

Hydraulic Upgrade Mitigates Recirculation and Reduces Energy Consumption

ISO 13709/API 610 (BB2) Process Pump Upgrade

The Challenge: A major oil refiner faced serious reliability and energy consumption issues with a critical refinery process pump due to a drastic change in operating requirements. Mechanical failures and poor efficiency were leading to high operating and maintenance costs as well as lost production time.

The Solution: Flowserve engineers designed a hydraulic upgrade consisting of a new impeller and a volute modification which significantly increased pump efficiency while also eliminating the detrimental effects of recirculation.

A severe duty ISO 13709/API 610 (BB2) refinery process pump was exhibiting abnormally high vibration levels and undesirable energy consumption. Flowserve engineers were consulted to assess the pumping system for the root causes of these issues and to recommend reliable and economically justifiable solutions.

Inspection revealed excessive wear and damage to wet end components caused by recirculation. Further evaluation of pump and system parameters indicated the pump was operating at approximately 39% of best efficiency point (BEP) to meet actual capacity requirements – far from its original design point.

Effects of Recirculation

In addition to the significant energy consumption costs associated with inefficient pump operation, recirculation caused by excessively low-flow rates can lead to:

- Increased axial and radial loads
- Increased dynamic loading
- Internal recirculation
- Increased vibration

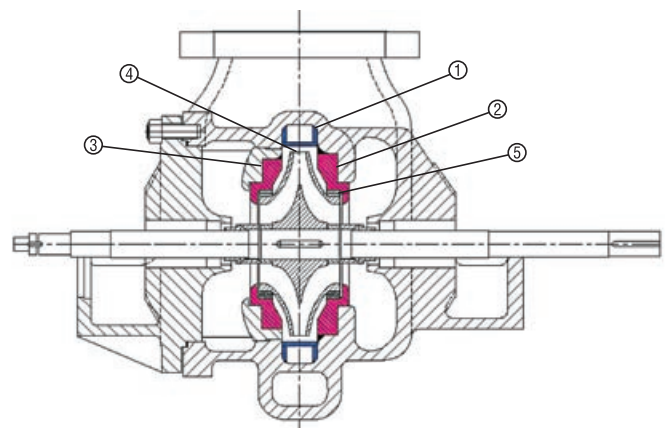
These factors all contribute to premature bearing and mechanical seal failures, resulting in increased operating costs and decreased production.

Improved Hydraulic Performance

Flowserve engineers designed a smartly conceived upgrade to adjust the pump's hydraulic characteristics to more efficiently and reliably meet actual system requirements.

Key upgrades included the following:

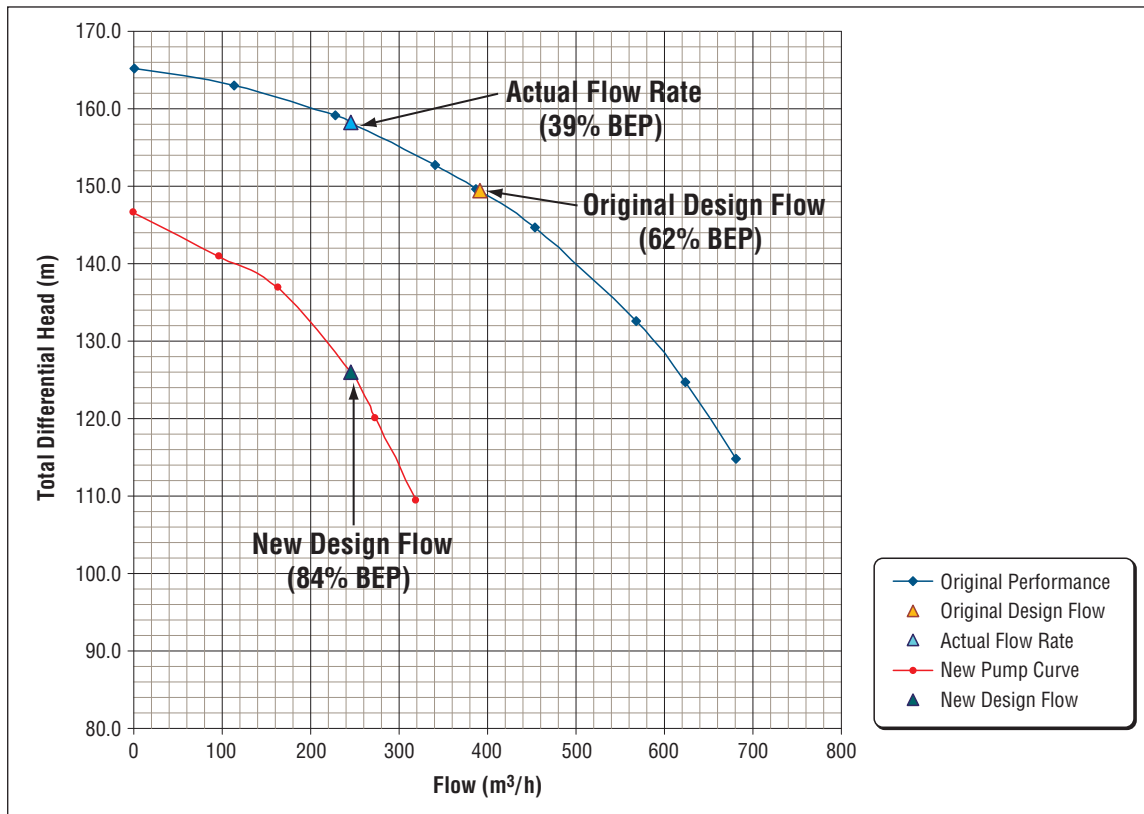
- ① Plate inserts welded into casing volutes to reduce capacity
- ② Casing machined to accept new wear ring adapter rings
- ③ Suction end bracket machined to accept new wear ring adapter rings
- ④ Original impeller replaced with Flowserve designed impeller
- ⑤ New wear rings fitted to casing and impeller



