



# Large Seawater Intake Pump Upgrades

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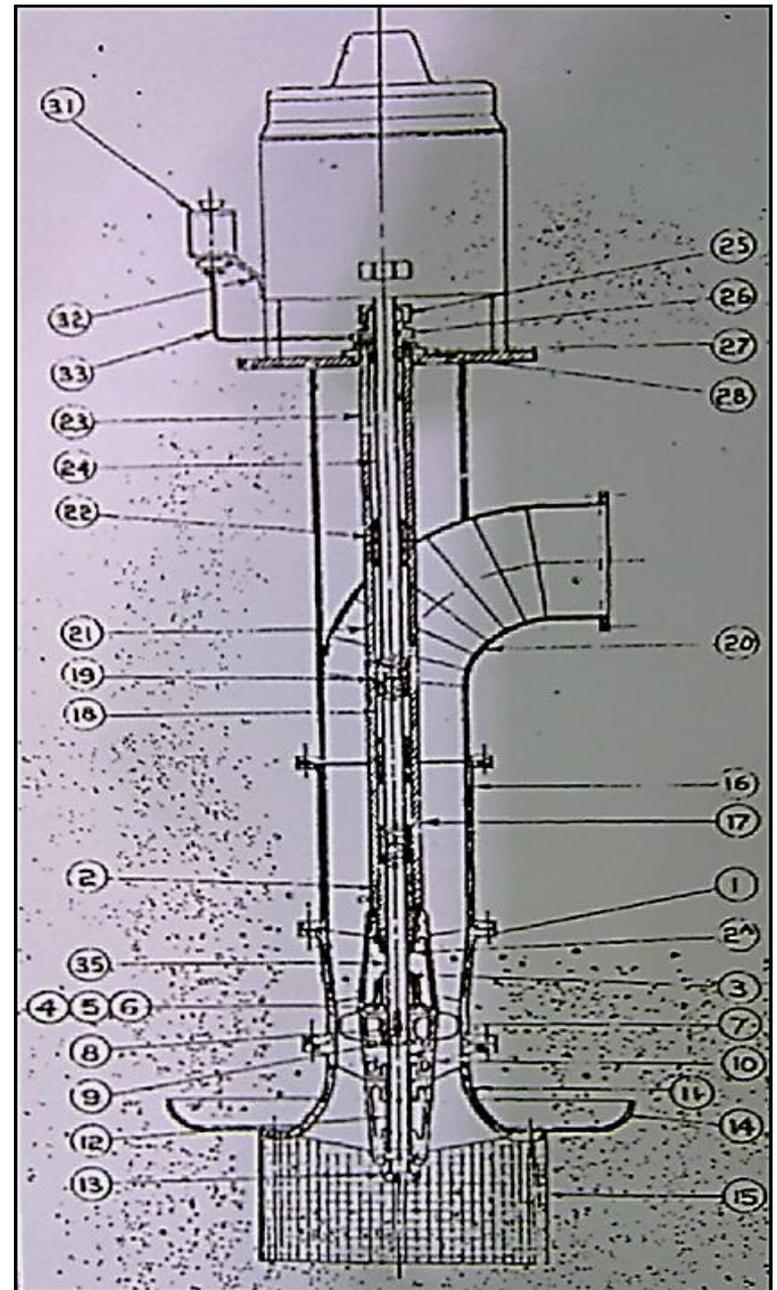


# Background



# Background (cont.)

- Vertical pump with enclosed shaft tube.
- Flow rate 35,000 GPM.
- Over than 50 years old.
- Obsolete and no spare parts available.



Large Seawater Intake Pump Upgrades

# Problem

- Frequent pump seizure.
- Enclosed tube oil sealing failure and seawater contamination.
- Repeated failure in the bushings.
- Enclosed shaft tub difficult to fill due to improper venting.
- Pump head weak base plate.



