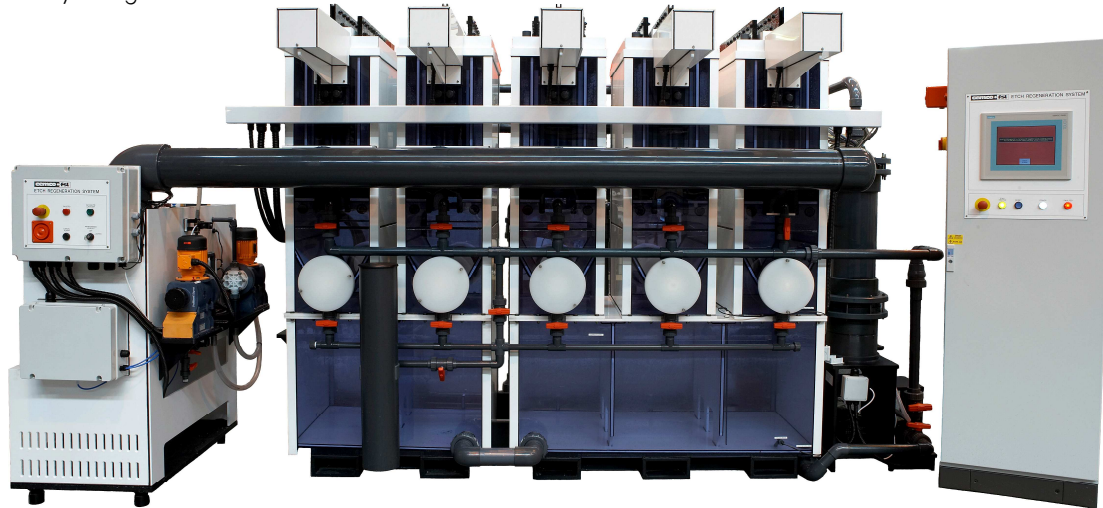


ETCHANT REGENERATION AND COPPER RECOVERY SYSTEM

The CEMCO Etchant 'Regen' System uses a specialised Electrolytic Cell enabling Acidic Cupric Chloride Etchant to be 'regenerated' whilst recovering the copper etched from the panel surface.

The photograph illustrates a 10 kg/per hour Cupric Chloride Electrolytic Regeneration Cell.

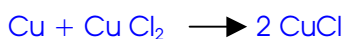


CEMCO manufacture Regen systems in a range of sizes. They are built as 2kg (4.4 lb)/per hour cell modules. This refers to the recovery rate of copper per hour. Modules can grow in size to a maximum of 10kg (22 lb)/per hour. Thereafter multiples of modules can be used in series with one another to suit any size production.

RECOVERY OF COPPER

In the manufacture of printed circuit boards the unwanted copper is etched away by acidic solutions of Cupric Chloride.

The equation for the Etching Process is:-



Cu Cl₂ being active Acidic Cupric Chloride

2 CuCl being in-active Cuprous Chloride.

As the Copper dissolves the effectiveness of the solution falls dramatically and it must be regenerated. The traditional way of doing this is to oxidise the cuprous ion produced with Acidified Hydrogen Peroxide. During this process the volume of the solution increases steadily.

The etching module will constantly produce spent chemical during the period of operation due to the necessity to re-oxidise the etching bath.

The excess or spent etchant is a hazardous waste

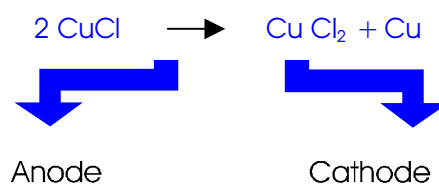
which is becoming increasingly more expensive to remove. Spent solution is normally precipitated as Copper Oxide and discarded for landfill.

The original proposal for recovering the copper in a high quality form came from EA Technology Ltd.

Using an electrolytic technique involving a divided cell, simultaneous regeneration of the etching solution and recovery of the unwanted Copper is made possible.

Special membranes act as Cell dividers allowing current to be passed between the electrodes whilst keeping the Anolyte and Catholyte solutions apart.

Copper concentrations are maintained using synchronous metering pumps. Recovered Copper is collected at the cathode as pure Dendritic flakes.



This process resulted in recognition by the United Nations Environment Programme.
Patent No. 2050428

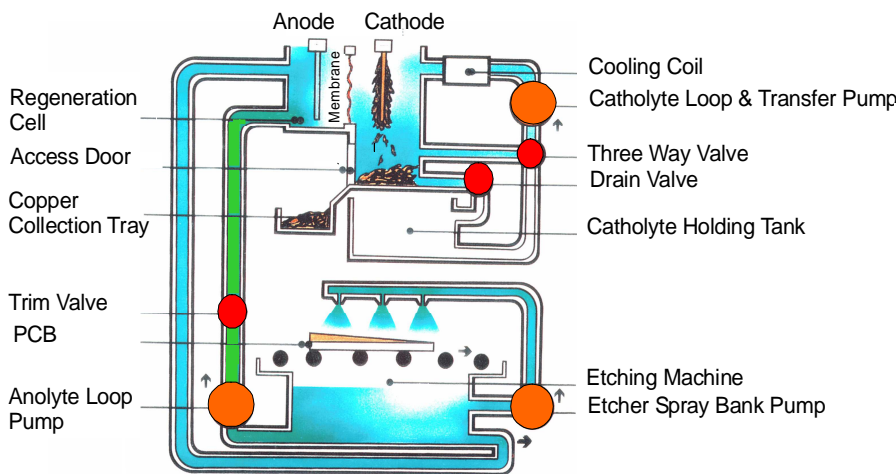
HOW DOES THE REGENERATION SYSTEM WORK?

Etchant is pumped in a closed loop between the etch module and Electrolytic Cell in high volume. A Redox Oxidation Reduction Potential controller monitors the condition of this fluid loop. The probe will activate the Electrolytic Cell dependent on the volume of work being processed through the etch module.

When activated, etchant is re-oxidised at the anodes to yield an active high O.R.P. etchant, whilst copper is being deposited at the cathodes from where it is scraped and settles in the copper collection area.

The Anodes and Cathodes are separated by a semi permeable membrane which allows current transfer between the electrodes. The solution used at the Cathode is also Acidic Cupric Chloride but in a reduced state. The Electrolytic Reaction ceases when the Redox Potential reaches its required value.

Due to the high turnover rate of the etchant bath, the reaction time to chemical change is significantly faster than conventional additive dosing systems.



BENEFITS

- No chemical oxidising agent is required
- No storage of fresh and spent etchant
- Low copper level in etchant promotes sludge free working
- The only by-product is copper powder
- A profit over total running costs is made.

CELL SPECIFICATIONS

The example outlined is based on a 6 kg (13.2 lb) /per hour system.

Overall dimensions [footprint] :
1900mm x 1300mm : 74.8" x 51.2"

Holding capacity copper : 240 kg (528 lb)

Power requirements :
6000 amp 10V DC via a transformer rectifier

Cooling total :
Chilled water is required @ 10°C max.
15 litres (2.75US gallons) per minute as required @ max.
1 bar pressure.

Flow rate in Etchant loop : 250 litres (45.8 US gallons) per minute.

