Cyanide Plating Bath Recovery by Vacuum Evaporation

General

Disposal of cyanide-bearing solutions is among the most serious and costly problems facing the plating industry today. Cyanide-bath recovery is an economical and practical alternative to this problem.

With a properly designed installation, cyanide need cause no more concern than any other plating solution. It can even be re-introduced into plating lines where cyanide-free solutions have been substituted because of pollution-abatement requirements.

Virtually any dragged-out cyanide bath can be recovered from its associated rinse water with a QVF Vacuum Evaporator. This includes copper, cadmium, zinc, brass, bronze, silver, and gold plating solutions, as well as cyanide strippers and dips. While strippers and dips may be of low intrinsic value and may not be reusable, concentration or volume reduction with an evaporator can substantially reduce the cost and difficulty of treatment and/or haulaway.

Operating Conditions

The QVF Cyanide Evaporator is constructed of fiber glass-reinforced resin and stainless steel. It is fully compatible with alkaline plating solutions. The operating temperature range is 120-l 30 °F (49-54 °C) at a vacuum of 25-26" (635-660 mm) Hg.

Water distillate will have less than 5 ppm of principal bath metal, but may contain small amounts of cyanide, depending on the bath being recovered and the particular operating conditions. However, this is generally of no consequence, because the water distillate is reused in the rinse system. Since the concentrate will exit the evaporator at approximately 120-l 30 °F, it may be necessary to provide a small concentrate holding tank to allow the recovered bath to cool before returning it to the plating tank.

Purification

Because most cations tend to plate out of a cyanide bath in the same current-density range as the base metal in the bath, cationic impurities such as copper and zinc do not normally build up to any appreciable degree. In the event that metallic contamination should become objectionable, conventional purification techniques such as "dummying," peroxide treatment, etc. may be implemented.

The most troublesome contaminant in most cyanide baths is carbonate. The evaporator does not increase the formation of carbonate, but it will recycle carbonates previously lost via drag-out. If carbonates do build up, they can be routinely removed by one of the commonly practiced methods described below.

- In the case of **sodium baths,** the entire plating bath (or some portion of it) can be cooled, allowing the carbonate to precipitate. This is the most commonly used procedure in the plating industry and is often referred to as "freezing out the carbonates." Along this same line, the concentrate from the evaporator can be cooled on a small-batch basis prior to returning it to the plating tank. A refrigeration unit operating on a small holding tank greatly simplifies the carbonate-removal process. Continuous chillers are frequently applied to large, continuous cyanide plating systems.

- **Potassium baths** must be treated differently because of the higher solubility of potassium carbonate. The conventional method is to treat the plating bath with lime, thereby precipitating the carbonate with calcium. Similarly, the concentrate from the evaporator can be treated as a small batch, or pumped through a filter that has been pre-coated with lime.

Given a moderate amount of attention, carbonate buildup need not be a problem with cyanide recovery. In fact, carbonate removal on a regular basis may significantly contribute to bath life and plating quality — as opposed to the common philosophy of "run it 'til it dies."

Concentration Limits

The concentration limit of most plating solutions by vacuum evaporation is the saturation point of the constituents, or that concentration beyond which precipitation will occur. This limit for most cyanide solutions is approximately the bath concentration or slightly above.

A simple laboratory test can easily determine the practical limit of concentration for a particular solution. Whatever that limit may be, the QVF Evaporator can be easily adjusted to the concentration desired.

In the case of a cyanide bath that operates at low or room temperature, and has a low metal concentration, it may not be possible to fit all of the recovered concentrate to the plating tank. In such situations, it may be necessary to evaporate a portion of the plating solution itself during down-time (such as on weekends) in order to reduce the volume of the plating solution sufficiently.

Another approach is to continually bleed a small portion of bath into the rinse stream that feeds the evaporator. This is an effective method of removing the higher viscosity water (compared to the viscosity of most cyanide baths) that is dragged into the bath from previous rinses.

Other Technical Information Sheets Available

TI-CR
Chrome Plating Bath Recovery by Vacuum Evaporation

TI-CRE
Chrome Etch Bath Recovery by Vacuum Evaporation

TI-NI
Nickel Plating Bath Recovery by Vacuum Evaporation

TI-RP
Electroplating Rinse Practice and Evaporator Sizing

TI-CN: This Technical Information Sheet supersedes all previous issues.

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