Fast payback from pump

Switching to a new type of pump on a filter cleaning system which previously relied on a multi-stage centrifugal pump, is saving a Swedish paper mill about £4000 per year in energy costs.

The Bäckhammar Paper Mill, at Kristinehamn, Sweden, produces almost 100 000 tonnes of Kraft paper each year and has an annual production capacity of 160 000 tonnes of unbleached sulphate pulp. The sulphate process is mainly closed. The white liquor is recovered using burnt lime, while the residual lime 'mud' is collected by filters. These are cleaned with re-circulated water, which must be pumped to them at pressure – ideally at about 50 bar.

Although multi-stage centrifugal pumps are commonly used in the industry for this task, high energy consumption and other limitations experienced with this type of pump prompted mill management to consider alternatives, when the position was reviewed two years ago. Maintenance costs had been high, not least because of problems with seals and bearings. Above all, the pumps were expensive to run. With average power consumption in the region of 30 kW, assuming continuous operation and energy costs of SEK 2500 per kW per year, the cost of running a centrifugal pump for one year worked out at SEK 75 000 (c.£4,800). That was for energy alone.

By contrast, the Hydra-Cell G25 diaphragm pump recommended by pump specialists, AB Telfa, draws only 3kW of power, and in every respect is more than equal to the needs of Bäckhammar on this application. Moreover, the new pump is smaller, easier to service and considerably less expensive in terms of capital cost. A further benefit is that it is able to work continuously at pressures up to 70 bar, as compared with the 30 bar maximum generally offered by multi-stage centrifugal pumps. The extra pressure gives more efficient cleaning and increases the capacity of the filters.

In the Hydra-Cell design, the diaphragms are actuated and supported by hydraulic oil pressure, which always balances the pressure of the liquid being pumped. This allows them to work without stress, even at high pressure, and is one factor in the notable durability of the pump. Additionally, there are no vulnerable seals in the unit. As Sture Olsson, of AB Telfa, was able to forecast, "The Hydra-Cell pump would also cut maintenance costs. Unlike a centrifugal pump, where the cost of replacing seals, bearings and so on is relatively high, the Wanner pump is particularly economical to maintain. Not only is it very hardwearing (its uses include pumping abrasives and slurries) but, when it finally does need a service, the straightforward replacement of wear parts for around SEK 9000 virtually gives you a brand new pump."

Now well into its second year of operation at the Kristinehamn mill, the Hydra-Cell pump has justified all expectations. After saving heavily on initial outlay (it cost between 25% and 50% less than multi-stage centrifugal pumps originally under consideration), it has cut filter pump energy consumption by 90%. Bäckhammar has also been able to raise the pressure of the cleaning water to 50 bar, and so increase filter capability. Meanwhile ongoing servicing costs have been reduced.

In short, the initial investment has paid off in under a year, while annual savings of SEK 60-70,000 (£3800-4500) continue into the future. IM

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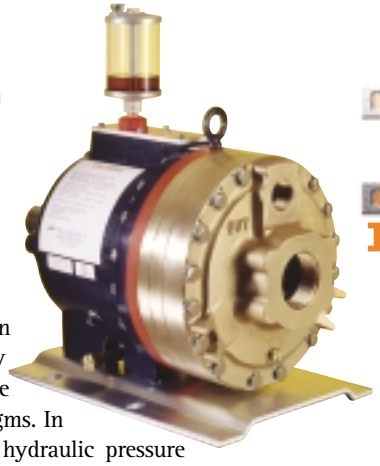
Protecting your **diaphragm**



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To protect Wanner Hydra-Cell pumps in face of abnormal and adverse system condition, the manufacturer is progressively introducing an important new development - the Kel-Cell. Patents are pending on Wanner's new technology, but it is already incorporated in all 70-bar rated pumps (G10, G12, G25 and G35 models) and in Slurry-Duty pumps. Kel-Cell DPC (diaphragm position control) technology, an enhancement of the existing Hydra-Cell technology, involves subtle but far-reaching modifications on the drive side of the pump.

Hydra-Cell pumps are seal-less. Pumped fluid is totally isolated from drive elements by diaphragms that are flexed from behind by hydraulic fluid to provide the pumping action. Unlike conventional hydraulic diaphragm pumps, they operate at high speed, which means less pulsation and more flow in relation to pump size.

Flow is directly proportional to pump speed and is little affected by changes in pressure. Maximum working pressure is 170 bar on some models, and generally 70 bar or higher. High efficiency (above 80%) reduces energy consumption.

One of the main factors in reliability is hydraulic balance across the diaphragms. In normal operation, hydraulic pressure always matches system pressure, so that each diaphragm is fully supported and enabled to operate without stress irrespective of pressure level.

The Kel-Cell innovation safeguards the diaphragm in the event of abnormal or fault conditions, which would cause the diaphragms to operate out of hydraulic balance. Such faults may be caused, for example, by an inlet valve shut off, or a blocked inlet filter or inlet pipe, or by operating continually at zero outlet pressure - with the effect that the diaphragm gradually deforms and may eventually rupture.

"In all such conditions," says Wanner's Dennis Heath, "Kel-Cell DPC is designed to stabilise the diaphragms and so prevent incidental failure. It is not a substitute for good system design. Nevertheless, it's a significant advance for the extra protection it gives, especially on critical applications." IM

Even the most reliable pumps can be at risk of damage occasionally if the system itself misbehaves - whether through poor system design, faulty installation or some operational incident that has not been allowed for.

For further details quote the relevant enquiry number on page 41

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