RenoCell®

Application Brief

Pattern Plate Acid Copper and Tin/Lead Plating Line

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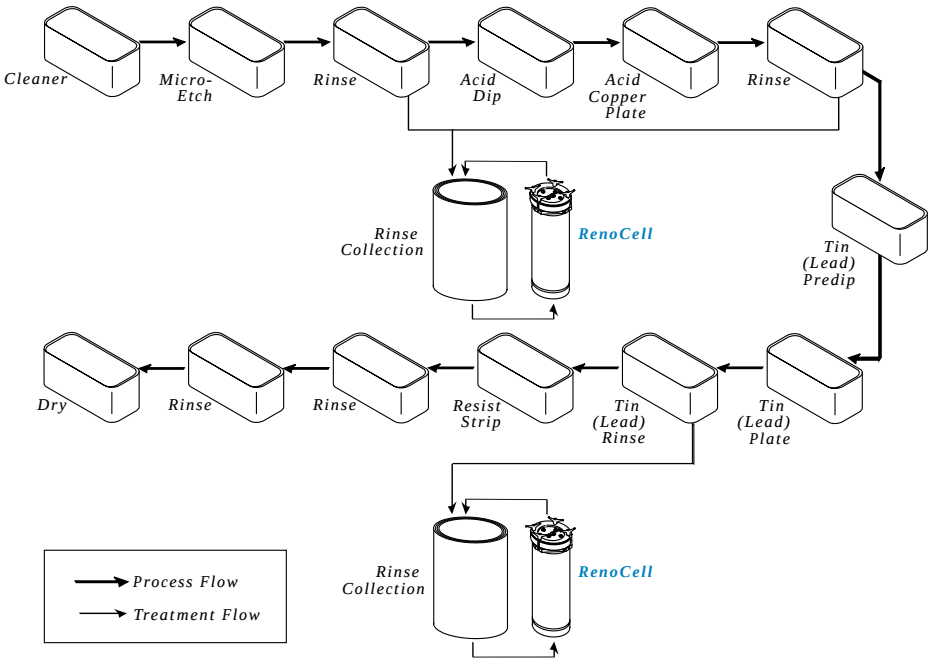

Introduction

The conducting circuitry of a PCB contains Copper as the most prevalent conductor along with the lesser use of Nickel, Silver, Tin, Tin-Lead, and Gold as etch-resists or top-level metals. RenoCell electrodeposition technology has proven applications in removing these metals from process rinse waters.

PCB manufacturing involves over 50 different process steps. Subtractive processing involves the selective removal of copper to form the conductive circuit patterns. Initially, a Photosensitive resist material is transferred to the virgin Copper surface and the circuit patterns are exposed to UV light, and with the circuit pattern developed, the remaining unwanted exposed Copper surface is then etched away by chemicals and rinsed by water.

The image resist material is then removed and a final protective Solder resist is applied. Plated through hole PCBs require the selective deposition of Copper and Tin or Tin-Lead on an Image formed in a similar way. The Plating Resist forms the circuit pattern and, on its removal after plating, the Etch Resist (the Tin or Tin-Lead) protects the circuit during etching of the newly exposed substrate Copper. Subsequent similar processes selectively plate Nickel and Gold on the edge contact of the circuit.

RenoCell technology focuses on the removal of metals from these complex chemistries and provides for waste minimization and continued reuse of the rinse waters.

RenoCell addresses the important management issues of:

- Increase in process and water treatment costs
- More stringent metal compliance levels associated with effluent regulations
- Various volumes of, and concentrations in, metal contaminated water rinses
- Reclaim of valuable metals

Economic and Environmental Benefits

PCB process lines include concentrated chemistries for cleaning, etching, electroplating, and stripping each, followed by rinsing process steps. RenoCell provides PCB manufacturers with several major benefits:

- Virtual elimination of all metal-bearing hazardous sludges, saving over 40% in overall treatment costs
- Total operational cost savings of 70% over

conventional treatment methods
- Lower initial capital costs with faster pay back periods (less than 2 years)
- Reduced wastewater loading on existing waste treatment facilities
- Conformance with federal and local discharge compliance standards

Implications of RenoCell Application to Pattern Plate Acid Copper and Tin-Lead Plating Lines

In a typical pattern plate Acid Copper and Tin-Lead Line , the PCBs are passed through a Tin-Lead stripper etch, an acid cleaner, Micro-etch, and then Copper plated to build up the circuit patterns, which are then further covered by Plated Tin or Tin-Lead Etch resist. The diagram above shows where RenoCells are placed in the process stream to treat rinse waters at the source where they can be readily reused in the process.

A specific pattern plating line was referenced here to gather typical PCB volumes, values and other key parameters. The following assumptions were established.

Pattern Plate Acid Copper and Tin/Lead Plating Line Assumptions:

- 100 panels/hour - single flight bar
- 0.048 drag out ratio
- 6 liters water/rinse and 12 rinses/hour
- Line operates 24 hours/day, 6 days/week, 50 weeks/year

Micro-etch and Copper Plate Spray Rinse Water

In a typical process, the rinsing of the panels after Micro-etch and copper plating is often performed in the same process stage, and often this is a spray rinse. The common Copper concentration of 25 grams per liter for Micro-etch and 15 grams per liter for Copper Plate is used in this process sequence. When the rinse waters from these operations are treated with RenoCell, more than 2,600 pounds of Copper per year are removed.

Tin Spray Rinse Water

Immediately after Copper plating, Tin/Lead, as an etch-resist, has been the predominant metal finish plated over the copper. Now, due to environmental concerns about Lead, Tin/Lead is largely replaced with Tin when a reflow finish is not required. Tin concentration of 14 grams per liter is used in this process sequence. Renocell treatment of rinse water after the tin plating process recovers approximately 950 pounds of tin per year. Tin reclaim by refiners is enabled because Tin metal is not considered hazardous.

Conclusion

When used as source treatment, the RenoCells remove Copper, Tin and Tin/Lead contaminant's without the manufacturer having to form metal-bearing sludges. Savings in disposal costs and water reuse minimizes annual operating costs and results in less than two years of amortization of capital costs. The use of RenoCell further results in a reduction of both rinse water volume and removal of metal contaminates sent to end-of-pipe treatment prior to discharge.

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