CASE STUDY

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

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

Influent Characteristics

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Typical Analysis</th>
<th>Maximum Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Greenish</td>
<td>Greenish Blue</td>
</tr>
<tr>
<td>PH</td>
<td>5.8 to 7.0</td>
<td>8</td>
</tr>
<tr>
<td>Conductivity mmho/cm</td>
<td>5000 to 8000</td>
<td>23000</td>
</tr>
<tr>
<td>Sulphates as SO₄</td>
<td>1000 to 2000 ppm</td>
<td>5000 ppm</td>
</tr>
<tr>
<td>Chlorides as Cl</td>
<td>450 to 1000 ppm</td>
<td>1500 ppm</td>
</tr>
<tr>
<td>Calcium as CaCO₃</td>
<td>150 to 400 ppm</td>
<td>800 ppm</td>
</tr>
<tr>
<td>Magnesium as CaCO₃</td>
<td>350 to 500 ppm</td>
<td>800 ppm</td>
</tr>
<tr>
<td>Copper as Cu</td>
<td>3 to 5 ppm</td>
<td>100 ppm</td>
</tr>
<tr>
<td>COD</td>
<td>500 to 700 ppm</td>
<td>1000 ppm</td>
</tr>
</tbody>
</table>

Thermax Solution

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