

Treatment of a Power Plant Cooling Tower with Peracetic Acid

Problem:

A geothermal power plant in Nevada had used sulfuric acid in the past to control cooling tower water pH. Since the plant got away from acid several years ago, scale had become a problem in the condenser tubes and cooling tower fill. The condenser tubes had from egg shell to 1/8 inch of scale. Field tests confirmed that the scale was calcium carbonate. The main problem of the scale was loss of heat transfer efficiency which ultimately lead to less power production.

Cause

The cause of the calcium carbonate in the heat exchangers was the periodic addition of calcium hypochlorite (HTH) to the cooling tower water. The cooling water pH was on the border line of calcium carbonate solubility even with scale inhibitor added. Slug feed of the HTH temporarily caused the calcium and alkalinity level to rise above the calcium solubility point thus precipitating calcium carbonate scale.

Solution

In order to provide an effective biocide program that does not contribute calcium salts or alkalinity, HTH was completely eliminated from the treatment program. It was replaced with an Enviro-Tech peracetic acid (PAA) program. The PAA was added twice per week during the winter and three times per week during the summer. Each slug feed added 4 gallons of

PAA over a one hour period to a system volume of 100,000 gallons. Advantages of the PAA program over chlorine based programs included:

- PAA did not contribute dissolved solids, calcium, or alkalinity. As a result, the scaling tendency was lowered.
- PAA killed over 90% of the bacteria present in a period of one hour at a dose of only 5 ppm.
- PAA was compatible with the current organic scale inhibitors at use concentration.
- PAA was less costly than the HTH program.
- 4. Results: After running the PAA program for a period of four months during the hottest part of the cooling season, an inspection of the cooling system was conducted and revealed the following:
 - The cooling tower mist eliminator, fill, internal support structure, and basin were very clean and free of both slime and algae.
 - Bacteria plate counts are running in the middle to low side of the maximum recommended level at 102 to 103 per ml.
 - According to plant personnel, the heat exchangers were very clean when opened and showed very good bio fouling control.
 - No further evidence of calcium carbonate scale was found in the heat exchangers.