

## Demand-Based Halogen Control Helps Boost Cooling Tower Efficiency at GE Plastics Plant



**Don Ricketts, Lab Specialist at the GE Plastics plant, checks the current millivolt reading of the High Resolution Redox control system. The system constantly monitors the oxidant demand in the cooling tower's return water and automatically feeds the required amount of NaOCl to achieve and maintain system cleanliness.**

When the GE Plastics manufacturing facility in Mt. Vernon, Ind., experienced difficulty maintaining consistent chlorine levels in one of its cooling towers, it switched from manually-adjusted chlorine dosing to a fully-automated system that modulates halogen feed to meet the current system demand. With this control system, the cooling tower is automatically treated with the oxidant dose required to achieve and maintain system cleanliness, and halogen levels are now consistently maintained within the specified range.

The plant's Number 3 Cooling Tower, which serves the facility's biphenyl acetate unit, is an induced draft cross-flow system with a design circulation rate of 28,800 gpm and an evaporation rate of up to 288 gpm. Inlet and outlet water temperatures are 95°F and 85°F, respectively.

The cooling tower allows for the recycle of cooling water to reduce the quan-

tity of makeup water and discharge from the plant. The unit is operated at five cycles of concentration and has automatic pH and blowdown capabilities. Cooling tower system makeup water comes from the facility's mill water treatment unit.

Chlorine residual in the water returning to the tower is measured by scheduled lab tests using amperometric titration. Prior to the adoption of the new oxidant control system, results from the wet tests were used to calculate chlorine feed rates, which were then adjusted manually.

### Erratic Halogen Levels

Residual test results did not provide operators with an accurate picture of the ever-changing oxidant demand in the system. Almost immediately after the tower's start-up, chlorine residual levels in the return water became increasingly erratic.

The system would constantly swing back and forth between having too much chlorine, which could promote corrosion, to having too little chlorine, which could increase the potential for poor microbiological control and subsequent fouling. Although the desired free chlorine residual range in the return water is 0.1 to 0.3 ppm, actual chlorine levels in the return would swing from less than 0.1 ppm to as high as 2.0 ppm.

### Demand-Based Halogen Control

To maintain system cleanliness, changes in oxidant demand must be quickly dealt with to avoid system fouling which can reduce heat transfer rates, restrict water flow, and lead to higher operating and treatment costs. To address the problem of erratic chlorine residuals in the return water, the plant evaluated and then adopted

Redox (also referred to as Oxidation Reduction Potential, or ORP) measures the electromotive force generated when an oxidant is present in aqueous solution. The strength of the force, which is measurable in millivoltage, is directly proportional to the oxi-

dativity strength of the treated system. The redox measurement in the GE plant's cooling tower at any given time is a measurement of the current oxidant

**Periodic wet tests did not provide an accurate picture of the ever-changing oxidant demand in the cooling tower system.**

Almost simultaneous with the adoption of HRR control, the plant switched from the use of gaseous chlorine at its Number 3 Cooling Tower to sodium hypochlorite (NaOCl) in order to improve safety.

Working with representatives of Stranco, Inc., Bradley, Ill., GE Plastics installed a HRR control system to automatically control halogen feed. The controller monitors the oxidant demand in the return water and automatically feeds the

required amount of MaOCI to achieve and maintain system cleanliness.

The HRR control system senses the current oxidant demand in the cooling tower system via a redox electrode in a continuous sample flow of the system's return water. NaOCI feed is regulated using the controller's time-based proportional mode.

#### **Halogen Levels Stabilized**

Don Ricketts, Lab Specialist at the GE Plastics plant, reports that the adoption of demand-based halogen feed immediately stabilized oxidizing biocide levels at the facility's Number 3 Cooling

Tower. The plant's former method of basing oxidant feed rates on residual test results had subjected the cooling tower to constant over- and under-feed. With HRR control,

the precise amount of oxidant is now continuously fed to meet the current demand of the system, resulting in improved biological control and reduced potential for fouling.

The potential for corrosion from high halogen levels is also now substantially

reduced. Quarterly mild steel and admiralty tests indicate corrosion rates well within acceptable levels.

Based upon the improved performance of the Number 3 Cooling Tower, the plant installed HRR controllers at two other cooling towers serving the facility. Ricketts says NaOCI consumption for microbiological control in the cooling towers has been reduced by approximately 30 percent. This, coupled with the significantly reduced man-hours required for monitoring and manually controlling halogen feed, has brought a quick return on the plant's investment in the new equipment.

**The adoption of demand-based halogen feed immediately stabilized oxidizing biocide levels**



STRANCO INC. P. O. Box 389 Bradley, IL 60915 800-882-6466 FAX: 815-932-0674

Internet: <http://www.stranco.com>

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