CASE STUDY

THERMAX

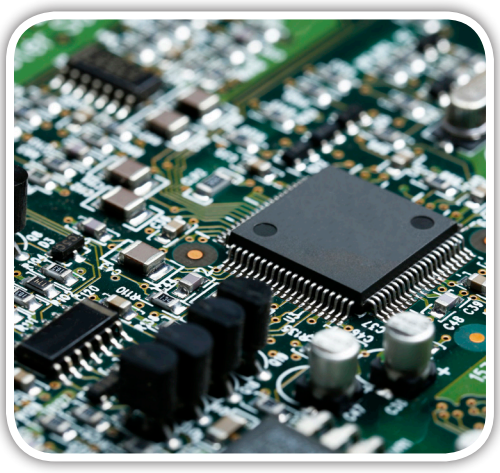
Heavy Metal Removal using Ion Exchange Resins

Introduction

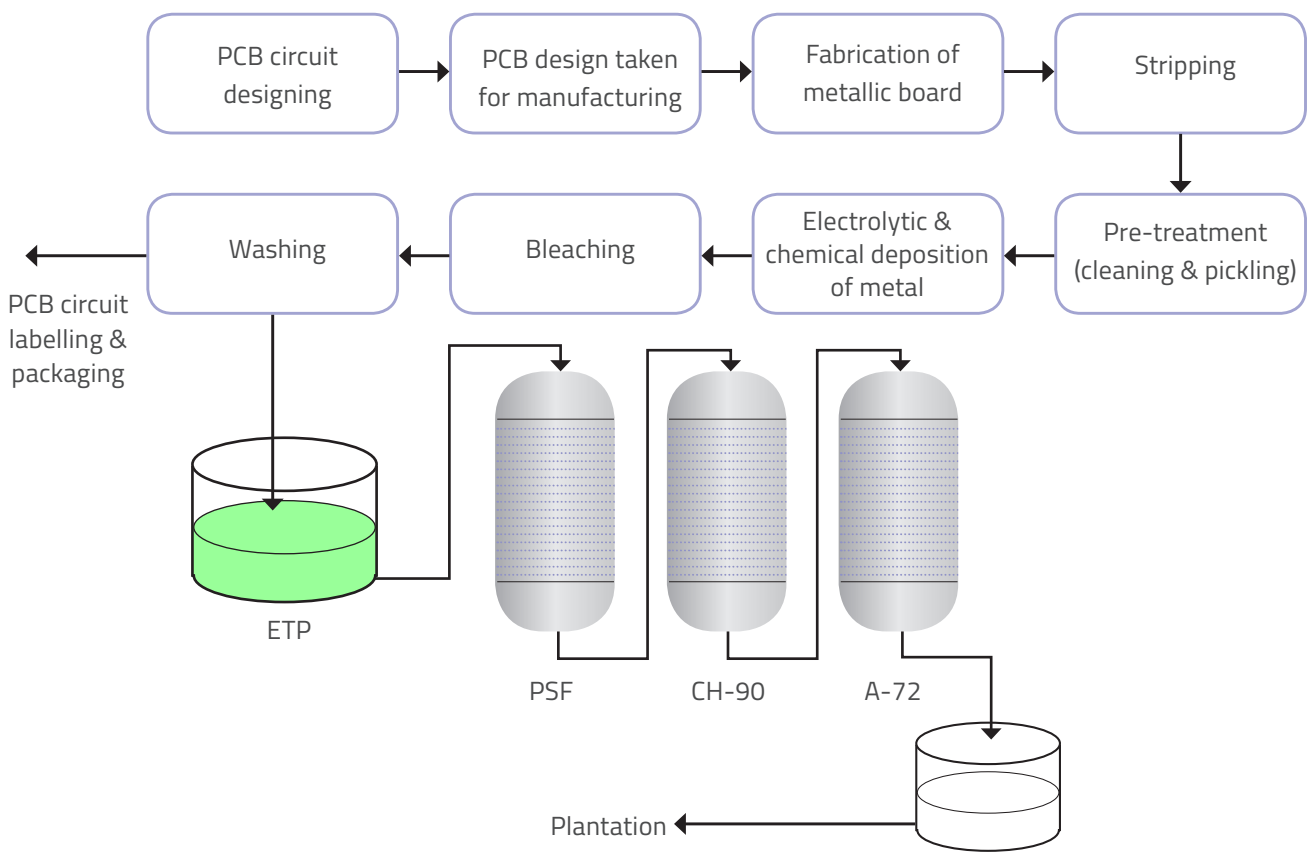
Heavy metals are naturally occurring elements that comprise essential and non-essential metals. They have relatively high density and are toxic even at ppb levels. Essential metals include Cu, Fe, Ni, and Zn & non-essential metals include Cd, Hg, and Pb. Heavy metals are major pollutants of freshwater reservoirs because they are toxic & non-biodegradable. They are easily absorbed by fishes and can also be found in vegetables due to their high solubility in aquatic environments. Hence, they may accumulate in the human body using the food chain. So it is very important to develop methods that can decrease the concentration of heavy metals in wastewater. One such developed technology for this application is ion exchange resins.

Challenges

One of the PCB (Printed Circuit Board) manufacturers approached Thermax for the removal of metal and color from their effluent in ETP plant. The customer had high concentrations of copper, sulphates & chlorides. Thermax performed a detailed study on effluent generated in the plant and figured out that there are certainly other problems in ETP than just color. They observed that the color was due to various dyes and there were metallic impurities which is coming after washing the excess metal from the circuit board, along with that some organic and inorganic impurities.



Process



Influent Characteristics

Parameters	Typical Analysis	Maximum Range
Color	Greenish	Greenish Blue
PH	5.8 to 7.0	8
Conductivity mmho/cm	5000 to 8000	23000
Sulphates as SO_4	1000 to 2000 ppm	5000 ppm
Chlorides as Cl	450 to 1000 ppm	1500 ppm
Calcium as $CaCO_3$	150 to 400 ppm	800 ppm
Magnesium as $CaCO_3$	350 to 500 ppm	800 ppm
Copper as Cu	3 to 5 ppm	100 ppm
COD	500 to 700	1000 ppm

Thermax Solution

Various methods were tried for the reduction like poly, segregation of effluent but nothing was found as efficient as ion exchange resins. Many trials were conducted on Tulsion® resins for the reduction of heavy metals, color & organics. Thermax proposed chelating resin Tulsion® CH-90 along with strong base anion Tulsion® A-72 MP suitable for this process which was able to remove colors and heavy metals as desired by the customer.

Results

- Colorless effluent
- Heavy metals less than 2 ppm

Advantages

- Multiple effluent handling with a single plant
- Easy operations
- Maintaining ETP outlet standards as per pollution control board norms