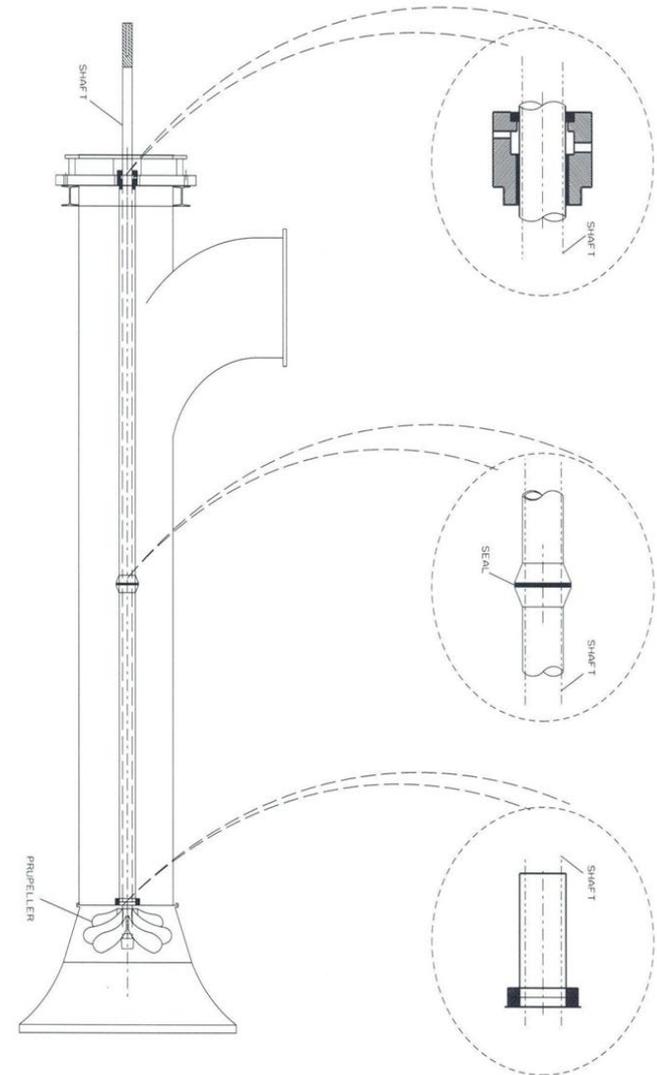
# Findings after Dismantling

- Excessive rubbing on all bushings.
- Damaged O-ring at lower side of enclosed tube.
- Oil leak between enclosed tubes.
- Lack of lube oil at enclosed tube.



# Failure Root Causes

- Insufficient oil flow in the stuffing box.
- Upper bushing is not totally submerged in the oil.
- Oil leak between enclosed tubes segments.
- Insufficient oil flow between un-grooved bushings.
- Repetitive oil leaks from lower side tube O-ring.



# Recommended Upgrades

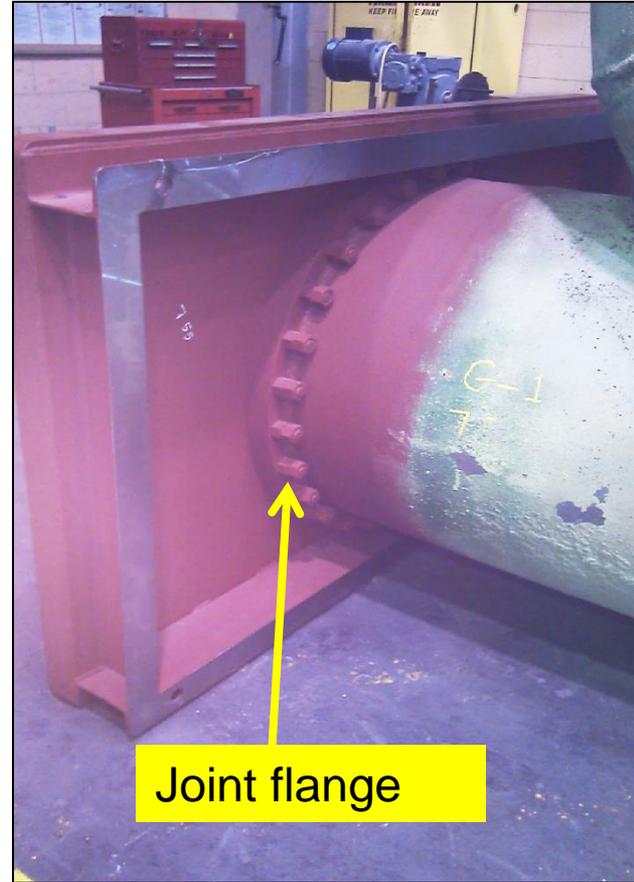
- Split base platform pump head and increase plate thickness.
- Upgrade upper stuffing box and bushing.
- Improve shaft tubes joint sealing.
- Improve enclosed tube lower side sealing.

