



Technical Paper

Energy efficient pump components

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Cooling water pumps retrofit

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Summary

Main reasons for the retrofit of cooling water pumps in the cogeneration power plant was the change of operating conditions and consequently the changed operating points for cooling water pumps. The cavitation damages on pumps impellers were observed frequently. The complete procedure is discussed, starting with preliminary site tests for the exact determination of existing situation. Flow measurement was performed with calibrated current meters. Analysis showed that pumps have operated at overload and additionally the absolute efficiency was low. Basically, the pumps were still in good condition, so the customer's requirement, that only impellers should be replaced was understandable.

Basic requirements were following: energy costs reduction (higher pump absolute efficiency, better adaptation of pump characteristics to the system characteristics) and higher pumps reliability – better cavitation characteristics. Next step was hydraulic design and optimisation supported by CFD*, no model tests were carried out. The limitations were given by existing meridional cross section. Inlet angles were analysed in order to improve pump NPSH** characteristics and outlet angles for shifting of pump best efficiency point nearer to the operating point. Two different blades thicknesses and two numbers of blades were analysed.

The manufacturing technology was chosen based on specifics of the order, impeller was fabricated by welding. The acceptance tests after retrofit showed the increase of pump total efficiency for 7 % and it was shifted nearer to the operating region. Energy costs reduction was satisfactory. The expected impellers lifetime was longer because of better hydraulic shape and, additionally, change of material - new impellers are manufactured from the material W.Nr. 1.4313. After three years of operation no cavitation damages have been noticed.

* CFD - computational fluid dynamics

** NPSH - net positive suction head