

Preventing Corrosion Can Save Billions of Dollars

Sophisticated finishes are developed and specified for many industries, including medical, aerospace, military, engineering, consumer, construction, energy, and a host of others. Application requirements such as thickness, color, appearance, ductility, deposit consistency, post dips (along with others), and mesh all mesh to improve field performance and minimize corrosion. Only through the development and use of quality coatings can this be achieved.

NACE (National Association of Corrosion Engineers) recently stated that the direct costs to our nation of corrosion total \$276 billion/year. Where does the metal finishing industry fit into address corrosion? In a basic sense, corrosion defines the wearing away of metals, mainly through oxidation. Corrosion is produced through chemical reactions, and by-products such as rust. This leads to breakdown and failure of finished parts, typically assembled in critical portions of operating devices, equipment, infrastructure, and other items or materials. This demands substantial upgrades in-field performance and exposure of these related items that make progress possible. Add to this the importance of environmental stewardship and we can clarify the role of metal finishing in continually minimizing corrosion. Let us check into how different steps in any given process can be critical to quality finishing as it relates to corrosion prevention.

Raw Material Stock & Manufactured Parts:

Some examples of the variables that can impact the surface finishing process and problems include raw materials and storage issues that must be addressed. Metal finishers can only produce quality coatings if the incoming base materials exhibit the required surface characteristics. Put “garbage in, garbage out.” To save money, a metal stamper purchased cheaper coil stock. The poor surface quality and excessive carbon smuts gave the plater fits until the stamper addressed and corrected the problem.

In another instance, incoming aluminum sheets were purchased through a different supplier. The stock was stored outdoors until it was ready to be fabricated and plated. Nothing could be done to correct plating blisters. Not even replacing process baths. The problem was found to be the paraffin paper sandwiched between each layer of aluminum sheet. The paraffin softened and transposed onto the aluminum sheets in the hot sun. The surface preparation cycle could not remove this film. Eliminating the paraffin paper corrected the problem.

A different problem was related to fabricating a steel coil into parts that would be nickel & chrome plated. Unfortunately, the brightness and leveling characteristics of the nickel deposit suddenly dropped off. Analysis of the nickel bath and plating tests confirmed this was not the problem. Neither was there an electrical or mechanical problem. Inspection of the incoming coil found it to be to the customer’s specifications, with one side bright and the other side satin. The bright side should be formed as the exterior and the satin side as the interior. The coil was mounted in the stamping machine in reverse, causing the finishing problem.

In a different application, wire goods were inspected after plating and found to exhibit numerous micro cracks. It was believed that aggressive surface preparation was causing this problem. It was not only aggravating a bad condition at the manufacturing site, but the wire was poorly extruded, resulting in the micro cracking. Correcting the problem improved the quality of the extruded wire.

Process oils can be essential. Without consulting anyone, a purchasing agent on pricing consideration switched from mineral oil to chlorinated paraffin. The plater could not remove the new oil in his cleaners that were satisfactory for the mineral oils. Working with the supplier, they changed cleaners to altogether remove the chlorinated paraffin. These are some varied examples of how the condition of parts and what is coating them can be critical to quality finishing as it relates to minimizing corrosion. Equipment, old and new, can also be critical to the finishing cycle.

Equipment Considerations:

A unique problem occurred when a brand new automatic plating line was installed and began operation. This multimillion-dollar line only produced non-plated parts. Chemically, all process baths were found to be at optimum. The bussing was connected in reverse. It took a few minutes to correct the buss connections.

At another installation, a highly anticipated trivalent chromium alternative to hexavalent chrome plating was being installed. Part of the startup consisted of dummy electrolyzing to condition the electrolyte. Upon test plating, the chrome deposit was pewter in appearance, not like the blue white it was supposed to be. Another incidence of reverse bussing was found in the plating tank rectifier. Unfortunately, the new bath was so grossly contaminated with metallic contamination that it had to be replaced with a new make-up. This resulted in plating the desired chrome deposit.

Carbon filtration is very important to maintain the clarity of plating solutions and remove organic contaminants. If the equipment is properly serviced or used, the benefits of proper filtration will not be achieved. We have experienced many situations where filtration equipment was inoperable due to broken or worn parts. A lack of filtration can result in dull plating, roughness, and poor ductility. Sometimes the obvious corrective approach is bypassed to add more brighteners or other additives to the plating bath.

There have also been problems related to equipment maintenance. How can a trickle filter return possibly benefit the purification turnover of a 1,000-gallon nickel bath? Rectifiers can be considered the nerve center of the plating application. Without current, the parts don't get plated, and without proper current, the parts will not be plated to the required specification. Rectifiers need to be serviced regularly by capable personnel.

If corrosion is to be minimized and the service life of parts improved, attention must be paid to every portion of the finishing process. The examples given highlight problems and failures that adversely impacted the condition of the incoming and finished parts. Some instances were obvious, while others were more complicated, requiring intuition and patience.

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