ME Plant

Steaming ahead

Choosing the right pumps for injecting hot de-ionised water into a turbine steam line presented a challenge for an Austrian steel plant.

When an Austrian steel producer planned to install a temporary pumping system to control the temperature of superheated steam in a vital turbine, it was expected to be a tough proposition. The task was to supply the steam line with hot de-ionised water at temperatures up to 105°C and pressures to 45 bar. Service would be continuous - 24 hours a day, 7 days a week - over a threemonth period while permanent steam conditioning plant was re-furbished.

De-ionised water is a difficult liquid to pump. It does not have lubricating properties - so any pump that relies on the pumped liquid to lubricate its seals is vulnerable to rapid wear and likely to need frequent seal replacements. Most types of seal-less pump could not match the output pressures needed for injecting water into the steam line.

The plan envisaged by the steelworks was to use two multi-stage centrifugal pumps, alternating one week in operation with one week on standby or maintenance. But Verder Austria, the pump specialist consulted by plant engineering, proposed a different solution, and on their recommendation a system based on the Wanner Hydra-Cell G25 seal-less pump went into operation in June 2004.

Two G25 pumps were installed, as had been planned for the centrifugal pumps. In the event, only one was needed and the second acted simply on standby duty.

The Hydra-Cell pump/motor package, which included an oil cooler to compensate for high liquid temperatures, was almost 40% less expensive than the centrifugal alternative. Part of this was down to lower motor costs. Hydra-Cell pumps operate at more than 80% efficiency, as against maximum efficiencies of 45% for the multi-stage centrifugal pumps under consideration. The practical consequence was that the G25 pumps on this duty could be fitted with 11 kW motor, compared with the 55 kW motor needed to achieve comparable performance with centrifugal pumps. So ongoing energy costs would also be considerably lower.

Another important consideration for this application was that the Hydra-Cell is an ideal metering pump. Pump speed governs output flow - in a constant linear relationship which is not affected by pressure changes in the outlet line. Flow could be easily and accurately controlled (with a turndown ratio of 10:1 or better) via a frequency inverter, with the pump responding fast on signal when a rise or fall in steam temperature needed correcting by adjusting the flow of DI water.

A centrifugal pump would have been more difficult to control because the flow/pressure relationship is not linear. Performance through time would also change if seals were allowed to wear.

The performance of the Hydra-Cell unit stayed consistent throughout the specified three-month service period, and the pump ran as planned until the temporary steam conditioning system was de-commissioned. Little maintenance had been needed, no problems were reported and both pumps have been retained by the steelworks against any future requirement. ME

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