# Implementation

- Pump head split and increase plate thickness for better maintenance and stability.



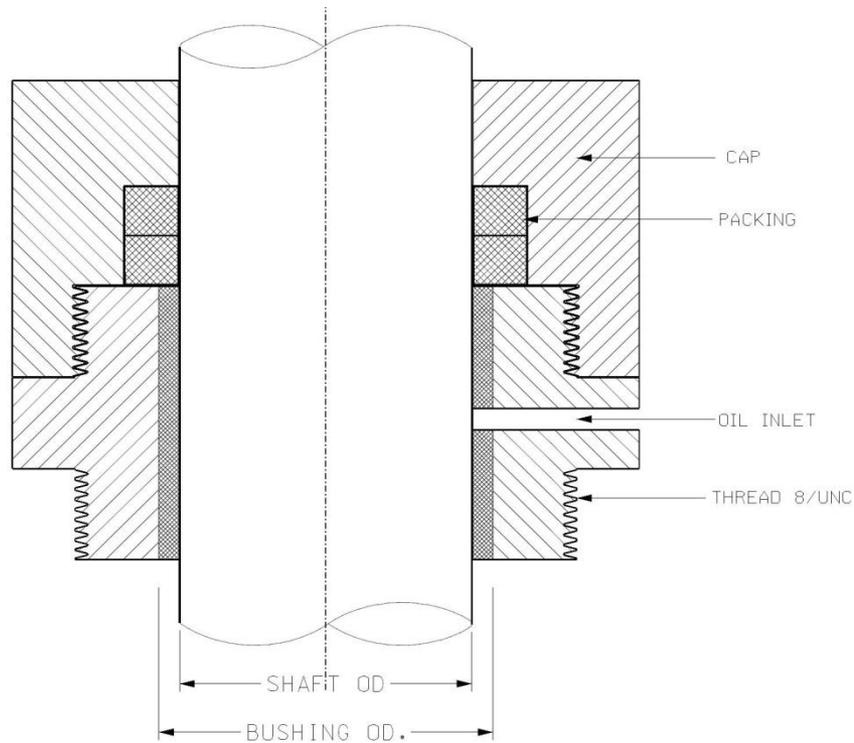
Before



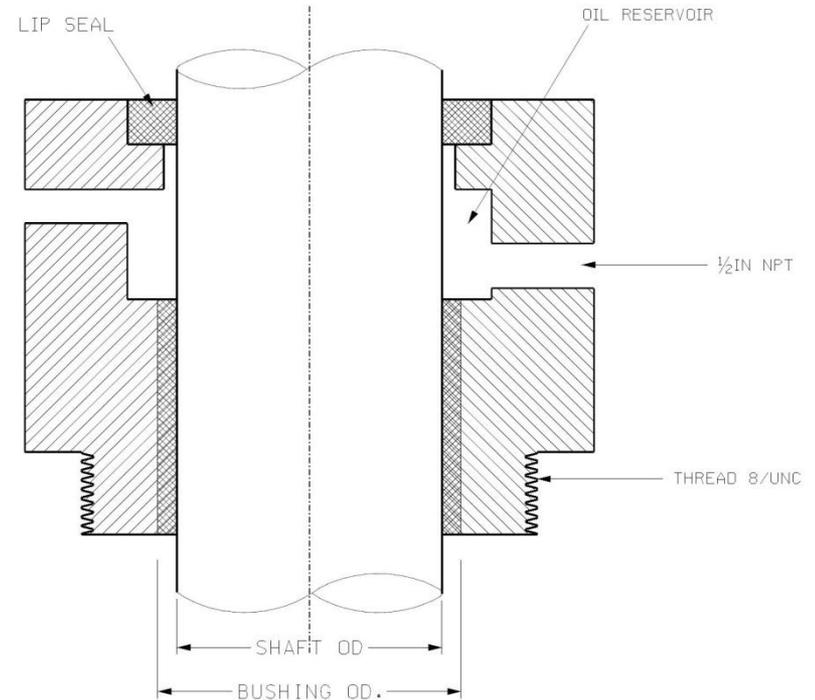
After

# Implementation

- Redesign upper stuffing box for better lubrication and oil flow.



