

Enhancing the EFFICIENCY & RELIABILITY of Boiler Feed Water Applications

The steam/cogen facility at one of the oldest and most prestigious Ivy League colleges in the United States plays a critical role for faculty and students – providing seasonal heat and air conditioning, plus electricity and steam for the labs and instruments used throughout the campus.

As is the case with many cogen plants around the country, segmented ring pumps were installed decades ago for boiler feed water applications. During that time, it was common practice to deploy smaller versions of pumping & piping infrastructure that worked well in large utilities. In theory - it was assumed that proven technology for utility-grade power plants could be scaled-down for universities or hospitals. But in practice, many cogen plants like this one experienced a technology transfer gone bad – all due to a common constraint tied to the height of their roofline.



In most boiler rooms at older universities around the country (as well as many hospitals and pharmaceutical companies), the height of the roofline limits the vertical distance between the deaerator and the boiler feed water pumps. As a result, Net Positive Suction Head (NPSH) available to pumps is limited - and suction transient conditions can cause vapor to travel from the deaerator to the pump. This causes cavitation, pump failures and in some cases, plant shutdowns. Larger utilities do not suffer this problem because the vertical distance between the deaerator and boiler feed water pumps can be three-to-five times larger.



For this university's maintenance team, the set-up caused weekly maintenance work on their segmented-ring pumps. A review of maintenance logs showed that more than 1,600 hours of work was required to keep their ring pumps operating. Thirty-two different work orders were placed to repair seals and rebuild bearings. During a four-year period they experienced four catastrophic pump failures – and downtime is never acceptable for plants in cold winter environments such as the North East.

The maintenance requirements for this university's segmented ring pumps reached an untenable position, requiring constant monitoring to check the seals or inspect the bearings. Beyond the financial costs - \$75,000 for parts and labor - morale for the maintenance team had reached a breaking point. Each winter morning's commute brought anxiety and the anticipation of pump problems awaiting the start of each day.

The solution for the university's boiler feed water applications came from Sundyne's Sunflo Industrial Grade Pumps. After extensive equipment analysis and a review of more than 8 years of data, the segmented ring pumps were replaced with Sunflo pumps. They also implemented a new configuration to enhance the steam rate, improve efficiency and permanently solve the excessive maintenance problems.

Sunflo integrally geared high-pressure pumps feature robust thrust bearings as part of their unique modular shaft assembly, which are sized to handle axial thrust without problematic balancing devices. The previous ring pumps were multi-stage designs that required a dynamic hydraulic balancing disc. Under normal operating conditions, water flowing through the pump kept everything in balance – but the suction transient conditions enabled vapor to reach the pump, negating the thrust balancing capability of the balance disc, upsetting the balance and allowing the rotor to shift back-and-forth. Because the clearances are extremely tight in ring pumps, even a slight shift can cause the impeller to hit the casing, which can lead to pump failures.

Sunflo pumps are single-stage designs, and the impellers feature optimized suction inducer technology that addresses low NPSH requirements in a way that eliminates pump cavitation. The new pumps also feature Sundyne's high-pressure impeller technology that is optimized to deliver high head. These features enabled the Sunflo pumps to withstand the upset conditions that plagued the ring pumps.

Once the suction transient conditions were addressed, the next step was to enhance the plant's efficiency, and implement a flexible configuration that could be varied from season-to-season. The university's engineers were quick to point out how the seasonal load swing increased the strain on the ring pumps, which exacerbated maintenance issues every time they made a switchover.

After reviewing the data, Sundyne determined that instead of running two pumps at 50-percent capacity, the university would be better served running three Sunflo pumps at 33-percent capacity. The hydraulic configuration of the Sunflo pumps was optimized for the new service conditions, providing turndown flexibility for warmer months - and the ability to boost steam output in winter months - while maximizing the pump's hydraulic efficiency.



The Quantifiable and Qualitative Value of Streamlined Maintenance:

The first maintenance benefit the university noticed about the Sunflo pumps was the simplified service access. Their former segmented ring pumps were difficult to access. Each pump weighed almost 300 lbs., and required an A-frame and chain hoist to lift and remove for service. The situation was complicated by the fact that there's very little head room in the boiler room. Once a pump was removed, it could be out-of-duty for months awaiting parts, which are difficult to procure on short lead times.

But the Sunflo pumps feature a modular shaft assembly that can be serviced in place. Over the last four years, the university has only had to replace one shaft assembly - and the job was accomplished by simply swapping in a new module without having to disconnect the motor. Beyond this one issue, the only other maintenance required has been regularly-scheduled oil changes – versus daily inspections for the segmented ring pumps, and what seemed to be non-stop maintenance.

For the university's engineering team, addressing the suction transient issues and solving their pump failures was job-one. Enhancing efficiency with a more flexible approach for each season was their second priority. But the best improvement gained from Sunflo pumps came from the streamlining of their maintenance program.

The switch from segmented ring pumps to Industrial Grade Sunflo pumps has enabled the university's maintenance team to be more effective. Instead of always focusing on boiler-feed pump problems, they're now able to spread their time and resources out across the entire campus – providing a return on their Sunflo investment that is not only measured in dollars, but also in time, and peace-of-mind.

For more information on Sunflo Pumps, please visit:
www.sundyne.com



The sunflo line of industrial grade pumps are the perfect solution for boiler feed water systems used in steam and power generating applications where efficiency, performance, and uptime are critical.



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