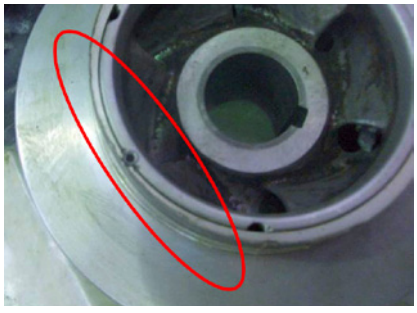
CASE STUDY

Improved Reliability of Dirty Drain Pumps Operating in an Extremely Abrasive Service

Vertical closed drain pumps (VCR – VS6) at a refinery terminal in Azerbaijan were being operated on an extremely abrasive service, taking suction from a mixed drains tank. The amount of sand within the drainage fluid was causing wear within the pumps, rapid deterioration in performance, and increasing vibration levels. This resulted in frequent pump shut down and change over to maintain operations.

Shaft damage at bearing location



Wear from the sand abrasion on the wear ring of an impeller

The challenge

Problems arose as the sand laden pumpage settled within the tank and on each start up large quantities of sand was being drawn up into the pump. Due to the physical size of the pump being very small, it was susceptible to three-body abrasive wear at the close clearances.

- Heavy wear of the shafts was occurring at bearing locations with consequential damage at impeller wear ring clearances.
- Original hard face coatings had failed, shafts wore, and tungsten carbide bushes wore to approximately twice new clearances after a few months of operation.
- The pumps continued to operate, with progressive fall off in performance, until high vibrations caused them to be shut down.

The customer's main aims were to increase the time between repairs, reduce the maintenance costs and ensure that the pump would be more reliable during service. As the site process could not be changed a means of managing the rate of wear was required.

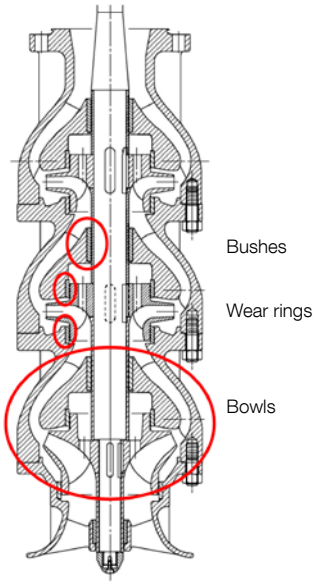
The solution

The solution adopted was to modify the design of the pump to improve the erosion resistance of the wearing parts but also to reduce the susceptibility to initial three-body wear. The main changes were as follows:

- Shaft diameter was increased and with the use of bearing sleeves, the larger projected area gave a lower specific bearing load.
- Bearing sleeves and integral impeller wear surfaces were upgraded to SUMEPUMP™ SA60 abrasion resistant coatings.
- Additional 'bearing' support was given to the rotor by upgrading wear ring material to solid Tungsten Carbide.
- Impeller and bowl passages were line-of-sight coated with abrasion resistant SUMEPUMP™ ER coating.
- Internal running clearances were increased to combat three-body wear.

The Sulzer difference

Sulzer's unique know-how of wear abrasion coupled with the technical offerings of SUMEPUMP™ coatings resulted in a retrofit solution that ensured the reliability of pumps operating in abrasive service, whilst also reducing the cost of repairs and increasing the mean time between reapairs for our customer. The modifications in materials and design changes have resulted in >18 months reliable service for the customer and after inspection still showed minimal wear.



Cross section of pump showing modified bushes, wear rings and bowls

Inspection of the upgraded rotor 18 months after operation

Customer benefit

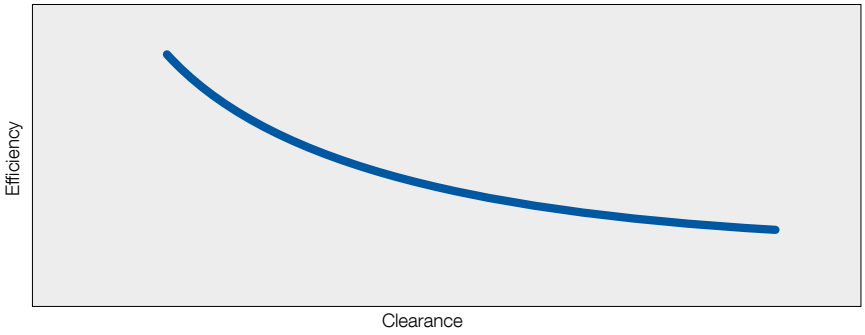
One trial pump was upgraded and installed in 2011 and after 12 months operation the pump was still performing “as good as new”. Customer stripped the pump for inspection and found wear was minimal. This led to an additional upgraded unit being purchased to complete the upgrade of the drains system.

Main benefits to the customer were:

- Pump wear rates significantly reduced
- Mean time between repair (MTBR) significantly increased
- Reliability of drains system greatly improved

Product data

Efficiency decay with respect to increased pump clearances:



Three-body contact high initial wear rates

Two-body contact lower wear rate as clearances increase

Contact

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Applicable markets

Hydrocarbon processing

Applicable products

VCR – API designation VS1