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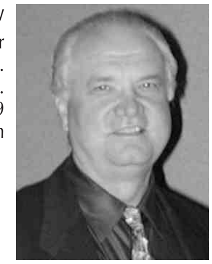

Filtered Thoughts

Dear Advice & Counsel,

We are seeing minute defects in our decorative nickel-chromium plated castings. They look like tiny blisters. The problem comes and goes, and right now is coming at us pretty hard. Can you help us discover the nature and causes of this problem.

Signed, Prickly Pete

Dear Mr. Pete,

We cross sectioned the defects (shown in photo 1) and examined them under the microscope. What appear to be tiny blisters are actually "bumpy" plating caused by trapped particulates. The cross section showed that the bumps are in the bright nickel deposit, and we found several foreign particles within those bumps (photos 2, 3).

The most likely cause is either poor filtration practice or introduction of a continuous stream of foreign particles. One source of a continuous stream of foreign particles is your anode baskets. Make sure they don't look like those in photo 4 (photo taken at a different plater). Anode baskets must be bagged to keep the silt made by dissolving nickel from entering the plating solution. If the top of the anode bags go below the liquid level in the plating tank, a clear path for these particles to travel from inside the bag to the surface of your parts is provided.

As for filtration, it typically cannot keep up with a continuous stream of particles belching from anode bags. However, the following are good operating practices, which are provided in the AESF lesson on "Filtration and Purification of Surface Finishing Solutions," co-authored by Jack Berg of SERFILCO, Ltd., and me. In this lesson, Jack provides the following advice on filtration:

"Depending on the viscosity of the processing solution and the tendency of particulates to produce defects in those solutions the required number of turnovers in a solution will vary. "Turnovers" refers to the number of times per hour that the volume of the processing tank is processed through the filter. Turnovers dictate the size of the recirculation pump. In general, higher turnover rates yield higher quality of filtration. The filter's surface area will dictate how much solids can be retained before the flow drops too low in removal efficiency (usually indicated by a pressure drop). The nominal porosity of the filter dictates the removal of 90–95% of all particles larger than that pore size. As a filter is used, the nominal pore size "automatically" is reduced by accumulated solids partially blocking the pores of the filter, so a filter that begins service with nominal 15 micron particle retention can quickly become a 10 micron filter in the presence of particulates."

Solutions prone to generating large amounts of solids necessarily require larger micron ratings and larger filter surface or solid holding capacity.

For bright nickel, Jack recommends 4–5 turnovers, 7 ft^2 of filtration area per hundred gallons of solution, and 15–50 micron pore size (using cartridge filtration).

High flow rates through the filter are recommended, wherever possible and practical, in order to bring particulate matter to the filter quickly and, thereby, minimize or prevent particles from settling on parts being processed. No matter how fast the flow rate is, some degree of particulate contamination will always

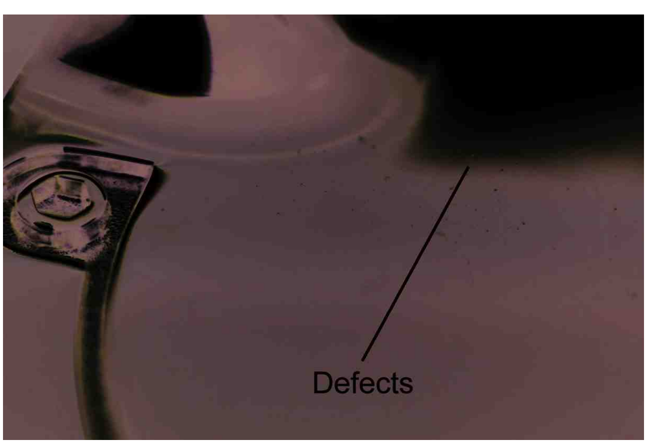

Photo 1—Bumps in nickel deposit.

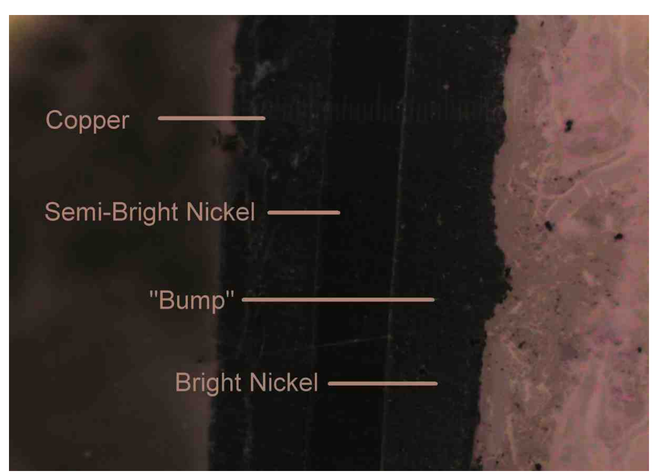

Photo 2—Cross section of the deposit.

