Finishers' Think Tank

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Desired Plating Adhesion: Considerations of the Process

The cost effectiveness of processing parts in one planned cycle cannot be underestimated. Success of the operation indicates finishing requirements have been achieved. By considering plating, the appearance, coverage, thickness of deposit (s), ductility and post quality control testing, the end product is ready for the next step, such as additional processing or assembly. This also means that the cost associated with the actual metal finishing has been achieved, as per budgetary target. When coupled with the job price quote, the anticipated profit margin has been met. This is all on the good side. Success makes everyone happy, especially the customer who accepts parts done right, and on time.

Unfortunately this does not always happen. There could be a slew of problems associated with any project that can certainly challenge the best of metal finishers. Of course, the problems can be the obvious and the unbelievable. Many of us, through experience, have probably encountered many of these challenges. By considering plating adhesion problems, let us review some of the varied problems that can and do occur.

"Miss"-information

Blue prints, sketches, specifications, requirements or physical examples usually accompany parts from the customer. Normally the plater will review the information, clarify and confirm. A next step would be to provide parts on a test basis, usually small lots to be plated and returned for approval. Once this is done, price quotes approved and inspections passed, the job comes in on a production type, continual basis. This is when problems occur that should not have, based on the successful trial or prescreening. Before the dam bursts on potential problems, it should be noted that "miss"-information plays a key role in igniting the fuse activating plating rejects. That and other situations, not always obvious, can make for some challenging troubleshooting. The examples of poor plating adhesion can be tracked to any of the following described problems.

Parts

Sometimes, what looks to be the same really is not. A different grade of basis metal sheet, coil or pieces, may have been used to stamp or manufacture the raw parts. This normally occurs as a cost savings and is rarely communicated to the plater. Another similar problem is switching to a different process oil (coolant, lubricant, cutting oil, rust preventative, etc.). Heat treating may be a part of the hardening cycle for raw parts. The wrong cycle, mixture of gases or time, does affect the type and tenacity of heat treat scale. In these cases, the standard surface preparation products are found to be suddenly inferior to the task at hand. Drainage can be very critical, especially in intricate geometric designs. Drain holes may be added at the plater's request, to facilitate rinsing and minimize carryover of solutions from one process tank to another. Sometimes this step can be omitted or forgotten during fabrication. Steel coil having a polished side and a dull side could be inadvertently reversed in the stamping operation. Parts are shipped to the plater with a dull outside that cannot be adequately bright plated. Intentional overplating, or excess additions of brightener agents cause deposit brittleness.

Optimum line performance

This encompasses the process tanks and equipment. The total finish can only be as good as the complimentary parts in each step of the cycle.

Cleaners

Heavily soiled cleaners that don't provide any surface soil cleanliness may actually deposit oils on parts. Low cleaner concentration or out-of-operating specification range (time, temperature, concentration), are common, sometimes overlooked circumstances. Metal contamination in the cleaner promotes surface smut formation. Hexavalent chromium contamination passivates, thus affecting the ability for adequate preplate activation. An underconcentrated electrocleaner tends to etch basis metals.

Acids

Contaminated or weak acids will not sufficiently activate the basis metal. Other related problems include descaling, rust and oxide removal, as well as immersion deposits (*e.g.*, copper). Plating line acids should not be used for routine stripping purposes. An acid for one basis metal may not be appropriate for treating other basis metals.

Rinsing

This can become a real problem, especially when trying to conserve water. The best definition of poison in this is "not enough." Failure to rinse off cleaner or acid residues adequately leaves a surface film, which becomes a barrier to depositing the plated metal effectively. The water rinse temperature will become very important in geographic areas that will soon approach autumn, followed by winter. Cold water will rinse soils and residues off parts less effectively than warm water.

Visual inspection

It is not enough to look, but one has to see what the surface condition is like as parts progress through the plating cycle. Water breaks are a dead giveaway in finding a surface preparation problem. Periodically wipe a part to be sure it is relatively smut free. Take care that the correct chemicals and products are added to the process baths. Mix-ups can and do occur.

Plating bath

The routine, scheduled analysis should not be short changed. It is especially important to maintain proper balance of brighteners and accompanying organic addition agents. Basic analysis of plating salts and, where applicable, bath pH are also very important.

Maintenance

Operating equipment which provides current, heat, filtration or agitation should be serviced and maintained in optimum condition. Plating barrels experience a unique problem, with respect to failure of contacts, to remain seated in the saddles. Likewise, poorly racked parts get no or insufficient electrical contact. There have been several instances where new lines or tanks are installed. Service work necessitates disconnecting bus connections. As per Murphy's Law there is a good chance (it's only supposed to be 50:50) that when re-connected, bus connections are reversed. For a plating tank, there would be no plating with reverse connections. In an electrocleaner, the metallic smuts and other positively charged particles would plate on to the basis metal.

As we should recognize, there are many problems associated with a lack of plating deposit adhesion. In most circumstances these problems can be tracked to things, such as the examples given. With the volatile status of metal pricing, it becomes all the more important to optimize control, maintenance and update accurate information. One pass in the cycle has to suffice. Otherwise that already-tight profit margin could be lost. ***P&SF***

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Answers to I.Q. Quiz #445

From page 11

1. False. The percentage of the less noble metal increases.
2. The effect of current density on alloy composition is liable to be greater in simple primary salt solutions than in complex primary salt solutions.
3. True.
4. The ratio of the primary ion concentrations of each metal
5. The current density range for constant composition (or at least practically constant) must be wide enough to permit good "composition throwing power."

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