Finisher's Think Tank

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Corrosion Prevention is the Main Focus

Reflecting on the metal finishing industry, it should be plain to acknowledge that corrosion prevention is our main driving force. We can assume with confidence that identifying, preventing, and combating corrosion are paramount to what we do. Sophisticated finishes are developed and specified for many industries, which are dependent on what we can provide. These include medical, aerospace, military, engineering, consumer, construction, energy, and a host of others. Application requirements such as thickness, color, appearance, ductility, deposit consistency, post dips, and others, all mesh to improve field performance and minimize corrosion. Only through the development and use of quality coatings can this be achieved.

Why is it that what we do is so important to industries and our nation's infrastructure? A quantitative value will usually suffice to attract attention. In this respect, NACE (National Association of Corrosion Engineers) recently stated that the direct costs to our nation of corrosion totals $276 billion per year. This is not only a big number, it's a staggering value. It probably exceeds the GNP (gross national product) of some countries. Where does the metal finishing industry fit in to address corrosion? In a basic sense, corrosion defines the wearing away of metals, mainly through oxidation. Corrosion produces byproducts, such as rust, through chemical reactions. This leads to breakdown and failure of finished parts, typically assembled in critical portions of operating devices, equipment, infrastructure, and other items or materials. Due to the progressive development of products and processes, modernization leads to improvements in how we live, work, travel, and play. This, in turn, 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

Metal finishers can only produce quality coatings if the incoming base materials exhibit the required surface characteristics. Simply put, "garbage in, garbage out". As examples I can relate to many such instances, covering different reasons for inferior incoming quality. To save money, a metal stamper purchased cheaper coil stock. The poor surface quality and excessive carbon smuts, gave the plater fits, until the problem was addressed and corrected by the stamper.

In another instance, incoming aluminum sheets were purchased through a different supplier. The stock was stored outdoors until 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. In the hot sun, the paraffin softened and transposed on to the aluminum sheets. 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 and chrome plated. Unfortunately, the brightness and leveling characteristics of the nickel deposit suddenly dropped off significantly. 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, one side bright 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, but only aggravating a bad condition at the manufacturing site. The wire was being poorly extruded, resulting in the micro cracking. Correcting the problem improved quality of the extruded wire.

Process oils can be very important. Without consulting anyone, a purchasing agent on pricing consideration switched from a mineral oil to a 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 and can now satisfactorily remove the chlorinated paraffin.

These are some varied examples of how the condition of parts and what is coating them can very important 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 as soon as a brand new automatic plating line was installed and began operation. This multi-million 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 start up 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. It was found to be another incidence of reverse bussing to the plating tank rectifier. Unfortunately, the new bath was so grossly contaminated with metallic contamination 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 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. I 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 by passed in favor of adding more brighteners or other additives to the plating bath. This in turn exacerbates or worsens the plating condition.

There have also been problems related to lack of 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. Without proper current, the parts will not be plated to the required specification. Rectifiers need to be serviced on a regular basis by capable personnel. If not, the obvious problems will occur.

One very expensive problem comes to mind. The decorative chrome deposit was hazy and white washed. The bath analysis was in range. All other baths, rinses, were also in good order. The wrong approach occurred where sulfuric acid and barium carbonate additions were made. Next, panic stepped in as rinses were dumped and the chrome bath was replaced with a new make up, all to no avail. Finally some one mentioned the rectifier. A call was placed to the manufacturer. Within five minutes the serviceman accurately diagnosed the problem with his oscilloscope, AC ripple.

If corrosion is to be minimized and the quality service life of parts improved, attention to every portion of the finishing process must be in focus. The examples given highlight problems and failures that adversely affected the condition of the incoming and finished parts. Some instances were obvious, while others were more complicated, requiring intuition and patience. In itself, corrosion is a major challenge to progress. That is why the metal finishing industry is so important to all facets of global activity. ***P&SF***

Fact or Fiction

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Another reason is that the links between SV40 and human cancer took a long time to define and breakthroughs in molecular biology made the job more realistic in later decades. Perhaps today our regulators and researchers are more knowledgeable and willing to act quickly. A positive example is the tainted 2004 flu vaccine that was pulled off the market when it was discovered that it contained the same bacteria used in germ-warfare tests.[11]

Malignant mesothelioma is a relatively rare cancer, Striking and killing about 2,500 Americans a year and thousands more people in other parts of the world. No debate the disease is associated with exposure to asbestos, but as is now clear this is not true for all cases of mesothelioma and there is strong evidence that SV40 plays a role for some victims. You might argue that this is a small price to pay for eliminating polio. Before immunization, an average of 16,000 cases of paralytic polio were reported in the U.S. each year, and about 1,800 people per year died of this disease. There were no reported cases in the U.S. in 1999.[12] However, the unfortunate part of all this is that it could have been stopped much earlier. A safer vaccine was available long before early 2000 but was not made available for the reasons mentioned above. Dr. Michele Carbone, who has spent most of his career investigating SV40 says, "It is one of the most potent human carcinogens that we know." With all the wailing and gnashing of teeth we hear about all our potent synthetic chemicals why haven't we heard more about SV40?

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