Case History – WCTI COOLING TOWERS-FOOD PROCESSING

BACKGROUND

A large onion processing facility in Southwestern Idaho operates an ammonia refrigeration system to freeze finished product. Four ammonia compressors totaling 1,500 H.P. provide refrigerant to the tunnel freezers. Four evaporative condensers, with 1,600 tons of capacity, remove heat from the system.

The water quality in this region is very difficult to treat using traditional chemical programs. Evaporative condensers and cooling towers typically operate below 2.1 cycles of concentration to control scale. An acid feed program has increased the cycles of concentration to 3.1 at this plant. The facility operates their own wastewater treatment plant and the hydraulic load from the cooling towers is almost 40% of the total wastewater flow.

Plant management decided to investigate alternative treatment programs in view of the high blow down volume and the problems it created with wastewater treatment. The WCTI process was investigated and ultimately chosen to manage their cooling water program.

A REVIEW OF THE WCTI PROCESS

A unique patented technology was developed in 2004 to utilize natural water chemistry for cooling water treatment. The goal of the process is to minimize water consumption, eliminate chemicals and provide scale and corrosion protection.

These goals are accomplished through a unique treatment scheme that eliminates scale-forming ions, generates corrosion protection, and creates a biostatic environment to eliminate bio-fouling. The process consists of a high efficiency softener (HES) to remove scale-forming ions, namely calcium and magnesium from the makeup water. Removing these ions prevents any chance of forming scale and deposits. Sodium chemistry then prevails in the bulk cooling water.

Blow down can now be eliminated since the scale forming ions have been removed. Cycling up the tower water to very high levels results in high TDS, pH increase above 9, and dramatically increased levels of silica that provides many beneficial results in addition to virtual elimination of tower water wastage.

The result of this process produces natural water chemistry with unique properties. High cycles of concentration promote the polymerization of silica. Polymerized silica provides excellent corrosion inhibition to all forms of metals and concrete surfaces. The high TDS water in combination with high pH provides biostatic water chemistry that eliminates microbiological build up in the bulk water.

The net effect of this chemistry process eliminates tower blow down, eliminates chemical treatment, minimizes water consumption and provides excellent corrosion inhibition and microbiological control.

WATER QUALITY AND OPERATING EXPERIENCE

The processing plant started the WCTI program in July 2008. The water quality of the makeup water is shown below:

	Make-Up Water
Conductivity	720 umhos
Total Hardness	305 ppm
Silica (SiO_2)	32 ppm
M-Alkalinity	360 ppm

The tower water on the WCTI process is currently operating at just over 33 cycles of concentration. The tower water contains 24,000-PPM TDS, 23-ppm Ca Hardness and a pH of 9.7. There are no signs of scale, corrosion or biological fouling anywhere in the system. Below are some pictures of the installation:


EVAPORATIVE CONDENSERS


CLOSE UP VIEW OF CONDENSER TUBES


VIEW OF CONDENSER INTERIOR

QUANTIFYING THE SAVINGS

Poor make up water quality caused large volumes of blow down water to their wastewater treatment facility. Although the chemical treatment program performed well and protected the system, blow down cost was high due to limited treatment capacity.

The WCTI program saves $37,600/year in blow down treatment cost and saves over 8-million gallons per year of city water. Average blow down rates contribute almost 40% of the total wastewater volume. That volume is now available for additional treatment capacity.