Troubleshooting Aluminum Anodizing

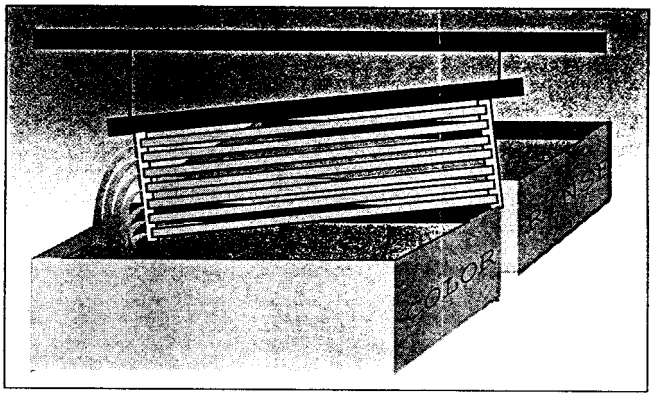
Part II: Cleaning, Rinsing, Etching, Desmutting

By GREGORY R. JESSUP
Novamax Technologies
Atlanta. Georgia

The most important step in anodizing is proper rinsing. Rinsing removes chemicals from aluminum's surface, leaving it free for further processing. But, water is becoming a costly commodity, and with new effluent regulations and controls, flows are ebbing.

Still, there are techniques that help lower water consumption and still provide for adequate rinsing. First and foremost, rinse water must be clean and overflowing, with enough turnover to keep rinses contaminant free. In some circumstances. because of part design, chemicals will be-dragged into a rinse. Therefore it is important to choose chemicals that are compatible with each other and have good rinsing characteristics.

One way to minimize the effects of dirty rinse water and reduce contamination is proper part draining. Parts should drain over the tank, not during transport to the next tank. This has a two-fold benefit: it reduces contamination and cuts chemical costs because chemicals are returned to the tanks (Figure 1).



1. SUFFICIENT DWELL TIME over rinse **tanks saves money.**

Troubleshooting Aluminum Anodizing. . .

Dirty rinse water contaminates process tanks, raising chemical costs and diminishing finish quality. Using the wrong type of water can also affect chemicals in subsequent tanks. Certain chemicals requireextremely pure rinses. Deionized water should be used before electrolytic color and sealing baths.

Cleaners remove soils from the surface of aluminum. A clean surface is soil and water-break-free. Proper cleaning ensures that surfaces are free from contaminants that may cause stains or pits during ensuing finishing processes (Figure 2).

Soils come in many forms, from shop dirt to buffing compounds, forming oils to graphite. Since there are different soils. cleaners should be chosen to remove soils encountered on individual anodizing lines.

Alkaline cleaners, employed on the majority of anodizing lines. are adequate in most cases. **But** when the new synthetic lubricants are used for drawing and stamping, acid cleaners or heavy-duty alkaline cleaners have become necessary.

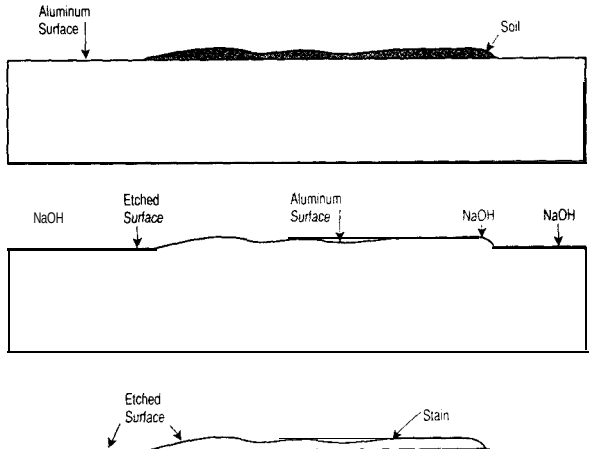
On bright-dip lines, metal oxides such as Al_2O_3, and buffing grit must be removed. Acid cleaners are sometimes used alone to remove the oxides that cause pitting or in conjunction with alkaline cleaners. Also, additives have been developed to prevent pitting.

Cleaning systems are designed to dissolve solids and hold them in suspension, therefore, baths buildup with dirt and become spent (Figure 3). A bath's longevity depends on use, type of soils and cleaner quality.

