

قطر للبترول  
Qatar Petroleum



# ENHANCING OIL PLATFORM AVAILABILITY AND RELIABILITY

Presented by

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# BACKGROUND



- As part of the Upgrade project of 1998/99 the Main Oil line (MOL) pumps were replaced with smaller pumps from NUOVA PIGNONE (NP), due to Three-phase separation. The new pumps were installed with John Crane (JC) Double Mechanical seals to API standards. However these seals started failing prematurely causing considerable losses in terms of :

- Production losses.
- High cost of barrier fluid.
- Higher maintenance cost.
- External leak of crude oil and HSE issues.



- The replacement modified seals supplied by NP/JC slightly improved over the previous seals and seal system, and the average seal failures reduced to three- four months, however dedicated manpower was required.
- In the earlier days most of the seals refurbishment were carried out by JC. Slowly this was carried out in house to reduce cost and time.

# INVESTIGATION

- Based on downtime and expenditure of three years, it was decided to improve on the seal system by looking at options for a new seal designed to meet the requirements.
- After various internal discussions and review of seal designs of various manufacturers it was decided to nominate John Crane for a revised study due to the following reasons:
  - 1) They had complete insight and knowledge of the frequent seal failures and problems encountered since commissioning.
  - 2) Complete knowledge of seal problems and findings through the seal refurbishment.
  - 3) **Free of cost for the trial period " one Pump".**



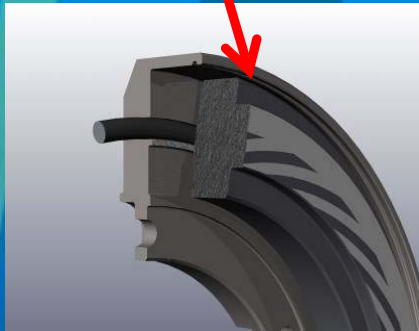
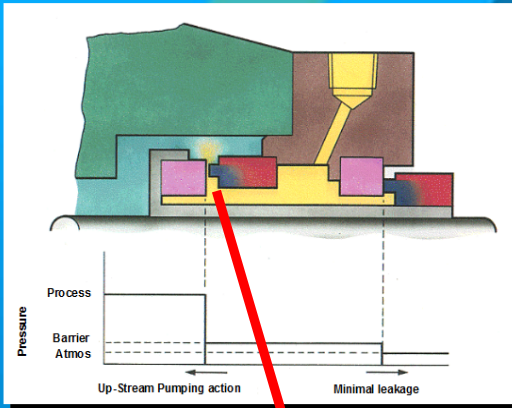
# IDENTIFICATION OF THE PROBLEM

- JC (local agent Al-Ahed) were invited for a site survey and one pump was stripped down, so that they were made fully aware of the sludgy, salt/calcium conditions the pumps are working in. The heavy deposits inside the stuffing boxes, balancing lines and throat bushings area were observed and noted.
- Further discussions were carried out and the following problems were noted:
  - 1) Frequent seal pot pressures adjustments and topping up of barrier fluid levels.
  - 2) Problems with external and internal leakage of seals and 'O' rings hanging due to sludge in the seal sections.
  - 3) Locking circlip of sleeve falling off during removal, thus difficulty in seal removal.

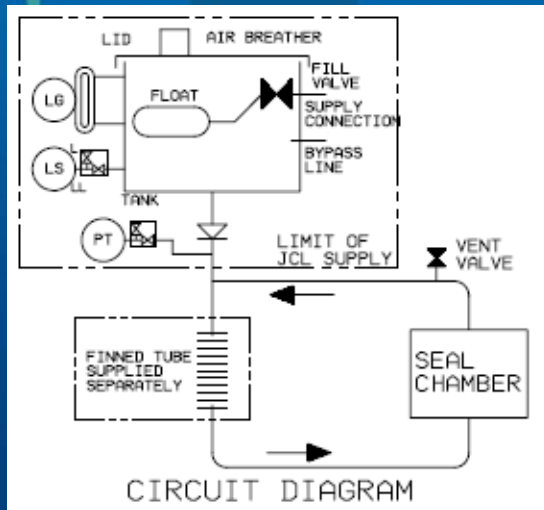


The heavy deposits inside the Stuffing boxes, Balancing lines and throat bushings area were observed.