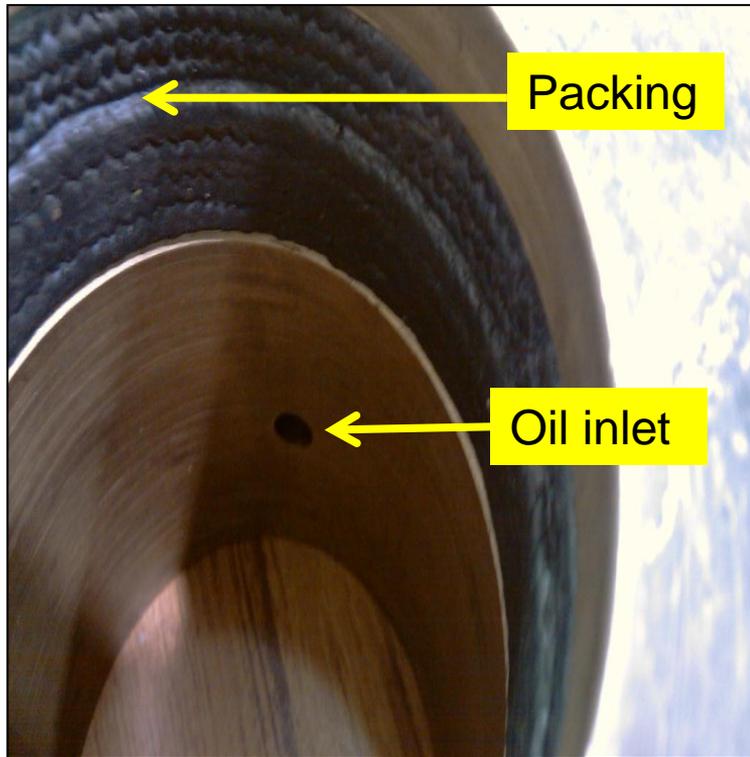
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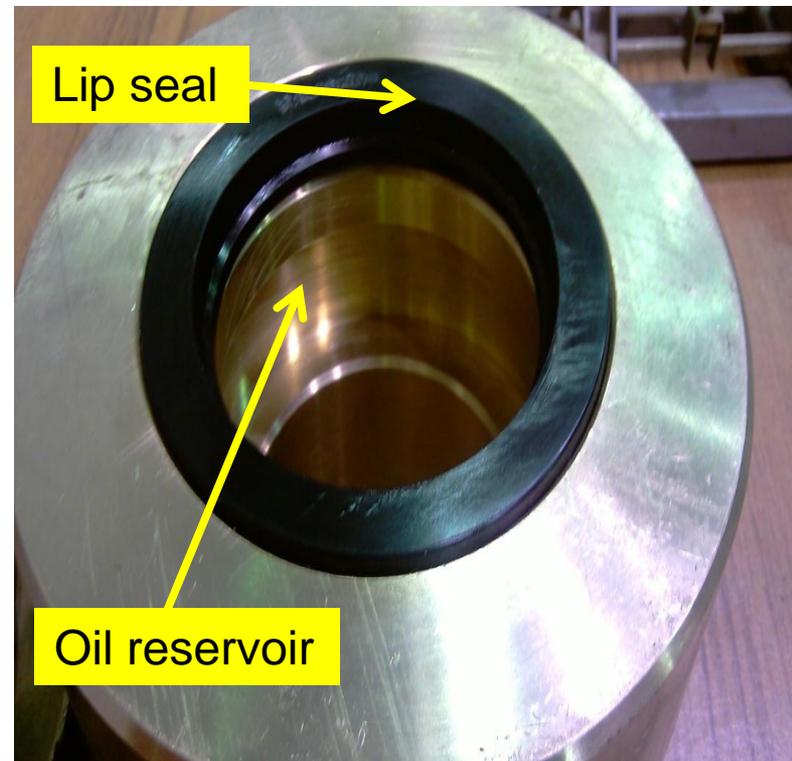
After

