

# TrueSense\* Online for Cooling Speed to Implementation Ensures Fouling Protection on Critical System



Speed. Getting it done and done right while seeing results quickly. That's what customers need, want and expect. Being able to accomplish that, without lengthy installation and calibration procedures, was an inherent system and process design requirement of GE Water & Process Technologies' TrueSense Online for Cooling system (Figure 1).

## Challenge

A western United States refiner primarily processes sour Canadian crudes. It is a fully integrated refinery with crude distillation, vacuum distillation, FCC, HF alkylation, catalytic reforming, hydrodesulfurization, isomerization, sulfur recovery, and product blending units. Collectively, these unit processes convert crude into various products, mostly gasoline, diesel, jet fuel, and asphalt.

One main cooling system services the plant's unit operations. The unit processes served by the tower system are the Crude Unit, Fluid Catalytic Cracker, Alkylation Unit, Hydrogen plant as well as other operations.

The tower has a recirculation rate of 8,000 gpm (30 m<sup>3</sup>/min), and a system volume of 80,000 gal-

lons (303 m<sup>3</sup>). Typical tower supply and return temperatures are 85°F and 95°F (29°C and 35°C) respectively.

## Critical Heat Exchangers

There are a multitude of critical heat exchangers, including hydrogen plant process gas coolers, alky debutanizer overhead condenser, and alky depropanizer-HF strippers. While these exchangers are not the hottest, they tend to be limiters of production.

The most critical is the debutanizer overhead condenser. This exchanger condenses butane from HF (hydrofluoric acid) hydrocarbon vapors. It's a 4-pass bundle, carbon steel, with 180°F (82°C) skin temperatures.



Figure 1: TrueSense Polymer monitor

The economic impact of this exchanger is high. The large, high flow system tends to draw old tower debris forward, restricting flow. This requires "external cooling" during summer months to ensure no curtailment of production throughput. The tolerance for less than optimal heat exchange is low and fouling control is critical. Making sure the right amount of polymer is present under varying conditions of stress is vital to ensuring maximum plant production.

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## Chemical Treatment Program

The cooling system employs city water make-up that is relatively consistent, with moderate hardness and approximately 12 ppm of silica present.

The treatment program consists of an alkaline zinc program.

- Continuum\* AEC 3131 Alkaline Treatment
- Spectrus\* BD 1500 Biocide Enhancer
- Spectrus NX 1103 Microbiological Control Agent
- Hypochlorite

The treatment program is GE's non-phosphate, halogen stable cooling technology, and incorporates the polymer for fouling and deposit control.

The control parameters for the recirculating water are:

- pH 8 to 8.2
- Conductivity, 1,500-2,000 µMhos
- Cycles of Concentration: 4 to 6
- Polymer, 12 ppm<sup>1</sup>
- Zinc, 0.5 to 1.0 ppm total
- Free chlorine, 0.2 – 0.5 ppm

<sup>1</sup>Target threshold polymer concentration

Both automated pH and blowdown control are in place.

## Solution

TrueSense technology was introduced as an integrated, modular system. A permanent installation was desired – specifically a fully integrated, “plug and play” system. In addition, the system was wireless enabled to allow for communications with key personnel, without the costly and time-consuming requirement to run conduit and pull cable.

The GE team was diligent about preparation, making sure that water, power, chemicals, and 4-20 mA sensors had been run to the building. All of the analyzers, controllers and pumps were laid out in a logical easy to access format. This pays big dividends further into the operational life of the equipment. In a matter of hours, following a smooth installation, the GE team ensured a robust operation by optimizing and testing operational parameters, training supervisors and operators,

and watching how the system behaved under different conditions.

Due to the straight-forward design of the displays, and the logical layout of the skid, the operators were impressed with the ease of use of this system. (Figure 2)

The startup was easy, with TrueSense operation deemed intuitive; the interface is clean and flows in a single direction.

## Results

Leading up to the start-up of TrueSense, the plant was manually feeding the Continuum AEC product. Immediately prior to turning on TrueSense, there was a 4 ppm threshold polymer concentration in the system as the system was in manual mode while the installation was occurring. The first reading on the TrueSense was a 3.5 ppm, and the new offline test was reading essentially the same at 3.9 ppm. The system was turned on, with a goal of maintaining a target threshold polymer concentration number at 12 ppm. Figure 3 shows the trend in the polymer concentration over the first day. TrueSense achieved and held polymer consistently within 19 hours.

The customer was pleased with the installation. GE's local Account Managers find training people in the plant on what they need to know to be



Figure 2: The fully integrated TrueSense system.

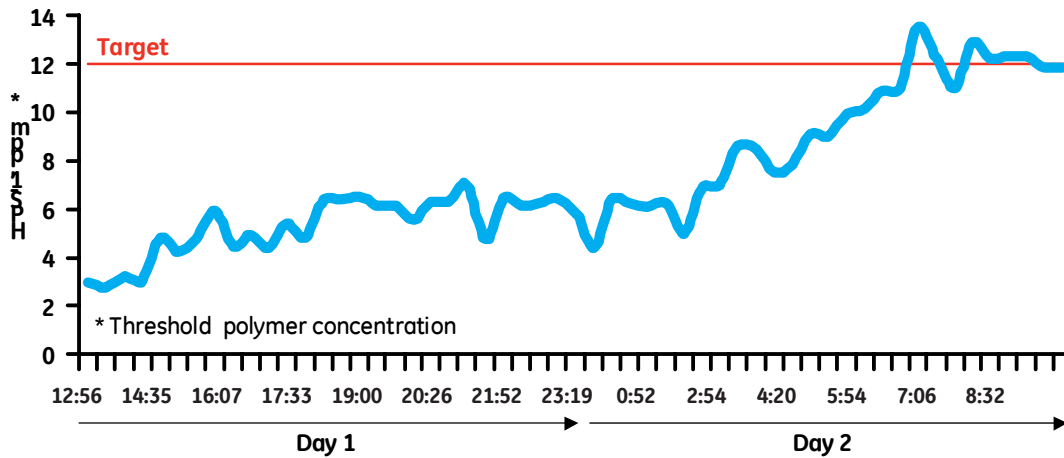


Figure 3: Control was established within hours.

easy. Fixing problems should be equally easy. Without passwords into critical areas, there is nothing that can be 'broken' on the front-end programming configuration of screens.

Typical corrosion rates for mild steel are less than 0.2 mpy with less than 0.1 ppm residual iron – excellent results for a refinery application.

The wireless communications provide easy access to performance information, for both the customer and GE personnel, enhancing the system control and optimization. Plant personnel have additional security in knowing that these tools are in place and constantly working for them, and that their critical exchanger has the best monitoring, control, & protection program available.