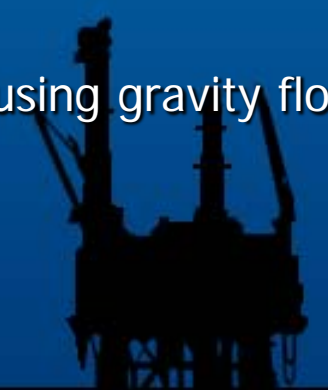


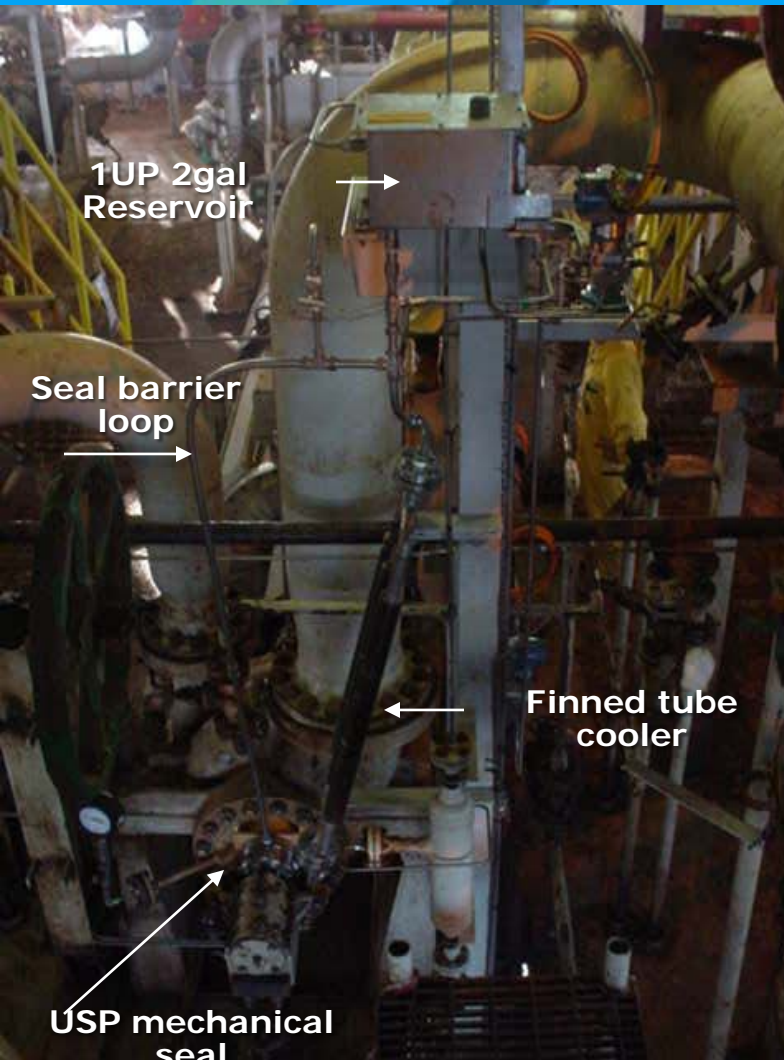


al groove technology



- Based on the findings and the history provided by QP for the old pumps (prior to 1998) JC proposed installing their latest technology seals – Upstream Technology Seals. "Low operating pressure"
- These seals had not earlier been used for Crude pumps and were also not approved to API standards.
- The outboard seal was further improved to bellows design to overcome the feasibility of 'O' rings hanging up , and to accommodate for the higher operating pressures in case inboard seal fails.
- Further fresh water was proposed as a seal barrier and QP were requested to install a storage tank, above the pump.
- Simple un-pressurized barrier system using gravity flow portable water.





- It was further agreed that JC will install and monitor the seal system for free trial period of six months. If the seal / system proves the requirements, QP will proceed further for the next 5 pumps; otherwise JC will remove the seal and re-instate the old seal system free of cost.
- After seven months of installation, the trial seal worked trouble free and it was decided to proceed with the balance pumps. "the seal ran for nearly 15 months trouble free operation.



# The following advantage were observed over the 1st seal operations:

- Average seal life on these 6 pumps have been more than 2 years and still running trouble free, when compared to old seal with 3 to 4 months life.
  - Flushing of the seals on an average every two months, instead of weekly flushing as before.
  - Seal maintenance zero to negligible, thus savings on manpower, downtime and spares.
  - No operational adjustments are required on the seal system, other than venting of the seal system daily which requires only 5 minutes for the Operator, thus savings of man-power involvement and time.
  - Lower power consumption due to unpressurized seal arrangements.
  - Better seal health monitoring system using water consumption and pressure readings/log.
  - Zero leakage or contamination hence better HSE maintained on platforms.





## Expenditure For the Old Seal Design:

- Total expenditure for seal refurbishments for one year, based on data available in SAP( average for one year) : **Qrs. 328,000**
- Average man-hours cost for flushing the seals (for involvement of 4 persons) - 9 hours @ 450 QRs/Hr.: **4050**
- For one year flushing : Manpower cost x No's of pumps x frequency of flushing x months =  $4050 \times 3 \times 4 \times 12 =$  **583,200**
- Minimum Diesel losses during flushing (50 l/pump)/year :  $0.75 \times 50 \times 4 \times 12 \times 3 =$  **5400**
- **Total = 328,000 + 583,200 + 5400 = QR 916,600/-**



# ACHIEVEMENTS

- Reliability of Oil stations enhanced-- Since the latest design seals have been installed, the reliability & availability of the pumps has increased to 95%.
- Dramatic reduction in maintenance cost. Seal maintenance negligible, thus savings on downtime and spares.
- Drastic reduction in Production and maintenance manpower utilization.
- Environmentally safe due to no consumption of diesel and external oil leaks.



**THANK YOU**

