

Unlocking energy efficiencies while troubleshooting a curious case of cavitation

CUSTOMER

European chemicals major

LOCATION

Shanghai, China

INDUSTRY

Petrochemicals

KEY SERVICES

1. Inspection and analysis

2. Troubleshooting

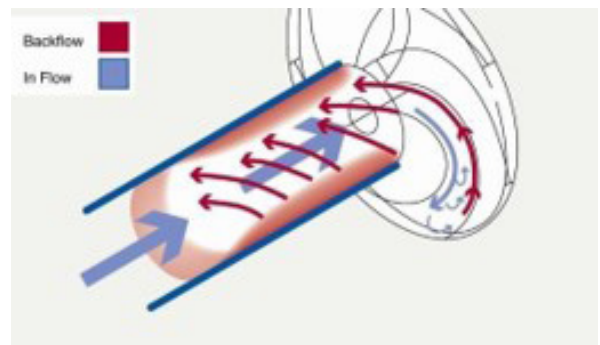
3. Retrofit services



THE CHALLENGE

Dip in pump efficiency and cavitation puts operators in a tricky situation

- The global petrochemicals major discovered that its four, 19 year old cooling pumps were suffering from increased breakdowns
- 2 pumps were from Sulzer and 2 from another European OEM
- They were set-up and designed for parallel operation
- 2 of the pumps were starting to operate under its best efficiency point
- The mean time between failures (MTBF) shrunk to between 1 to 1.5 years, a huge concern and strain on operational and manhour costs
- Vibration was of 8-12mm/s , notably lesser than the 4.5mm/s expected.
- Upon inspection, serious cavitation was also exhibited
- The maintenance team sought Sulzer's expertise to troubleshoot and propose on a remedy



THE SOLUTION

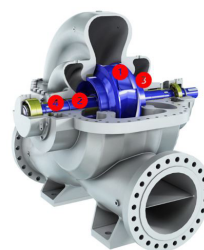
OEM-agnostic engineering prowess that works

Root-cause analysis and trouble shooting

- Sulzer's engineering team did a thorough inspection in an attempt to determine to root cause of all the pain-points
- It was discovered that the 2 different set of pumps were set up for parallel operation
- This arrangement advised by the EPC when the plant was built was contrary to the original installation best pump engineering design practices, when the pumps were specified.
- The varying hydraulics between the 2 set of different OEM pumps meant that parallel operation increased the pressure at the outlet of the failing units, causing a high level of backflow and cavitation.
- Inevitably, efficiency was affected

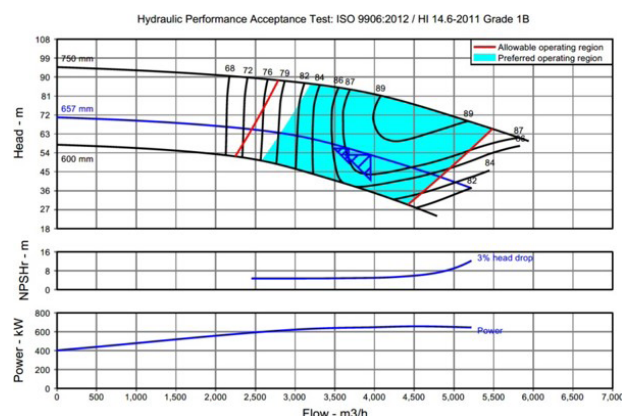
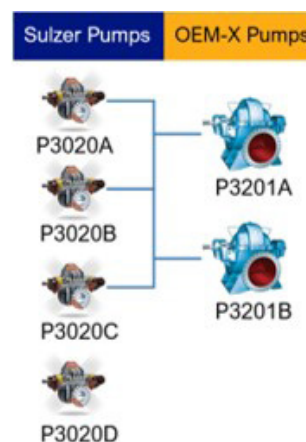
Retrofit excellence through hydraulic re-rate

- To ensure that the pumps could operate at BEP, a mixed hydraulic re-rate for pumps P3020A,B,C were proposed, where it entails overhauling the pump to modify its differential pressure, flow rate (or both) through re-designed hydraulic components, impeller modifications etc to increase pump efficiency.
- A retrofit expert for pumps of any age or brand, Sulzer's innate design understanding ensured an optimal approach.
- Furthermore, it was offered at a lower cost than purchasing new equipment.
- The impeller was re-designed to meet current operating parameters with upgraded material from carbon steel to chromium steel for increased durability
- The original labyrinth seals were replaced with a more modern design, providing a much better sealing effect to further improve efficiency.
- P3020D was replaced with and engineered for compatibility with updated duty conditions .
- All upgrades were done with minimal on-site civil
- New sleeves, DUPLEX wear rings and bearing isolators were fitted too, and a ceramic coating was applied to the volute engineering impact



Retrofit Design Features for P3020ABC

1. Hybrid Impeller with SMD 500-750A
 - Material upgrade to CA6NM
 - F17 type trimming.
2. Volute is applied with ceramic coatings.
3. New TP420 sleeves for original shaft and new impeller.
4. DUPLEX 3A wear rings are to transition impeller eye.
5. Upgrade to bearing isolators from deflector.



CUSTOMER BENEFIT

Cost and carbon reduction coupled with increased energy efficiency

- The rerate delivered instant improvements.
- Out of the four pumps, A, B and C were able to improve from 80% efficiency up to 88.1%. Pump D, which had suffered the most damage, improved from 74% to 87.4%.
- Together, this equates to an annual energy cost saving of approximately USD 224,684 and a reduction in carbon footprint of over 495 tonnes.
- The pumps could now work in perfect harmony with the other set, so cavitation damage due to backflow was eliminated.
- Vibrations and noise also returned to acceptable levels. Consequently, the MTBF increased from 1.5 to 5 years
- ROI was achieved within a year

PROJECT KEY FACTS

CARBON REDUCTION

495 tonnes

ENERGY COST SAVINGS

US\$224,684

MTBF DIFFERENCE

3.5 years

THE IMPACT

End to end OEM agnostic solution that works- from root-cause analysis, solution to execution which yields notable energy efficiency improvements.
