CELEROS™ FLOW TECHNOLOGY

CASE STUDY

REDESIGN OF VERTICAL PUMP TREBLES MEAN TIME BETWEEN FAILURE

Vespel® bearing

CLYDEUNION® PUMPS

- Redesign addressed origin of failure
- MTBF improved for under 1 year to more than 3 years
- Chemical leakage prevented, improving site safety

Industry: Oil & Gas – chemicals

Region: Europe

Category: Site fault investigation

API Type: VS6

ClydeUnion Pumps Aftermarket Technical Services team has experience across a range of services on critical rotating and reciprocating equipment to improve operational safety, reliability and efficiency. The design upgrade of the VM32 for the oil and gas market is one of our success stories documented in our library of case studies. These case studies highlight the requirement from the customer, how we achieved the goal and the process we followed to deliver the improvements.

CHALLENGE

A post-installation modification to improve flow in a vertical chemical pump had weakened the discharge elbow. Subsequent cracking had been weld-repaired several times, but the pump was increasingly difficult to maintain. The customer asked ClydeUnion Pumps to undertake a redesign of the discharge elbow to prevent further deterioration.

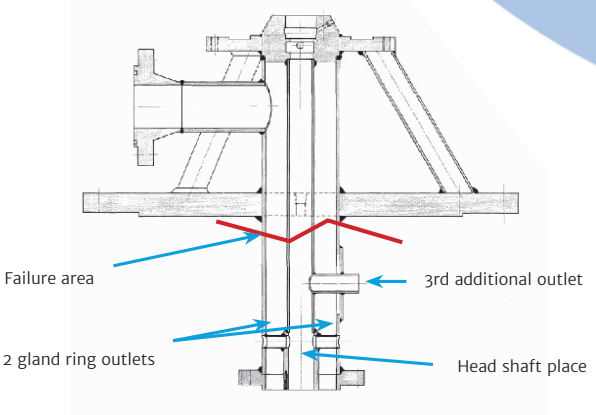
SOLUTION

The modification that had caused the failure was undertaken originally because the gland ring outlets on the discharge elbow were not sufficient to evacuate the liquid passing around the head shaft. ClydeUnion Pumps therefore proposed a solution that would address this original issue as well as repairing the point of failure.

The solution was to re-design the discharge elbow and separate it in two parts: the elbow itself, above the support surface, and a suction spool under. ClydeUnion Pumps redesigned the upper section with vanes to make it stiffer than before and incorporated a new salvage pipe in case of leakages. The lower, suction spool section has been made as a single piece part to increase its solidity. The former three gland ring outlets have been replaced by one, and the liquid pumped is passed by five holes that represent an area equivalent to the former version. To prevent corrosion, the bearings were also upgraded to a material with superior wear and abrasion characteristics, plus better chemical compatibility.

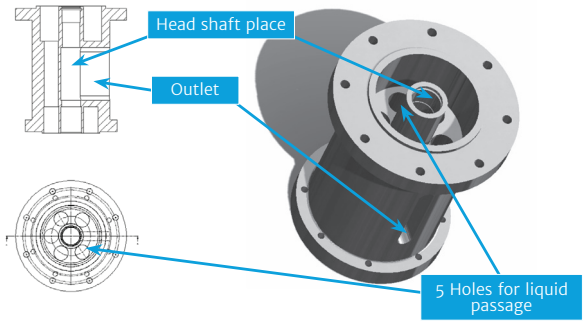
OUTCOMES

The pump has been operating well since the upgrade. The change of bearings material has eliminated abnormal wear and reduced the MTBF from less than one year to in excess of three years.



