearance of the conditioned metal surface can help the observer focus on what process or portion of the cycle may be suspect. Poor cleaning or activation may be noted by water breaks after rinsing. Surface smuts may be detected by wiping parts. Pitting may be due to cleaning (attacking base metal or under concentrated electrocleaner) or aggressive acid activation. Poor cleaning and surface smuts may result in brittleness or poor adhesion of the subsequent plating deposit, haze, or clouds. Plating defects occurring in the process bath may include: brittleness, dullness, poor leveling, pitting, poor throw or coverage, off color, roughness, or burning, to name some frequently encountered problems. At the worst, observed problems may be due to a combination of surface preparation and plating.

Maintenance

Proper maintenance includes analysis control as was previously discussed. In some instances maintenance additions can be factored into the production schedule. Properly spaced replenishments will keep concentrations closer to the desired operating range. This eliminates the problem of under concentration severe enough to affect the finishing quality, followed by large corrective additions. Automatic dispensing of plating additives by delivery through ampere hour meters is an excellent method of replenishment and concentration maintenance. Liquid cleaners also exhibit this benefit, dispensing product concentrate to maintain solution conductivity.

Another aspect of maintenance is the importance of equipment operation and service. For the plating bath: filtration, rectification, temperature controllers, contacts, racks & barrels, liners, should be serviced regularly. This greatly helps to minimize plating problems. This also holds true for the equipment needs of surface preparation.

Rejects can easily double or triple the related costs for reprocessing parts. Alternatively, reject parts would be scrapped. By implementing and maintaining a practical system of analysis, observation, and maintenance, rejects can be substantially avoided. In fact, the quality of finishing can meet the requirements, specifications, and specific quality control parameters. These benefits can be realized on a continual basis, from load to load. Analysis, observation, and maintenance may be simple concepts to implement. However, their merits can be easily overlooked. Don’t lose sight or focus.