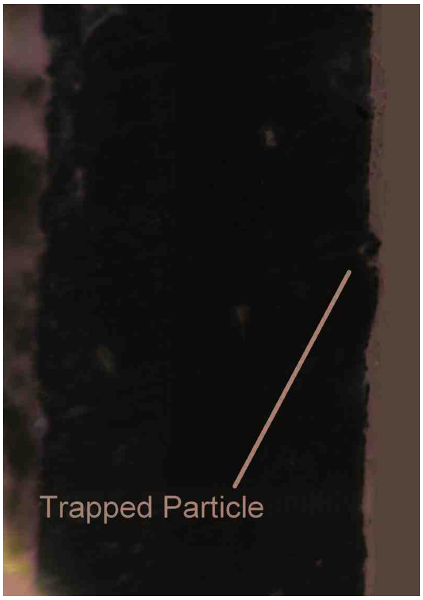

Photo 3—Cross section showing trapped particle.

exist. However, if continuous filtration is used at a relatively high flow rate, at about 4 to 5 turnovers per hour, and the filter is operated even during tank idle periods, a reliable particle removal rate will be successfully maintained. Typically, once four tank turnovers are employed, 97% of all filterable particulates are being removed (assuming ideal mixing of the process).

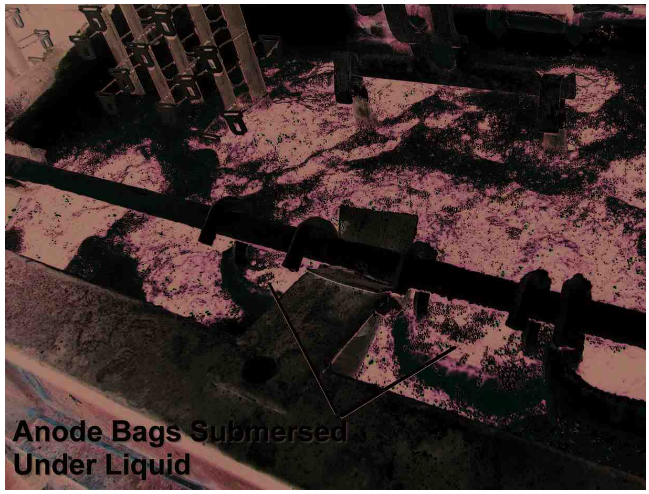

Photo 4—Submersed anode bags.

The higher the turnover rate, the longer the plating tank can be operated without producing a serious increase in defective product. As the filtering system continues to operate, the flow rate begins to fall and the pump pressure starts to rise since the filter begins to clog from build-up of particulate matter. When this occurs, servicing of the filter is required so that the expected flow rate is once again available. From an operational standpoint servicing of the filter should always occur before the pressure drop affects filtration quality. Frequent visual checks of the pressure in the filter, or a visibly lower flow from the filter should be performed. If the solution appears cloudy or significant amounts of particulate are found, batch servicing of the solution should be considered (affecting production), or the frequency of filter service should be increased. Ideally, if the lowest level of particulate is maintained in these solutions through proper procedures, then optimum filtration can be provided and, at the same time, the need for batch treatment to remove excessive contamination will be minimized.

Failure to maintain the filter may trigger the need for batch filtration of the process solution in order to insure complete removal of the particulate matter. This is accomplished by pumping the solution from one tank through a filter, and then back into the process tank. Batch filtration is also recommended after a major change in chemical make-up of the process. ***P&SF***

Fact or Fiction?

(Continued from page 22)

pounds) and Alabama (6 million pounds) were next in line.[6] No debate that mankind activities were responsible for much of this, but in California perhaps Mother Nature provided some help with all the nitrogen in the mountains by the central valley.

Don Curlee, writing for a central valley newspaper says it rather bluntly: "Besides lifting the blame for high nitrate levels from agriculture the data clears timber harvesting, industrial discharges and atmospheric emissions. Now that the record has been set straight the pseudo-scientific environmentalists are learning that throwing rocks at self designated 'bad guys' is a futile effort, especially when the rocks themselves are the cause of the trouble."[11]

P&SF

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