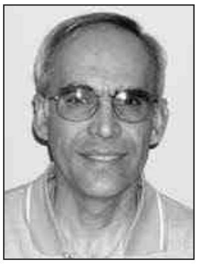

Finishers' Think Tank

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Racks: We Cannot Plate Without Them

Racks offer us the ability to fixture parts in a stationary manner for plating and other surface treatments, such as anodizing and electropolishing. The manner in which parts are fastened can range from simplicity (wiring) to specially designed racks with spring contacts and internal anodes. The manner in which parts are racked, along with the integrity of materials used, have a critical bearing on satisfactory processing of parts. Racks involve the application of metals, ranging from copper, bronze, copper / phosphorous and stainless steel. As we should be aware, the prices of these metals have risen appreciably in recent months. Therefore, it is important to factor in quality maintenance and correct use of racks.

Racks are usually designed and built with these considerations:

- Parts and their geometry
- Plating bath application and throwing power
- Targeted current density
- Production requirements per rack / flight bar
- Durability and maintenance

Knowing the number of parts that are racked helps to determine the total amperage by:

(total surface area) × (targeted current density).

This value is cross referenced to the current carrying capacity of the metal used in the rack construction (*e.g.*, copper). Hooks are very important. Without good stability in agitated baths and solid contact to the bus bar, electrical contact can be interrupted or fall short of the required current density. Hot or glowing hooks during a plating cycle are a primary alert to this problem.

Rack contacts, clips, and tips, are designed for particular parts. Considerations include:

- Contact points for optimum current distribution
- Cradling to insure rigidity or gravity contact
- Contact angles to minimize thieving and rack marks
- Geometric orientation prevents thieving, promotes maximum drainage
- Type of plating bath and application
- Transfer efficiency

Size and dimensions of materials are based on the current requirement.

Contacts, tips and clips are made of any of the materials described previously, based on process application considerations. As example, tips made of titanium are overwhelmingly used in anodizing.

Well built and maintained racks provide an economic payback with regards to trouble free operation and working life. Rack tips are opened, closed and conform to specific holding requirements. Quality connections to tips and splines are usually accomplished with rivets, screws and welds. This is critical to maintain desired current carrying capacity.

The simplest rack can be a strand of copper wire, straight or braided. It can be easily formed, recyclable, somewhat labor intensive, but maintenance free. The downside is limited throughput capacity of work, limited reuse and brittleness of the wire after one plating pass. Racks increase production throughput perhaps to the carrying capacity of the process line. Good insulation of the structure is very important. Polyvinyl chloride is the most widely used insulation coating. Done right, it is mixed, applied and cured, for superior service life. During continued use, the insulation could become cracked or pin-holed, resulting in:

- Buildup of laminating metal deposits
- Robbing current from rack tips
- Holding solutions that carry over into down line baths as contaminants
- Accelerating corrosion of the rack base material

Once in service, racks lose their new luster appearance, taking on a used, but hopefully not abused appearance. Rack contact points will eventually become overplated, possibly leading to breaking. Splines may crack or break. Out-of-commission racks or parts thereof effectively lower the production throughput. The service department or rack supplier can provide scheduled maintenance. Many racks are built to facilitate replacement of parts, such as contact tips. Rack sections that are connected with bolts can be readily serviced. Cracked or pin-holed insulation can be patched or stripped and replaced. With sufficient racks in house, rotation keeps available racks consistent with ability for effective service maintenance.

Chemical maintenance in the stripping of rack tips can be very effective. Every complete plating cycle can be supplemented with a strip cycle after finished parts have been removed. It is the best way to minimize plating deposit buildup on rack tips. Two treatment options are available: immersion or electrolytic. It is important to match rack tips for chemical stripping maintenance to the type of chemical solution. For example, stainless steel rack tips such as 304 or 316 series conform well to chemical stripping. Operating facts for immersion strippers:

- Typically strip copper and nickel
- Contains nitric acid, accelerators and fume suppressants
- Solution cooling to minimize temperature rise

Rapid, efficient stripping keeps the contacts clean and more effective.

Electrolytic strippers may exhibit the following profile:

- They anodically strip many metal deposits.*
- The primary oxidizer is an anodic current density at 250 to 700 A/ft^2.
- Secondary chemical oxidizers supplement the reverse current.
- Buffers maintain bath pH close to neutral.
- Operating temperature ranginess from warm to 150°F (66°C).
- Stripped coatings form insoluble metal hydroxides.

Filtration permits removal of the metal sludges. If the sludge is of consistent assay, it could be recycled by a smelter. Operating temperature encourages evaporation, providing the ability for maintenance chemical additions. These factors can position the electrolytic stripper into a no-dump bath.

Many shops and plating installations have specific, designated storage areas for racks. It is important to keep racks off the plant floor, preventing damage from entanglements and being dropped. Racks are only as good as their intended use, design and application. The materials of construction and proper maintenance cannot be overlooked. This is especially true when dealing with ever rising costs of metals and profit margins. ***P&SF***

** Metal deposits include: copper, nickel, chromium, alloys, zinc, tin and solder.*

NASF Welcomes New Members

As of July 22, 2008

Individual Members, Tier VII

Terry Benjamin—IPS, Inc., Long Beach, CA
Steve Deisher—Techmetals, Inc., Dayton, OH
Jim Edwards—Clean Earth Corporation, Gallatin, TN
Denys Flores—Mahle Metal Leve, Brazil
Satish Jalota—CSL Inc., Sunnyvale, CA
Gopal Krishnan—A Star Institue of Microelectronics, Singapore
Brian Larmour—Lisi Aerospace Canada Corp., Dorval, QC
Nicholas Peterson—Vapor Technologies, Longmont, CO
Suzanne Redding—Rohm and Haas Electronic Materials L.L.C., Freeport, NY
Jarrod Schell—Alion Science and Technology, Grand Forks, ND
Ellen Shepherd—LTG Inc., Warren, PA
Peter Tremmel—Accu-Labs, Inc., Chicago, IL

Answers to I.Q. Quiz #444

From page 7

1. **False!** It's total current divided by the cathode area
2. **False.** Throwing power is a quantitative evaluation of deposit uniformity. Covering power is the ability to produce a visible deposit in recessed areas.
3. **True.**
4. **False.** Anodically. Under cathode conditions, non-adherent metals or smuts can form
5. **True.** The voltage is usually higher for barrel plating.