# Implementation

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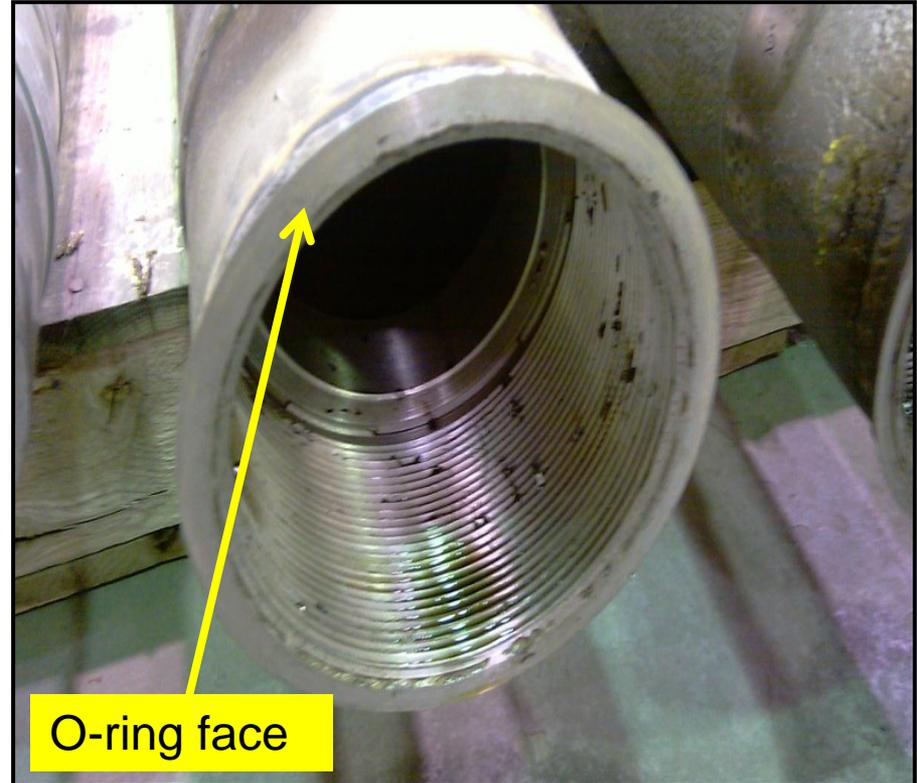
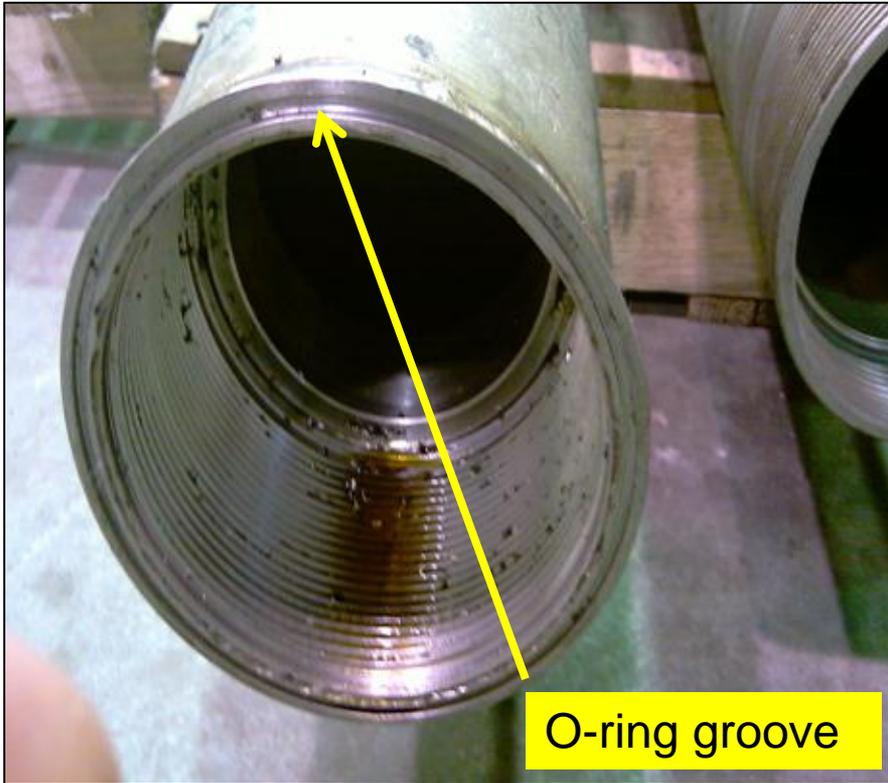
Before



