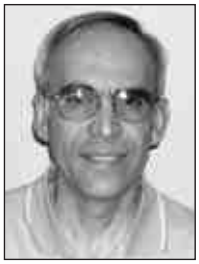


Stephen F. Rudy, CEF
Hubbard-Hall Inc.
563 South Leonard Street
Waterbury, CT 06708
E-mail: sfrudy@optonline.net

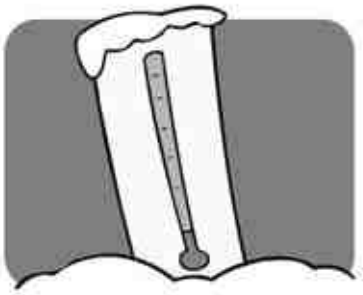
Take the Chill Out of Winter

It may be October, but for a significant part of the country, autumn slides us forward towards 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 whether hot is better or cold is better.

Surface preparation

Soak and electrocleaners

Most soak and electrocleaners operate within a range of 140 to 180°F (60 to 82°C). On prolonged cooling, such as over a weekend, the working solutions may drop to a sufficiently low enough temperature. This in turn may result 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 adding 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 to 100°F (32 to 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-containing drums must be stored above the freezing or critical temperature, as specified by the supplier.



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 critical 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 producing 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 formed has 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. The desired temperature range must be maintained during operation. Liquid zincate concentrates should be stored above 55°F (13°C).

Iron phosphates

Proprietary formulations may range from 100 to 140°F (38 to 60°C). Very little or poor iron phosphating can result from operating below the recommended operating bath temperature. Some of these baths also provide simultaneous cleaning and phosphating. A lack of cleaning in a cooled bath would compound the problems.

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 does. Cleaner films, plating solution drag out and other process 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 to 85°F (18 to 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 throwing power, lack of brightness, leveling, grain refinement and poor deposition rate. 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. Over time, cyanide-containing plating baths generate carbonates. A particular concentration range of carbonates is required to maintain good plating. However, once this range is exceeded, the plating bath experiences many deposition problems, along with reduced efficiency. The best way to remove the excess carbonates in non-potassium-containing cyanide baths is by chilling, usually below 40°F (4.5°C). This procedure rapidly precipitates 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, using a different process.

Chromates

Whether hexavalent or trivalent, chromate baths are temperature sensitive. Most baths operate best in a range of 70 to 90°F (21 to 32°C). Exceeding the recommended temperature can result in the 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. Some trivalent chromates do require heating to maintain a proper operating temperature range.

Post sealing of chromates has become very effective towards 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 in order 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 opportunity 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. Since 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. Check the boiler for sufficient steam pressure to provide sufficient heating in affected tanks. The general experience has been for integral equipment to break down 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***