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Everyone wants to cut their energy costs, even utility companies. Some of the biggest energy hogs in these operations can be found among the many pumps required to run these plants. Yet, in many cases, the big pumps (especially the older ones) can be updated to achieve some or all of the following advantages: increased performance, lower utility requirements, reduced Net Positive Suction Head Required (NPSHR), reductions in cavitation and upgrades in metallurgy.

One example of a Standard Alloys Custom Hydraulic Solution (CHS) involved a large circulating water system pump (one of six) for a utility company in the Northeast.While impeller damage due to cavitation dictated the overhaul of at least one of these pumps each year, during warm summer months the power station would periodically become load limited based on condenser backpressure. Thus, while eliminating cavitation was the primary objective of the CHS study, additional capacity also was requested. Fortunately, because Standard Alloys had reverse-engineered the impeller on this pump years earlier, the current impeller design was known. A redesign effort was initiated that resulted in a change in the number of vanes and a change in the vane shape. This redesign was double-checked by an outside consultant and verified.

Next, a new pattern and core boxes were made for the foundry. The new impeller was cast and machined, then verified against the design prior to shipment. Once installed, the performance was checked and the improvements were verified against pre-CHS tests utilizing ultrasonic flowmeters and other plant instrumentation.

The payback

The redesigned 46” impeller, custom-designed and built for this particular application, increased the capacity of the Worthington pump from 88,000 gpm at 100 ft Total Developed Head (TDH) to 94,000 gpm. It also decreased the NPSHR from 22 ft at the rated 88,000 gpm, to 17 ft at the

new 94,000 gpm rating.A byproduct of the pump operating without cavitation was a significant reduction in the noise levels measured around the pump with the new impeller. Furthermore, the energy requirement for the 2500 hp motor was reduced from 329 amps to 319 amps. (Remember, too, that with the 329 amps of the old design, the unit was only pumping 88,000 gpm. The upgraded design, requiring only 319 amps, is pumping 94,000 gpm.) Finally, just for good measure, Standard Alloys also upgraded the material to CD- 4MCu, which means it will be years before a replacement is needed.

Subsequent to the first impeller being installed, the remaining pumps underwent upgrades. Today, all six units are continuing to operate well.

Elimination of the cavitation will increase the life of the impeller, bearings and seal, thus extending the Mean Time Between Repairs (MTBR).Adding the value of the increased pump output to the energy reduction savings and the savings due to the longer life of the part and pump system makes this type of project easy to cost justify.

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