After

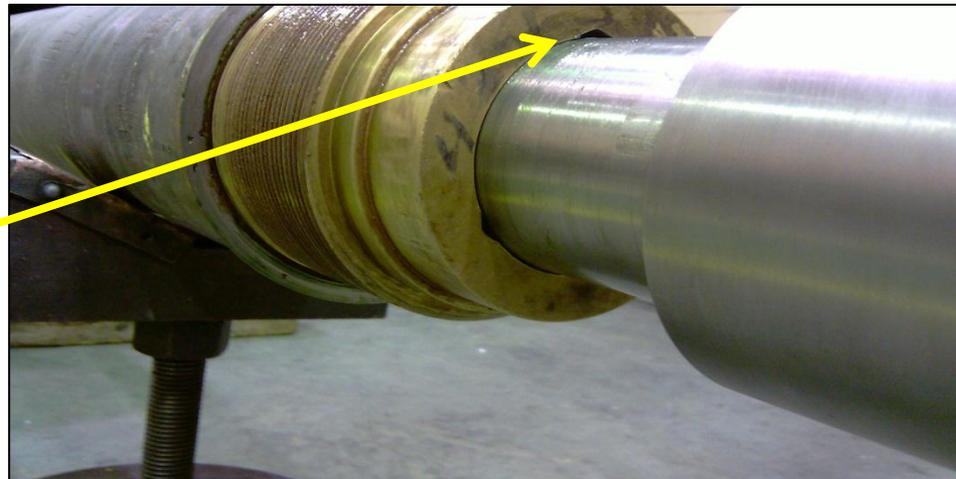
# Implementation

- Install O-ring between tubes to ensure seal between them.



# Implementation

- Bushing modification for better lubrication and oil flow.



Oil groove

# Implementation

- Lower tube sealing modification.



