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July 2006

PumpAction..... Issue 31

Welcome to the 31st edition of Pump Action.

This issue brings you a story about how 'outside the square' thinking helped solve a pumping problem in a wastewater pit. We also revisit a story published some time ago demonstrating that while pumps are taken for granted in many instances, they do keep 'surfacing' from time to time.

Pump Clinic this month focuses on the decision of where to use a positive displacement pump and where a centrifugal pump may be more suitable.

Further to Kelair's announcement of being the sole distributor for Viking pumps and parts in Australia, the transfer of all the Australian Viking stock is now complete. This will be supplemented on an ongoing basis, with weekly stock orders to minimise any potential stock-out.

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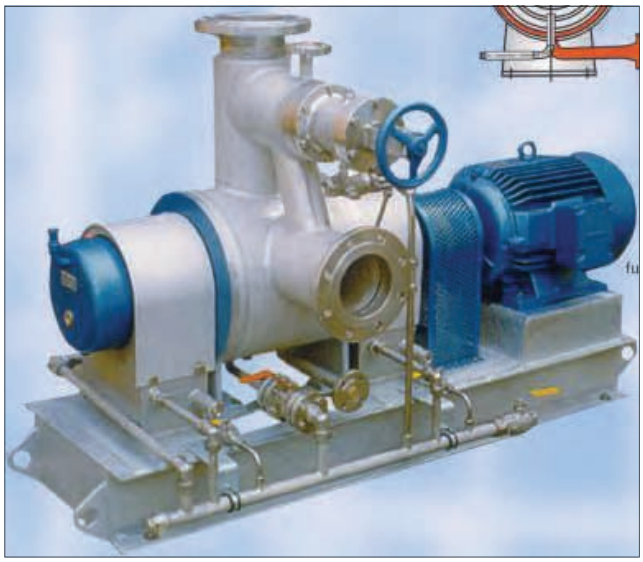
CASE STUDY

Kelair aboard Collins Subs

Sales Engineer Alan Bethell



The Australian Submarine Corporation (ASC) imposed strict specification parameters on Kelair to supply pumps for six Collins-Class submarines being build in Osborne, South Australia.

Kelair was required to supply fuel oil transfer pumps that complied with exacting weight, noise, vibration and hydraulic pulsation restrictions for 76 metre-long, 2400 tonne submarines.

For the task, Kelair supplied six Bornemann Double Screw W4.1ZK-36 pumps which will operate with minimal pulsation or turbulence. Each sub, the last of which will enter service with the Royal Australian Navy at the end of 1999, has one Bornemann.

"Bornemanns have a proven record for use in submarines in a number of navies around the world, and were selected as being the most suited to the requirements of our new submarines," said the Sub-contracts Manager, ASC.

A further two pumps have recently been acquired (July 2006) to add to those currently operating.

• For further Bornemann product information visit our website www.kelairpumps.com.au

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CASE STUDY

Kelair's Corro cantilever pumps outperform and outlast competition

Sales Engineer Alex Calodoukas

As discussed in a recent newsletter (Issue 29), vertical sump pumps are still widely used throughout many industries. When pumping wastewater from a pit there are several options you may use, including verticals, and also self-priming pumps, centrifugals with foot valves, air-operated diaphragm pumps, and submersible pumps.

Typically Kelair's customers rule out some of those options in preference for a best-fit option that's the most cost-effective, and in this particular application there were several considerations:

•Compressed air was not available, so diaphragm pumps were ruled out.

•It would be an unattended pump, operated automatically by high and low level sensors, ruling out the self-priming centrifugal pump due to the possibility of evaporation when faced with a lengthy, hot summer. This type of pump always needs at least some water (process fluid) within the casing to assist with creating a vacuum (by creating a seal around the impeller) when the pump is turned on.

•There was a possibility of solids entering the pit, such as small sticks or even pieces of waste plastic bags, ruling out the centrifugal pump with foot valve option. Once the foot valve jams in the open position, the pump will lose its prime. It will not pump water again until someone physically attends the pump to clear the valve.

•A submersible pump may have been an option, but the customer had a preference for the vertical sump pump.

Issue 29 also discussed the vertical column pump with support bearings along the length of the vertical shaft (joins the pump wet-end in the pit, to the motor mounted above the pit). This type of pump would not suit due to the presence of salts in the fluid. Salts crystallise on the surface where the salt water has evaporated and are

abrasive. Vertical column pumps require lubrication of the column support bearings and that is typically done by the process fluid. It would not be long before the abrasive, crystallised salts wore away the pump's column bearings.

