The Client

A major Midwestern university, whose Facilities Department goal is to create a functional and pleasing environment to promote superior patient care, education, and research. In this manner, they hope to support the university’s vision of transforming the world through an environment that will forever foster opportunities conducive to universal success in research, healthcare, and education.

The Client’s Needs

The university heating system was comprised of 8 Thermogenics Steam Generators, each producing 20,000 lb/hr of steam. These generators were on a central steam/condensate loop that provided steam to over 80% of the buildings on campus. Although the generators were not that old, they were designed and installed in a manner that prevented consistent feed of quality make-up water.

The system was being treated with a traditional approach:

- A Sulfite based Oxygen Scavenger was being fed to the storage section of the Deaerator to prevent corrosion
- A Phosphate/Polymer blend was being fed to the boiler feedwater to minimize deposit formation
- A Neutralizing Amine was being fed to the condensate storage tank to cycle through the system and protect against the potential of low pH mild steel corrosion.

The Findings

By thoroughly surveying the make-up, boiler and condensate systems, a number of improvement areas were identified:

1. High Iron levels were found in the feedwater
2. Iron tubercules were prevalent in the condensate storage tank, where low temperature make-up water was mixed with condensate
3. Inspection revealed high corrosion rates and iron deposition

Key Figures

- Over 20,000 full time graduate and undergraduate students
- > 2200 Academic staff members
- Over 1400 Acre campus
- > 100 major buildings
- Sustainability program driven by campus solar research efforts

(1) Feedwater Iron  (2) Iron Tubercles  (3) Iron Deposits
The Solution

In order to prevent iron corrosion, improve boiler cleanliness and optimize overall ease of application, Veolia Water Technologies introduced ProtectAll™ as the “All-In-One” treatment for the university steam/condensate system. ProtectAll™ is a green, surface-active chemistry that selectively targets virgin metallurgies for formation of a monomolecular, hydrophobic protective barrier film. The 100% water-soluble ProtectAll™ chemistry partitions itself in both single and two-phase locations, thus providing metal protection throughout the entire steam water cycle.

After establishing a significant database of baseline data on the traditional program, the transition to the single drum ProtectAll™ technology was made.

Results

Immediately after switching to the ProtectAll™ technology, an increase in Iron “Pick-up” was noted as the existing iron oxide deposits were being removed. After approximately 2 weeks, the iron levels in the feedwater, boiler water and condensate system began to drop as the technology established its protective barrier on the newly cleaned surfaces throughout the system.

In approximately 2 months, the iron levels across the system stabilized at much lower levels than on the previous program (Table 1 below). Visually (pictured on the right), the water clarity has seen a significant improvement and condensate corrosion rates have stabilized at less than 0.2 mpy, indicating a well protected system.

The facility has been using ProtectAll™ now for over 1 year. During its annual shutdown, inspection revealed that the iron deposits and corrosion by-products that were prevalent throughout the pre-boiler and boiler systems have been significantly reduced. Due to the results and protection provided, the use of ProtectAll™ has been expanded to the Health Science campus as well.

Additional benefits provided by ProtectAll™ include:

• A single drum approach reducing chemical handling needs
• A single chemical feed system requiring less maintenance & upkeep

Performance

<table>
<thead>
<tr>
<th>Sample Point</th>
<th>Before ProtectAll™</th>
<th>After ProtectAll™</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedwater Tank</td>
<td>3.49 ppm</td>
<td>1.8 ppm</td>
<td>48.4%</td>
</tr>
<tr>
<td>Condensate Tank</td>
<td>1.77 ppm</td>
<td>0.29 ppm</td>
<td>83.6%</td>
</tr>
<tr>
<td>Condensate Laundry</td>
<td>3.29 ppm</td>
<td>0.46 ppm</td>
<td>86.0%</td>
</tr>
</tbody>
</table>

Table 1
Iron Analysis Before & After ProtectAll™