GE Solves Boiler Feedwater Quality and Footprint Issues at a Steel Mill Power Plant

Challenge

A power plant located within a Canadian steel mill, needed to solve a water quality problem for their boiler feedwater.

The power plant is a 70-MW cogeneration plant with 50% extraction of the steam to the steel mill.

The boiler feedwater goes to a 1450 psig boiler. The area's water source had been known to contribute to colloidal silica at other high-pressure plants.

The customer challenged GE to address three main concerns with our solution:

- **Colloidal Silica –** unchecked the colloidal silica would increase SiO2 levels inside of the boiler and travel throughout the steam system. This could lead to silica deposits, on the steam turbine, steam control valves and desuperheating stations. Silica deposits are tenacious in nature and very difficult to remove. Silica deposits can form in the low-pressure section of the turbine, affecting its efficiency and can even unbalance it, forcing a premature shutdown.
- **Small footprint –** the customer wanted to use the existing facility so the solution needed to fit within a very small area.
- **Automation –** the customer wanted a system that was "foolproof" and easy to automate so that they could reduce the staffing requirements

Solution

Previous solutions suggested by others focused on ion exchange. An ion exchange solution requires bulk acid and caustic, which would have required significant storage requirements, a larger footprint and EHS issues for handling and containment of the acid and caustic.

After an extensive evaluation, GE recommended a membrane-only solution to meet the customer's needs. As part of the study, GE showed the customer why the membrane approach was the only viable solution to meet their specific needs.

GE proposed installing the following membrane equipment:

- Three trains of ZeeWeed 1000 ultrafiltration (UF) units for pretreatment
- Two skids of Titan 144 reverse osmosis (RO) systems for purification (Figure 1)
- Three trains of E-Cell MK3-27 electrodeionization (EDI) units for final purification and polishing (Figure 2)

The nominal flow for this system is 800 gpm (182 m^3/h) with a peak flow capability of 1200 gpm (273 m^3/h).

Figure 2: Main level showing the Titan systems

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Results

By creating a mezzanine level within the existing structure, GE was able to address the small footprint for installation. The mezzanine level houses the E-Cell EDI units just above the UF and RO units. This unique approach met the customers desire to use the existing facility. Other solutions would have required an expensive building expansion.

The GE integrated membrane solution meets the feedwater purity requirements consistently and with little maintenance required by the power plant personnel.

Additionally, the capital cost of the all-membrane approach was within 15% of an all ion-exchange approach without the added EHS issues and building expansion expenses.

Ultimately the customer chose GE because we took the time to understand their unique situation and designed a solution that addressed their specific needs.

If you would like to know how GE can solve your water treatment needs, contact your local GE representative or visit us at www.ge.com/water.

Figure 2: Mezzanine level above the UF and RO membranes, showing E-Cell Stacks