- **Re-design of the upper part of the discharge elbow**

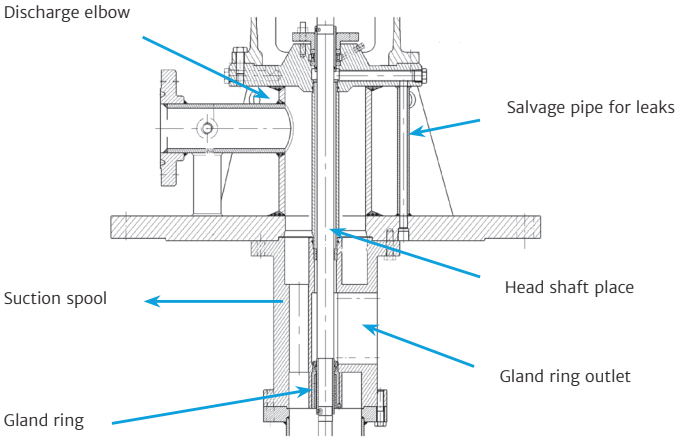
  This part is designed to be stiffer than the older version It also integrates a salvage pipe for possible leaks.



- **Re-design of the lower part of the discharge elbow (suction spool)**

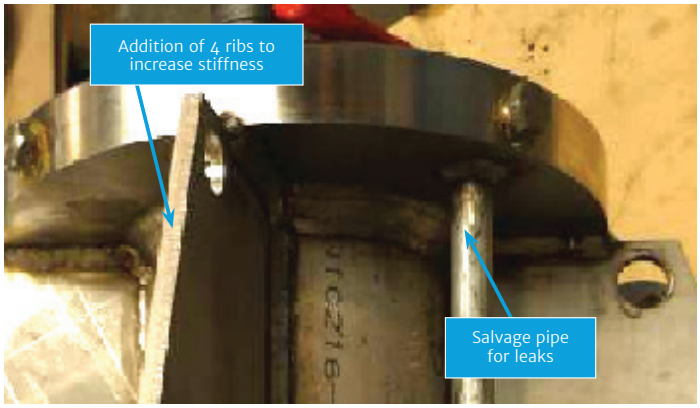
  A step-by-step manufacturing process was developed due to the necessity to alter dimensions for cladding after initial testing. Finally, calculations were made to predict the likely shrinkage of casing and cover fits after processing/cladding at 1,900 °F.

- **View of the assembly**



- **Assembly of Vespel® CR6100 bearings**

  Due to the abrasive nature of the liquid pumped (water + organic matter), the choice was made to change the former PTFE based bearings to Vespel® CR6100 bearings.



OPERATIONAL IMPROVEMENTS

Since the upgrade and the change of bearings material from PTFE to Vespel® CR6100, there has been no abnormal wear of bearings. Before the MTBF for the PTFE bearings was less than one year. The pump is operating well with the new discharge elbow.

FINANCIAL ILLUSTRATION

Analysis on 3 years

- **Current version:**

  Expertise, overhaul of the entire pump + studies and supply of new designed parts = 70K Euros

  MTBF is currently more than 3 years.

- **Former version:**

  Maintenance cost required for bearings change and expertise of pump state = 20K /year

  Cost for 3 years = 60K Euros + spare parts + weld repair of discharge elbow > 70K Euros

Aberdeen Service Center
P: +44 1224 756 100

Abu Dhabi Service Center
P: +971 02 4081900

Annecy Service Center
P: +49 405 220 2401

Baton Rouge Service Center
P: +1 225 778 3310

Battle Creek Service Center
P: +1 269 966 4782

Burlington Service Center
P: +1 905 315 3813

Calgary Service Center
P: +1 800 352 8294

Corpus Christi Center
P: +1 361 371 6519

Downey Service Center
P: +1 562 622 2371

Glasgow Service Center
P: +44 141 637 7141

Jenks Service Center
P: +1 281 217 6359

Odessa Service Center
P: +1 704 808 3780

Penistone Service Center
P: +44 1226 763 311

Singapore Service Center
P: +65 6513 9276

Zhengzhou Service Center
P: +86 371 8665 2391

E: cu.sales@celerosft.com
www.celerosft.com

CELEROS™ FLOW TECHNOLOGY

SPEED | EXCELLENCE | PARTNERSHIP

Ref no: CUP_383_04_VS6-VTU_GB Version: 10/2020