

3 Keys to Better Surface Preparation

Analysis – Observation - Maintenance

Metal finishing processes, based on their 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, oils or lacquers. These are examples of processes that to varying extents are depleted upon use, either by immersion or electrolytically.

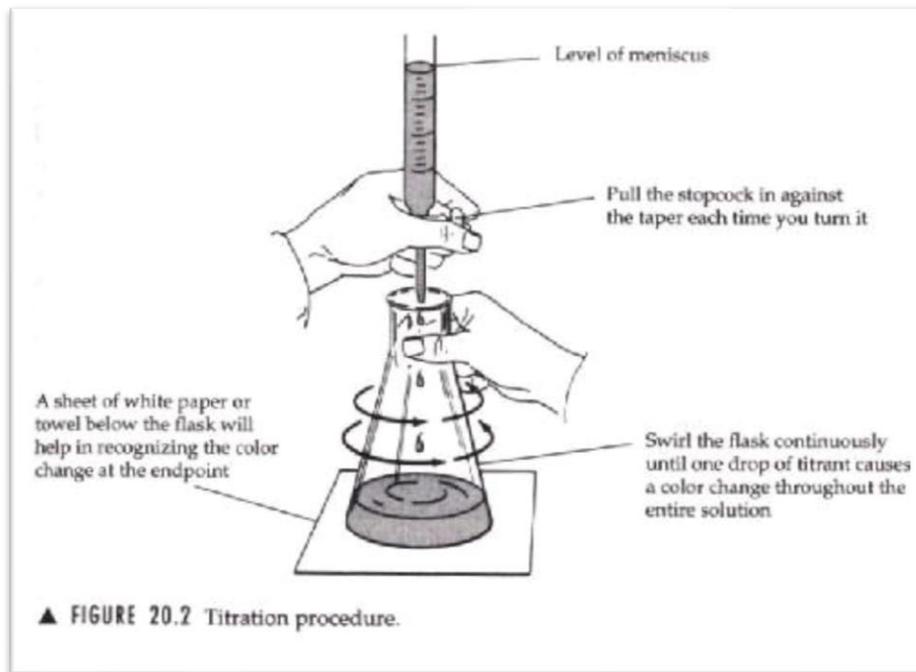
There are many other baths and processes that are similarly affected when in use. Appropriate replenishment is the critical factor in maintaining the desired operation of any process bath, be it surface activation, finishing or post-finishing. This is typically achieved by adding specified quantities of bath components. The processes described require regular reconstitution of specific salts, additives or product concentrates that are depleted via reaction, deposition, and drag out. Thus reinforced, the bath or process will perform as desired, adhering to the prescribed operating parameters.

1. 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 occur by adding a product concentrate or specific additive (e.g. caustic or acid). Since routine analysis can confirm a consistent consumption pattern, additions can be made on a specified basis, such as by working shift.



Traditional Titration Analysis Procedure



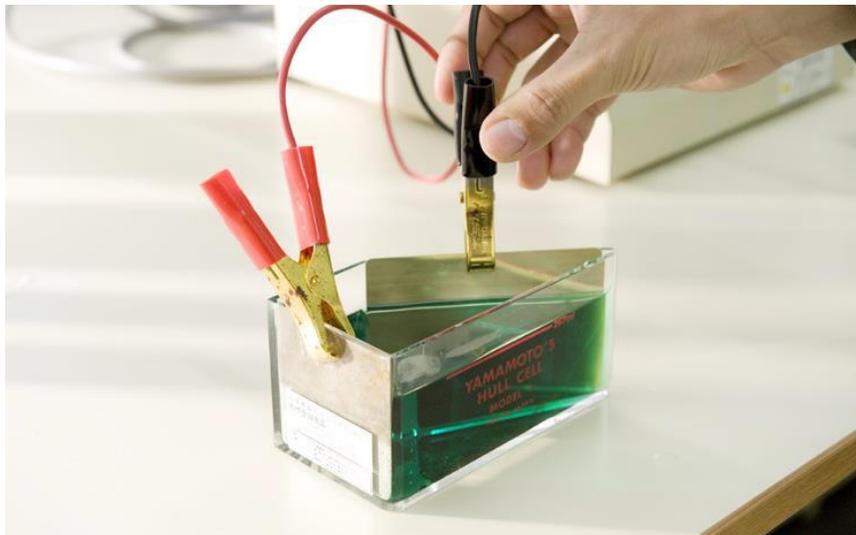
Technique tips are shown in the picture for optimum use of the procedure.

- Plating baths present a more complex analysis procedure, which 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 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 and 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 can be confirmed by a lack – or excess – of any constituents analyzed beforehand. 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.

Hull Cell & Rectifier Used to Test a Plating Solution for deposition Characteristics



Power Connections from Hull Cell to Rectifier: Red (+) from rectifier to anode – Black (-) from rectifier to cathode panel.



2. Observation

- Quality (or lack thereof) in the surface preparation or plated finish can be readily observed. A problem in the appearance of the conditioned metal surface can help an 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 electro cleaner), aggressive acid activation, or lack of an anti-pit additive in the plating bath. Alternatively, it may require filtration to remove fine particles.
- 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 (see above), poor throw or coverage, off-color, roughness or burning – to name but a few frequently encountered problems.

At their worst, observed problems may be due to a combination of inadequate surface preparation and plating. Do not overlook the inherent problem associated with poor quality base-metal parts. They may appear to be fine, but quality issues with material typically become magnified in the finishing cycle.



3. Maintenance

As we've mentioned, proper maintenance includes analysis control. In certain instances, maintenance additions can be factored into the production schedule. Properly spaced

Plating Additive Dispensing via Amp Hour Meter



Liquid cleaners offer similar benefit, dispensing product concentrate to maintain solution conductivity.

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 delivered through ampere-hour meters is an excellent method of replenishment and concentration maintenance.



Toroidal Conductivity Probe used to activate pump to deliver liquid cleaner

Another aspect of maintenance is the importance of equipment operation and service. For the plating bath, filtration, rectification, temperature controllers, contacts, racks and barrels and liners should be serviced regularly. Not only does this substantially minimize plating problems; it also holds true for equipment properly calibrated and rated for accurate service. Remember, confidence in performance and results is only assured by the accuracy and precision of the process.

Reject the inevitability of rejects

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.

Rejects can easily double or triple the related costs for reprocessing parts – or else they're scrapped. Fortunately, by implementing and maintaining a simple and practical system of **analysis/observation/maintenance**, rejects can be substantially avoided. Done right, this is a benefit that keeps on giving, on a continual basis, from load to load.

Our people. Your problem solvers.



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