Plating Systems & Technologies

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Treatment of Waste from Mechanical Plating and Mechanical Galvanizing

Mechanical plating produces spent plating liquor that must be treated to remove heavy metals from the waste stream before discharge to publicly owned treatment works (POTW). The waste stream contains no toxic chemicals other than heavy metals and it contains no complexing agents or chelating agents so the treatment of the waste is relatively straightforward, as follows:

Effluent from the mechanical plating (or galvanizing) operation is collected in a suitably sized tank. If the pH is not below 2, it is lowered below 2 by the addition of a mineral acid such as sulfuric acid or hydrochloric acid. This reduction in pH allows the treatment of the effluent for hexavalent chromium using sodium bisulfite. Sodium bisulfite added to the wastewater reduces the hexavalent chromium to the trivalent form. (In some plating operations, this step is unnecessary because there is enough ferrous iron in the wastewater (from the pickling of the parts which takes place in the process) to reduce all of the hexavalent chromium to trivalent chromium.) Trivalent chromium is first, treatable by the hydroxide precipitation method which follows, and second, it is a relatively non-toxic form of the metal. (If there is no chromating done, or it is done in a separate operation, the preceding paragraph does not apply.)

Next, the wastewater (which may be in this tank, or it may be in a separate tank) is treated by the addition of lime or caustic soda to raise the pH to approximately 9.5. At this pH the lowest level of zinc is obtained in the final effluent. This step also precipitates the minor amounts of tin and copper resulting from the plating process. This step may be done either manually or automatically, depending upon the scale of the operation.

To the treated effluent is then added a polyelectrolyte, most often a synthetic anionic polyelectrolyte (usually called a "polymer", but occasionally a less expensive material such as aluminum sulfate. This allows the efficient filtration of the material in the step which follows. The effluent is now allowed to settle for as long a period as the equipment available will permit.

Following settling, the clear supernatant liquid resulting from the successful treatment of the waste is discharged.

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The sludge, which is at a relatively low concentration at this point, is concentrated using a filtering arrangement. Small operations often use filter bags, which give a final sludge product about 12% to 15% solids. Larger operations use filter presses, which will concentrate the sludge to about 30% - 40%.

Water from this operation is usually merged with the waste liquor for treatment.

At this point, some operations will dry the sludge to further reduce the volume and weight. The sludge from this operation is disposed of as a special waste or as a hazardous waste, depending on analyses of the waste and the state requirements.

There exist a large number of variations on this process.