



Hydraulic re-design removes bottlenecks for feed pump in paper mill

A leading global provider of fiber-based products was experiencing excessive cavitation and low flow with one of its overhung end suction pumps. The customer approached ITT PRO Services to improve the NPSH and flow with minimum operational disruption.

The Problem

After examining the pump, PRO Services engineers recommended that the pump be re-designed to lower the NPSH and produce greater flow. The existing paper mill feed pump was constrained and operating outside of ideal conditions, the NPSH_r at the pump's suction port was much higher than the NPSH_a. It was producing a flow in the range of 2700-3000 gpm (613-681 m³hr), well below the desired flow of 5000 gpm (1136 m³hr). Unfortunately, this desired flow could not be reached with the existing conditions at suction and, therefore, a redesign was required to lower the NPSH_r.

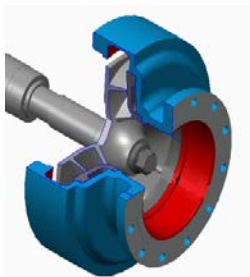
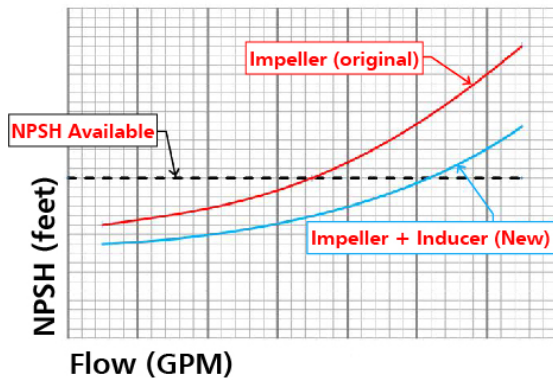
The Solution

PRO Services aimed to provide a solution that not only met the design requirements but also ensured the customer did not have the trouble of modifying existing pipework and connections. A customized inducer was designed to meet the hydraulic performance specified by the customer. This would lower the NPSH_r at suction and therefore allow the flow to increase. The original shaft was also extended to accommodate the inducer and maintain the existing dimensions so the connections, impeller and casing did not have to be moved.

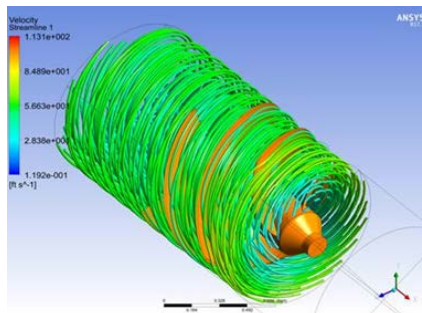
Benefits to Customer

By optimizing the flow and NPSH, the pump was operating closer to BEP, making it more reliable and easier to monitor for failure. The interchangeability of the solution—using the existing footprint, pipework and pump components in the re-design—allowed for a lower cost solution with less downtime.

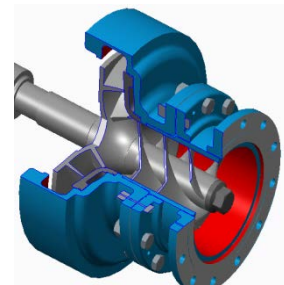
During the design and construction of the solution, abrasion-resistant materials were used to prevent future damage. This has resulted in a dramatic reduction in operation costs.



Original Pump



CFD Analysis of Designed Inducer



New Pump with Inducer and Inducer Shroud (Spool Piece)