Bottom Line Impact

For an investment of approximately USD 36 000, the customer was able to implement a complete hydraulic upgrade which improved the pump operating point to 84% of BEP. Energy savings alone were estimated at USD 9000 annually. In addition, the adverse effects of recirculation were eliminated with vibration levels reduced by 90%. This solution will eliminate persistent mechanical issues and unanticipated downtime.

Comparison of Operating Points



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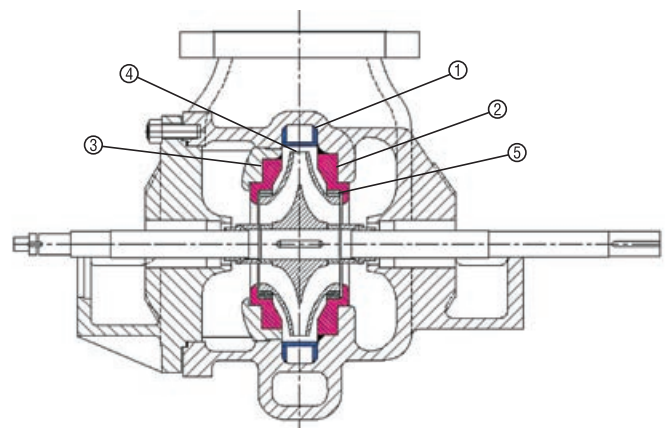
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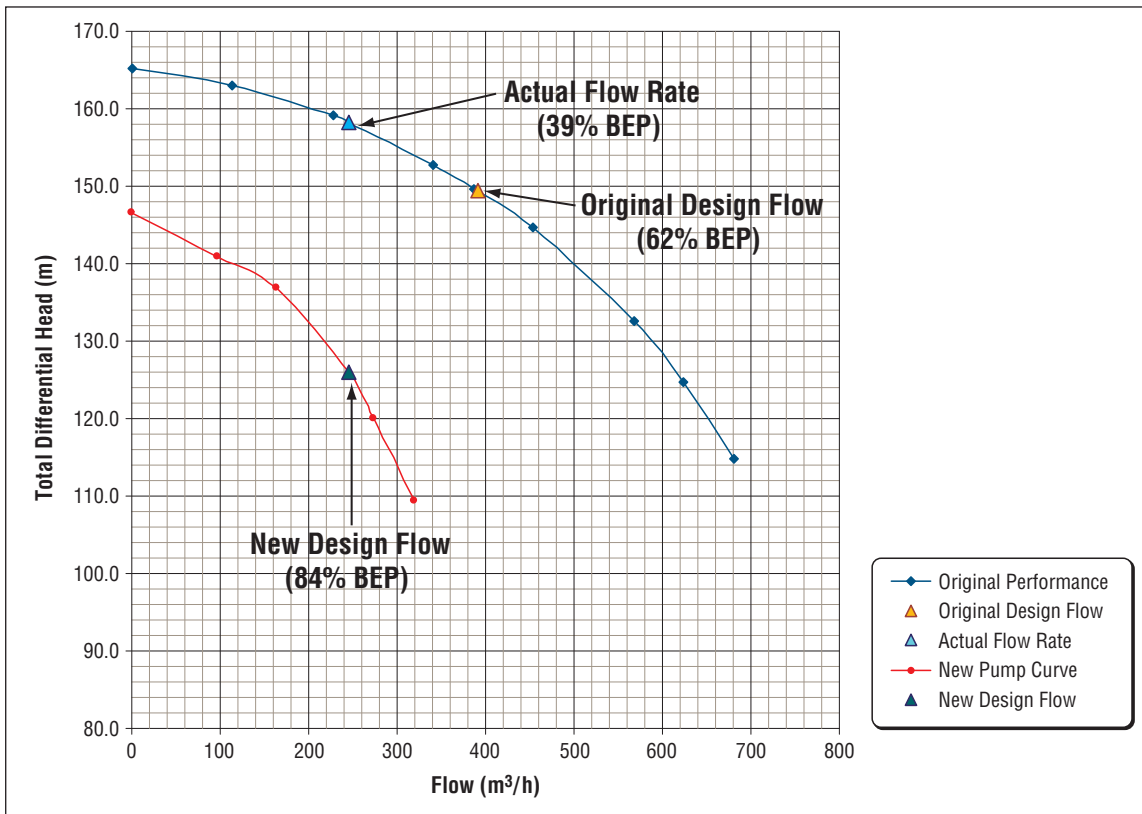
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