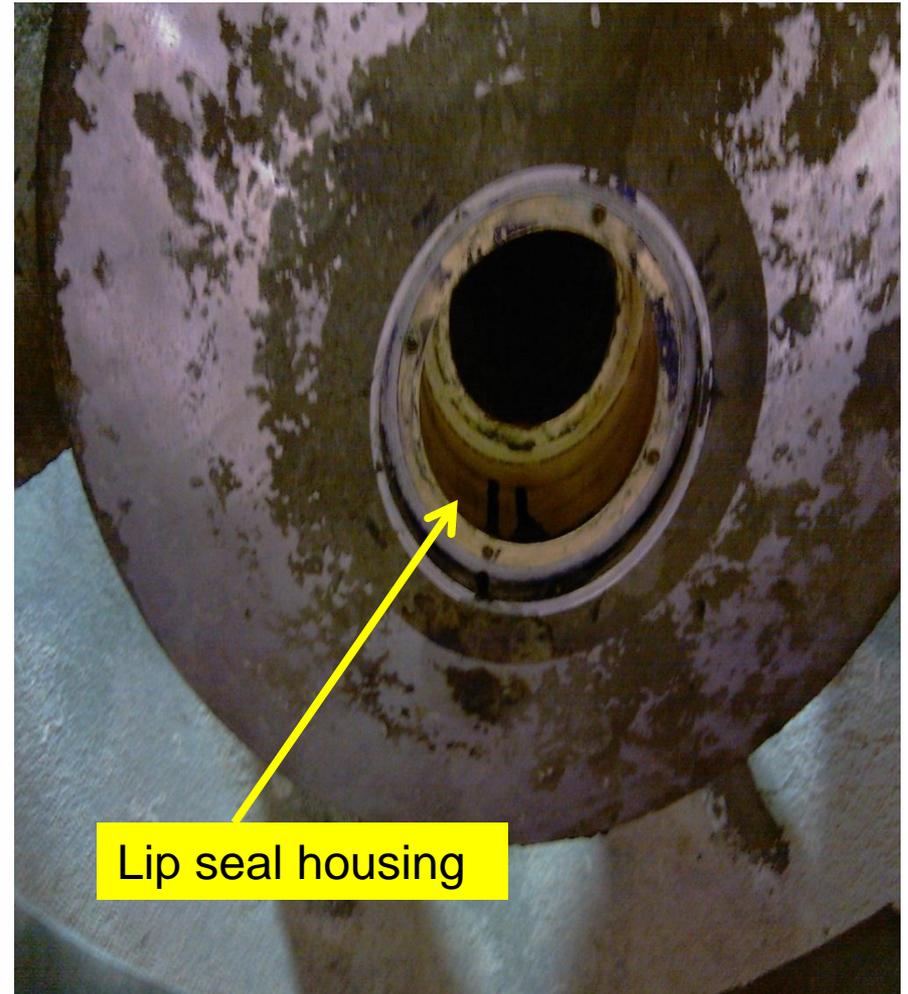
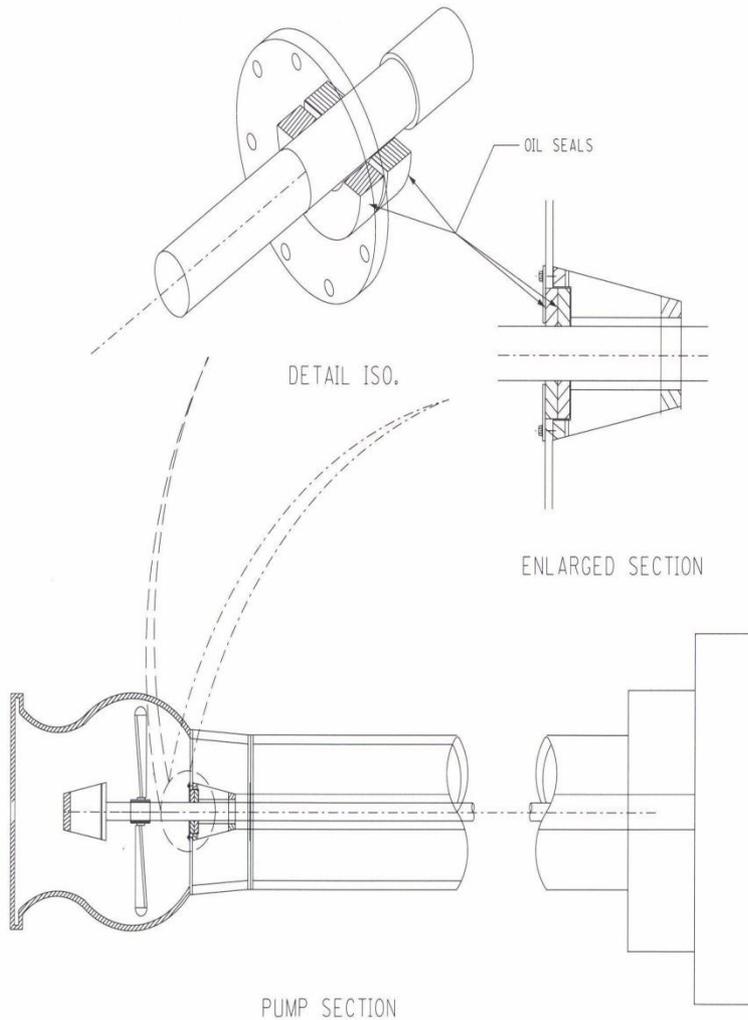
O-ring groove



Bowel

# Implementation

- Lower tube sealing modification to double lip seal.



# Outcome of Upgrades

- Cost avoidance.
- Improved pump MTBF.
- The pump has been running for two years.
- Spare parts availability and local fabrications.
- Lube oil filling period reduced from days to hours.
- Air pockets elimination.
- Simplicity to maintain and handling.

Thank you