For a cleaner bath to operate properly therecommended temperature,concentration and time should be maintained. Most cleaner problems are related tooveruse, using the wrong cleaner for the job or operating the cleaner at the wrong temperature.

If the surface is not properly cleaned, stains and pitting may occur. In addition,soils(especiallyoil)can bedragged down the line, causing more problems. Some problems encountered with cleaners and their possible causes are as follows:

Does Not Clean: Spent solution; low



2. UNCLEAN surface in an etch tank

concentration; incorrect cleaner for application: too cold.

Etching Parts: High temperature.

Redeposits Soil: Cleaner saturated with dirt.

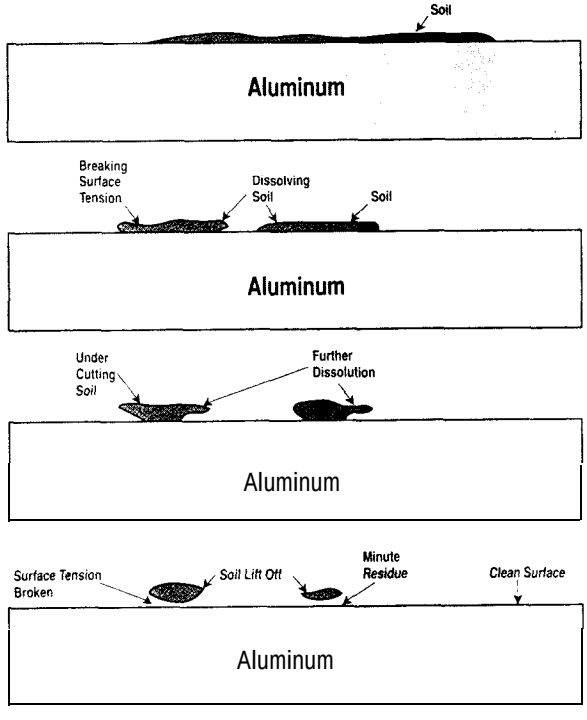
Crystals on Surface: High concentration; spent solution.

Etching provides the uniform dull surface that gives aluminum its aesthetically pleasing appearance. Several types of etches are used in anodizing. A conventional etch with additives allows for high aluminum concentrations and produces a matte finish. Recovery etch systems provide fast etching with good hiding characteristics.

In all cases, etch baths must be maintained for consistent finishes. Caustic, aluminum and additive concentrations must be controlled, as well as temperature. Also, an etch tank has to be decanted and the sludge removed. It is not normally necessary to dump the entire solution. however.

Etch problems usually occur when the bath is allowed to get out of control. If not enough additive or the wrong additive is used. fall-out may occur causing scale to form on the tank. (And cleaning out a scaled tank is one dirty job.) Overloading with additives can limit etching or cause a defect similar to the one it is supposed to eliminate.

Desmut/Deoxidize. Desmut/deoxidize solutions remove residue left behind in finishing processes. When aluminum is etched, the metallic particles (alloying ingredients) and oxides that are insoluble in caustic solution remain on the surface. These particles or smut have to be removed or problems can occur further into the process.



There are several types of desmut/deoxidize solutions. depending on specific needs and waste regulations. All desmut/deoxidizers are acidic, with proprietary additives. The acid concentration must be maintained to get the propel results. Desmut/deoxidizers are usually run at ambient temperature.

3. CLEANING action

TABLE I—Types of Rinses and Possible Problems

Dirty Rinse
1. Contaminant follows into the next tank
2. Rinse will not rinse
3. A reaction will continue
4. Dragout will neutralize the following solution

Stagnant Rinse
1. Contaminant buildup
2. Mold growth

City Water
1. Chloride contamination
2. Silicate contamination

Desmut/deoxidize problems usually occur when the concentration is too low. Reasons include the following: dragout; neutralization due to drag in of alkaline residue; and overuse, where parts in the bottom of the tank consume chemicals.

If smut is not removed, staining occurs. Also, smut sometimes shows up on the finished product. If parts are left in the desmutting/deoxidizing solution too long, acid etching may occur and an acid-insoluble smut forms.

Desmut/deoxidize baths used after bright dips can become loaded with copper and, if so, will revert to an immersion plating bath, plating copper instead of removing it. When this occurs the bath should be dumped or decanted, then replenished. **PF**