



Reel Problems – Part 2

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Dear Advice & Counsel,

We have operated a reel-to-reel plating operation for many years. Over the past ten years, we have seen a heavy turnover in management and now our line is operated under less than ideal conditions.

I am the latest manager faced with the task of improving product quality and productivity. I have a number of issues that I'd like to relate and get your comments/recommendations on:

Problems with the Equipment

1. We would like to reduce high temperatures and humidity levels within the area.
2. Chemical solution is drawn up into the hoods. Hoods and vents are hard to clean out. They become packed with chemical residues which reduce overall air flow.
3. We need a new design on tank covers to aid in minimizing heat and moisture into the current environment and to keep the baths free of contaminants. Our existing covers have been warped with heat and age.
4. The location of filters and pumps on tanks are in locations that are difficult to access (most of these are behind the line amidst piping, etc.).
5. We have issues with associates filling tanks and leaving hoses in the tanks causing tanks to overflow and fill up the containment pits.

Line Speed

We need a 5% increase in production each year. What specific actions can be taken to increase plating speed?

Please help.

Signed,
 Reely Needu

Dear Mr. Needu,

In July, we began by discussing your equipment issues. This month we will discuss issues affecting your plating speed:

Line Speed

The following are issues that can affect line speed.

1. Electrical connections

Electrical contact from the rectifier to the strip is made through use of capstan drives and rotary contacts at each end of the line (which is about 80 feet long). No additional contact is made with the strip. As a result, the distance between the rectifier and electrified cells are:

| | |
|----------------|---------|
| Electroclean: | 17 feet |
| Copper Strike: | 40 feet |
| Copper Plate: | 40 feet |
| Tin Plate: | 17 feet |

The high resistance caused by the long length of strip between the electrical contacts is one of the reasons why this line can only be operated at 9 to 18 feet per minute maximum. The large distance between electrical contact and electrified cell(s) results in large voltage drops that limit plating current density and lower plating speed. On-site measurements that we made with a tong meter indicated that some plating cells are experiencing a 25% voltage drop from the rectifier to the plating cell.

As a rule, the optimum distance between electrical contacts to strip in a reel to reel plating line is between 24 and 30 inches for each electrified cell. Consideration should be given to installation of additional electrical (rectifier) contacts with the strip so that there is a contact before and after each plating cell. Manufacturers of equipment offer a variety of methods for making electrical contact that would not leave marks on the strip, including edge selective contacts which make contact only on the edges of the strip.

An even better (but more costly) solution would be to replace all of the processing cells with newer designs that incorporate more modern design, including optimized cell length, electrical contacts and freeboard.

2. One rectifier, two plating tanks

The copper strike and copper plating tanks should each have their own rectifiers. By running a single rectifier for two tanks it is impossible to optimize the current density of the copper plating cell. As a result, plating efficiency in the copper plate tank can not be optimized. As an alternate, we see no reason why the two copper plating solutions cannot be replaced by a single Rochelle-type copper plating solution.

3. Anode-cathode spacing

The closer the strip runs to the anodes, the higher the plating efficiency and the faster the plating speed. Anode-cathode spacing is presently about 3" (See Photo 1). By reducing this to 2" or less (the closer, the better), plating speed can be increased by 30 to 50%, by allowing higher plating current densities. The spacing can be reduced by using wider anode baskets, or simply relocating the anode bars at the top of the tank.

4. Agitation.

Almost all plating solutions can benefit from higher levels of agitation. In the plating solutions employed on this line, the sole source of agitation is the movement of the strip itself (See Photo 2). The absence of additional agitation slows plating speed by limiting the employable current density. We noted that the low level of freeboard prevents the use of any significant increase in agitation (See Photo 2). If additional freeboard is created per our discussion last month, then the addition of mechanical agitation provided by eductors or recirculating pumps can allow for operation at higher current densities, thus improving plating speed.

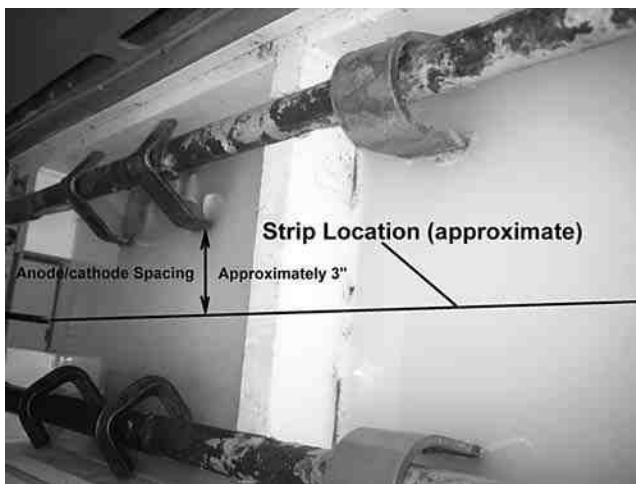


Photo 1—Anode-cathode spacing.



Photo 2—Tank with copper plating solution showing limited free-board and accumulated salts.

Note that it is unwise to use air agitation in the tin and cyanide based solutions, as air agitation can oxidize tin(II) to tin(IV), and air agitation can increase carbonate production in cyanide solutions.

5. Maintenance.

Note that the tank bus in Photo 2 is heavily loaded with salt crystals. These can

produce resistive connections between the anode bus and basket hooks, reducing the actual current delivered to the strip (and requiring a slowdown of the line). Maintenance personnel need to be made aware that the tank bus needs to be maintained in a clean, oxide- and salt-free condition. If, for some reason, maintenance cannot keep up with the needs of the line, I would suggest bolting the anode hooks

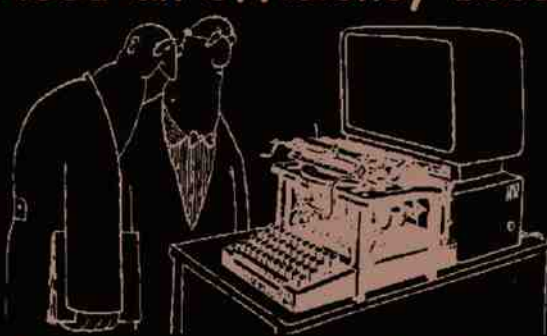
directly into the copper bus by tapping the hooks and copper bus and using thumb screws, to assure a firm level of electrical contact, even in the presence of salts.

Note:

SUR/FIN 2007 is in Cleveland this month (August). You may wish to attend this conference to see the latest technology that can address your plating speed issues. *P&SF*

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