EquiThrux™ - A new age vertical pump

Vertical pumps are never easy to operate and maintain. Well, until now!

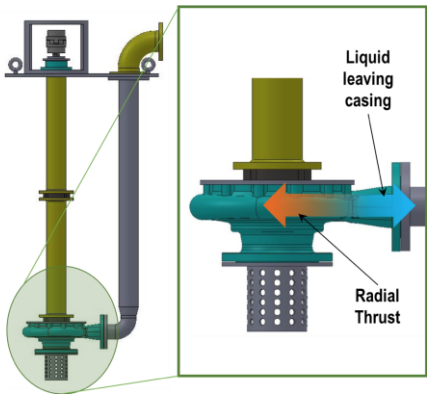
EquiThrux™ Technology

The problems with conventional vertical sump pumps:

Vertical pumps, often referred to as vertical submerged pump or sump pumps having numerous advantages over conventional end suction horizontal centrifugal pumps for a varied list of applications. Among some advantages, vertical pumps do not have the problems associated with cavitation due to insufficient NPSHa, can operate without need for mechanical seals and become indispensable when there is a suction lift requirement for the application. Yet, due to their complex repair and maintenance procedures, which lead to longer shutdowns and downtime of the plant, operators' preference tilts away from vertical pumps. If vertical pumps can be operated without their associated problems, and if they offer a longer mean time between planned maintenance (MTBPM), there is a strong case for the operators to enhance their plant efficiency by using vertical pumps. Most of the problems associated with the operation of a vertical pump are due to the fact that the rotating assembly spanning from the upper bearing to the impeller, needs to be carefully designed, manufactured and maintained. A deviation from the designed duty condition, and the pump starts giving trouble since long shaft impeller assembly needs to handle the imbalanced radial thrust on the pump. With the new tested and proven design of the vertical pump, it truly becomes a fit and forget (or rather fit and remember) pump. Operators who use vertical pumps certify that their biggest headache in vertical pumps is the wear and tear associated with the rotating parts, especially the wet bearings.

What happens in single delivery?

- According to Newton's third law of motion, forcing the liquid out of the casing gives equal and opposite reaction called radial thrust.
- Radial thrust pushes the shaft assembly away from the casing discharge flange and results in deflection of shaft & support assembly



Radial Thrust: The achilles heel of all vertical pumps:

Radial thrust, (the main culprit in vertical pump operation problems) which is the force due to liquid leaving the pressurised casing chamber (based on Newton's 3rd law), gives rise to deflection on the entire rotating assembly of the pump, which includes the impeller, shaft, intermediate shaft supports (wet bearings) and the upper dry bearings.

Due to the design structure of the pump, the radial thrust is absorbed by the wet bearings and finally by the upper dry bearings. Due to this deflection, there arises a need to continually monitor the health of the bearings by vibration monitoring and motor current spikes. Also, longer the installation depth of the pump, bigger the concern of deflection on the pump. Further, in case the duty point of the pump deviates or needs to change (for example in transfer duty application), then

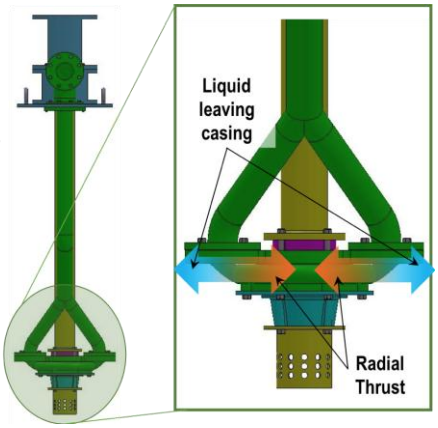
there is higher chance of failure since the tolerance for a vertical pump to operate in a range of duty points is less than those with short shaft like horizontal end suction pumps. Else, one needs to design for a thicker shaft which increases the cost and reduces efficiency. However, with the new design approach, such problems associated with vertical pump can be minimised to give highest reliability and MTBPM.

EquiThrux™ to the rescue:

The trick is to balance the radial thrust and nullify its effect on the pump, rather than to fight it. As with any force, in mechanical design, it is the unbalanced nature of the force which creates the problem. If the force can be balanced, most of the mechanical design issues are simplified. The same happens with EquiThrux™. The casing design ensures that the liquid, with same pressure leaves the casing in equal volume from diametrically opposite ends. Since there is radial thrust in same magnitude with opposite in direction, the effect of radial thrust, i.e. deflection on the rotating assembly, is minimised if not eliminated. Since the deflection is minimised, the resulting wear and tear on the wet and dry bearings is minimised improving the reliability drastically. Further, there may not be a need to have wet bearings for most of the applications. The added benefit of this design is that the operating range for the pump is more or less not a constraint. The pump can be operated to near shut off to full valve (near pump runout) without much wear and tear on the pump. This is due to the fact that no matter which zone the pump is operating, at any given point, the radial thrust is completely balanced and there is minimal net deflection on the shaft leading to minimal wear and tear and lesser vibrations.

What happens in double delivery?

- Radial Thrust is completely balanced by a double delivery design
- Unlike in single delivery, where the radial thrust deflects the shaft assembly, in double delivery design the radial thrust is balanced and shaft assembly does not deflect.



Benefits of the EquiThrux™ Design Vertical Pump:

- Balanced hydraulics for trouble free operation with long life
- Eliminates maintenance associated with intermediate supports like sleeve & bush in cantilever design pumps
- No external flushing / lubrication required for cantilever design pumps
- Pump can run any at head & flow point (even at shut off) without any damage
- Internal pumped liquid lubrication using for pumps with longer installation depths.
- Pump can run completely dry for long time without any damage in cantilever design
- Less spares needed compared to conventional design

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