Finisher's Think Tank

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Winter Means Heat

Finishing Problems and Benefits Come With Changing Seasons

It may be October, but for a significant part of the country, autumn slides us forward toward that unavoidable cold wintry season. Not a problem in most respects, especially the relief of working in milder shop and floor conditions. However, there could be problems, benefits, and opportunities, with regard to different process tanks and solutions. Let us review some of these in relation to hot is better or cold is better.

Surface Preparation

Soak and Electro Cleaners

Most soak and electro cleaners operate within a range of 140–180°F (60–82°C). Upon prolonged cooling, such as over a weekend, the working solutions may drop to a low enough temperature, resulting in some of the components precipitating out. It is more prevalent during the cold, wintry period. This, in turn, forms a sludging and scaling condition in the process tank. Subsequent heating for use may actually result in poor heat transfer (due to the insulating effect of sludges). Bumping and localized boiling may accompany this, which adds a safety hazard.

These conditions result in unfortunate downtime that detrimentally affects the intended production throughput. To avoid these problems, especially during the coldest periods of winter, many suppliers of cleaners recommend keeping the baths warm, or 90–100°F (32–38°C). By the use of thermostatic control, the temperature can be adjusted to heat the tanks in a time sequence that makes them "up and ready" when the work shift begins or resumes.

Another practical aspect to cleaners in the winter is to consider switching from powder to liquid cleaners. By their typical formulations, liquid cleaner concentrates contain up to 80% less solids. That means much less sludging when the cleaner bath gets cold. However, the concentrate drums must be stored above 40°F (4.5°C) to prevent the contents from freezing.

Acids

The reactivity of mineral and powdered acids increases with bath temperature. Whether the intended application is neutralization, activation, descaling, or derusting, solution temperature is key to success. In some applications heating (up to 120°F, 49°C) is essential. In plating lines, the acid is typically the last surface preparation step. An active, clean surface is essential to an adherent plating deposit. A cold acid or bath below 75°F (24°C) may not provide the surface conditioning required before plating, especially if on a fixed time cycle.

Zincates

The reaction of zincates forming a film on aluminum is certainly temperature dependent. In hot weather conditions, problems usually arise when the zincate solution temperature exceeds 85 or 90°F (29 or 32°C). The film forms a spongy, porous structure. In cold solution temperatures, usually below 70°F (21°C), the film formation is so slow in relation to the dwell time that it is not acceptable for adhesion or subsequent plating. In baths of some alloy zincates and their concentrates, irreversible precipitation of some bath components may occur at temperatures below 50°F (10°C). It is, therefore, important to keep non-operating zincate baths from getting too cold and to maintain desired temperature range during operation. Store liquid zincate concentrates above 55°F (13°C).

Rinse Water

How many readers have acknowledged a reduction in quality rinsing during the cold winter months? I have found this condition on a number of occasions. Cold water just does not rinse as effectively as warmer water. Cleaner films, plating solution drag-out, and similar baths, do not readily wash off the surface of parts in cold water. In this respect I would consider cold water as below 50°F (10°C). Incoming city water or well water can readily fall below 40°F (4.5°C), during cold winter periods. Take the chill out of rinse water, just enough, to make a quality difference.

Plating Baths

We are limited here to the baths identified as room temperature types. In itself, room temperature has a wide definition, usually in the range of 65–85°F (18–29.5°C). This includes the zincs (alkaline, cyanide, and acid), alloy zincs, acid copper, and other known baths. It is best to confirm temperature range, control, and appropriate equipment with the respective bath supplier. The downside of plating below the recommended temperatures include: poor throw, lack of brightness, leveling, or grain refinement, and poor rate of deposition. Some of the plating salts may also precipitate, coating anode baskets (causing polarization) and tank walls. Therefore, it is imperative to adhere to proper plating bath temperatures, using the appropriate heating elements, in relation to the plating solution types.

There is certainly an upside to chilling certain plating baths. In fact winter, in this respect, is a welcome sight. Overtime, cyanide plating baths generate carbonates. A concentration range of carbonates is required to maintain good plating.

However, once this range is exceeded, the plating bath experiences many deposition problems. The best way to remove the excess carbonates is by chilling the baths, usually below 40°F (4.5°C), rapidly precipitating the carbonates. Winter cold weather helps immensely by providing natural refrigeration. That is in the case of sodium cyanide based baths. Potassium cyanide based baths require barium cyanide or lime to precipitate carbonates.

Chromates

Whether hexavalent or trivalent, chromate baths are temperature sensitive. Most baths operate best in a range of 70–90°F (21–32°C). Exceeding the recommended temperature can result in formation of a thick, poorly adherent chromate. Operating the bath below the minimum temperature will significantly slow the film formation. In either case, the end result is poor corrosion protection of the finished parts. Warming the chromate bath to maintain recommended temperature, in conjunction with keeping the other operating parameters optimized, should keep the bath running smoothly in winter. Trivalent yellow chromates, at this time, are the only chromates that require heating to maintain an operating temperature range of 130–150°F (54–66°C).

Post sealing of chromates has become very effective toward extending salt spray protection. Many of these baths require mild heating for optimum performance. There is a trend to increase the application of trivalent chromates along with post sealers, to meet RoHS and WEEE requirements. It becomes very important to operate these baths as recommended, to meet the new mandates that include improving corrosion protection.

Equipment

The ability to provide adequate heating to affected process solutions does make strong demands on the equipment used. Now, before the impending cold sets in, is the best chance to examine what is in line and operating efficiently. The type of heating equipment should be compatible with the intended solutions, to avoid chemical attack. This information along with the recommended heating system (*e.g.* electric, steam) is readily available. Process bath vendors and equipment suppliers are the best sources for accurate data and assistance. Because we largely operate in an "on time mode," thermostatic control is almost indispensable. Check to be certain the thermostat is functioning properly. Purchase spare thermostats. The same applies for immersion heaters and coils. The general experience has been for integral equipment to breakdown at the most inopportune times.

Avoid a deep freeze that can slow down or stop production and finishing during the upcoming cold season. Make a service checklist and "winterize" process baths and equipment. Doing the right things now with appropriate maintenance could make it a hot winter for productivity. *P&SF*