For Kelair's customer, the best option was to go with a cantilever pump. The design has a one-only, sealed-for-life, robust bearing sitting above the pump's mounting plate, out of reach of the process fluid.

The cantilever pump is a sealless design, and in this case was made from synthetic, thermosetting, corrosion and wear-resistant materials. The pumps are capable of dry-running indefinitely and require minimum maintenance and inspection, handling temperatures between -200ºC to +120ºC. They will outperform and outlast many, if not all, competitors supplying lined or unlined pumps made from engineering plastics (eg PVC, PVDF, PTFE, etc).

• For further product information visit our website www.kelairpumps.com.au

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PUMP CLINIC 5

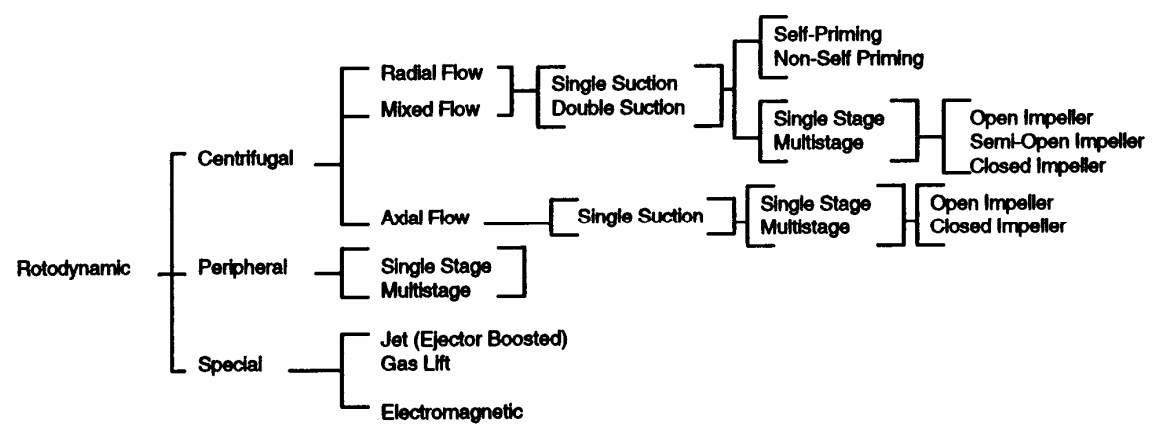
CENTRIFUGAL OR POSITIVE DISPLACEMENT
Which pump to choose?

Firstly, let us take a look at the two classifications in question and define both classes discussing the merits of individual types of pumps in each class.

1. Rotodynamic (which the main sub-classification is centrifugal)
2. Positive displacement

Rotodynamic

Rotodynamic pumps are rotary machines in which energy is continuously imparted to the pumped liquid by a rotating impeller, propeller or rotor.



For this discussion we will not consider the special category as they are rarely used and only under very specific conditions.

Before going on to review centrifugal pumps which account for probably well over 95% of Rotodynamic applications, when do we use a peripheral pump (sometimes called side-channel or regenerative turbine pumps)? They are most definitely not suited to handling solids because for efficient operation, they depend on close clearances between their impellers and guide plates which also limits their viscosity-handling capabilities to under 20mm²/sec.

However, they are ideal for low capacities limited to 10 l/sec at quite high heads up to 310 metres through multi-staging, plus they have a built-in self-priming capability. Finally, many peripheral flow pumps have the ability to handle quantities of vapour mixed with liquid for substantial periods.

Back to what we would all consider true centrifugal pumps, we can, for the purpose of this discussion, consider the following classes:

1. Closed impeller
2. Open Impellers
3. Slurry pumps

In considering these classes we must look at how they handle solids and viscous liquids. Closed impeller pumps below 80mm for example, should not be used for liquids of viscosity greater than, say, 50mm²/sec because the viscous nature of the liquid creates too many internal losses to operate efficiently, and likewise 'lightly muddy' water is about the worst solids they can handle. However, the larger the centrifugal pump, the higher the viscosity it can efficiently pump, such that at over 150mm for example, it can handle up to 800mm²/sec.

