Dealkalizer Improves Results and Reduces Operating Costs

Problem
A hospital system in the Central U.S. required high chemical dosages to control corrosion in the extensive boiler condensate return system. Due to high makeup water alkalinity, it was difficult to keep the steam line treatment levels in compliance with regulatory guidelines while providing adequate corrosion protection at the outermost parts of the system.

The hospital alternated five 400-HP boilers to generate approximately 22,700 lbs/hour of steam at 120 psig with natural gas as the primary fuel. City water with high alkalinity and hardness levels supplied the makeup water. Dual tank water softeners were used for hardness removal.

Analysis
Chem-Aqua audited the system paying particular attention to upgrading the pretreatment equipment. Depending on the raw water characteristics and operating conditions, using a dealkalizer to lower the makeup water alkalinity can significantly reduce the boiler blowdown rate and chemical requirements. A full analysis was required to determine the suitability of a dealkalizer.

The high alkalinity of the makeup water was the limiting factor that determined the blowdown rate. To prevent foaming and carryover, the M-Alkalinity of the boiler water had to be kept below 800 ppm (as CaCO₃). This resulted in a blowdown rate of 6.1% of the feedwater flow. By installing a dealkalizer, it was estimated the blowdown rate could be reduced to 3.3%. This was projected to reduce fuel costs by $16,000 annually and reduce water usage by almost 300,000 gallons per year.

High makeup water alkalinity levels also cause large amounts of carbonic acid to form in the condensate. Unless controlled by chemicals, the carbonic acid causes corrosion in the condensate return system and contributes to energy-robbing iron deposits on the boiler tubes. It was projected that a dealkalizer would reduce chemical costs by over $23,000 annually.

Solution
An appropriately sized chloride cycle dealkalizer was recommended at a total cost of $29,400, with annual operating costs estimated at $3,000 and payback on the project at 23.2 months. A brinemaker, at a cost of $44,300, was also suggested to meet the increased demand in brine volume and consistency. The hospital installed the equipment in December 2006.

During a subsequent review, actual natural gas savings were found to be $33,500 annually, based on 2007 fuel prices. There was an additional savings of $37,300 in chemical cost while maintaining corrosion protection. The actual payback for this project was 12.3 months.

The Chem-Aqua recommended pretreatment equipment upgrade significantly improved the water treatment program results and reduced fuel, water, and maintenance costs.