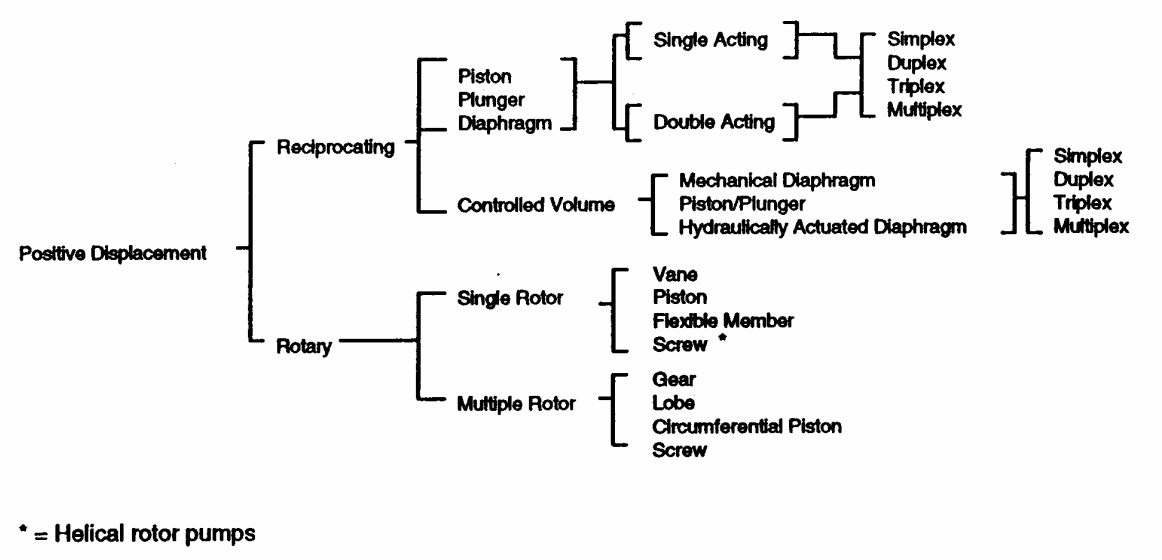
Open impellers can handle solids up to 5% provided that the individual solids can fit through the impeller passage-ways and remembering that high velocities within a centrifugal pump encourage high abrasive wear, if that is a characteristic of the solids. In these cases, a positive displacement pump with its lower internal speeds could be a more economic option as appropriate materials must be selected to accommodate the wear and this can be expensive.

For serious solid volumes, firstly these can be handled in sewage style pumps with single and two-vane impellers that have passages able to pass solids the size of the suction connection, generally beginning at 80mm.

Then we come to true slurry centrifugal pumps which can handle high volume solids, say to 50-60% generally at under 100 metres heads. These are built with large clearances with internal adjustment for wear, plus wear plates and components which are readily replaceable, including rubber-lined parts.

Positive Displacement

Positive displacement pumps are rotary or reciprocating machines in which energy is periodically added by application of force to movable boundaries of enclosed fluid containing volumes, resulting in a direct increase in pressure.



* = Helical rotor pumps

All positive displacement pumps can handle viscous liquids generally to very high viscosities and most are capable of handling substantial solids with the exception of vane, gear, multiple-screw and some forms of lobe pumps. For clean liquids of low viscosity, again many positive-displacement pumps can handle these liquids. However, many rotary types do not do it economically because of slippage of thin liquids (low viscosities) through their clearances i.e. gear, lobe and multiple-screw pumps.

For positive displacement pumps it should be remembered that in sizes up to say 50mm discharge, the capital costs generally are similar to centrifugal pumps.

However, after that, the positive displacement pump rapidly increases in cost, such that a 150mm discharge-type pump can cost many times that of a standard centrifugal water pump.

Conclusion

The above supports, in general, the basic conclusion that:

1. Centrifugal pumps are for low viscous clean fluids
2. Positive displacement pumps are for slurries and viscous liquids

However, there are some important instances which do not follow these basic conclusions:

a) Slurry applications, e.g. 80mm discharge and above and generally below 100m head should be centrifugal.

b) For clean liquid duties below 3 l/sec and above, 180 metres total head positive displacement pumps should be considered.

c) For viscous liquid applications with up to 800mm²/sec viscosity and capacities above 70 l/sec a centrifugal pump should be considered.

d) Generally, raw sewage applications should use centrifugal pumps

e) All applications below 0.5 l/sec should be positive displacement pumps

To conclude, every pump application should be individually considered as to the type of pump most suitable.

If in doubt, consult your pump supplier.