

27 November 2018

PRESS RELEASE

650 words

Flywheel pump prevents damage to infrastructure

Local pump manufacturer, KSB Pumps and Valves, showed-off its world-class engineering ability recently when it was called upon to develop a unique flywheel water pump system able to continue pumping long enough to mitigate the possible effects of water hammer in the event of power failures.

Ruan Nel, KSB Pumps and Valves project engineer, explains that the pump was developed for the rural Tsomo District Municipality where it is required for critical high lift pumping of potable water to supply water transfer requirements. Due to unstable electricity supply the municipality however, required a solution to prevent the potentially catastrophic backward rush of water in the event of a power failure that could lead to water hammer and the destruction of its water infrastructure.

This required the technical team to develop a reliable and failsafe method of maintaining water pressure long enough to reconnect power, or in the event of no availability of power, to (gradually) slow down and arrest the flow without air bubble-causing cavitation. Due to the rural location of the pump station, the team also needed to develop a reliable solution with minimal maintenance requirements.

High RPM

“The requirement for a flow of 380 cubic metres of water per hour, at differential height of 261m with an efficiency of 80.8%, called for a powerful pump and motor combination with the addition of a heavy flywheel.

“Weighing in at 681Kg each, the flywheels spin up to 3000 RPM and provide enough momentum to pump water for at least four minutes after power is interrupted. With a flywheel central to the design chosen, the pump selection was based on our high-efficiency Multitec multistage pumps which we configured in an inline orientation with the suction side on the left front side of the pump and discharge on right front side to make room for the flywheels.

“Considering the critical application in which the pump is to be used we also elected to manufacture all internals in bronze for corrosion resistance and low maintenance as well as added durability. In the end this is one of the only times worldwide that a flywheel pump of this size and such high

revolution has been undertaken and paves the way to apply a smart solution to an old problem,” says Ruan.

Well balanced

He continues that incorporating the flywheel was a particularly challenging undertaking requiring them to be specially designed and manufactured to high standards with balancing to G2.5 at 3000rpm, which is a particularly close tolerance to ensure near perfect balance. Mating to the pump also required careful engineering requiring self-centring ball bearings able to withstand high pressure, as well as special grease to allow for the high rpm. Operational bearing temperatures was tested to remain at 19-21°C during extended operation.

The system also uses a variable speed drive (VSD) to synchronise the motor, pump and flywheel speeds and makes use of specialised couplings to ensure the transfer of energy between the motor and flywheel remains seamless at all times including start-up, power outages and restart while the flywheels are still turning.

The system also required a heavy-duty base plate made from channel type steel and reinforced around the flywheel plumber block pedestal similar to large industrial baseplates and ensures the system remains perfectly balanced at all times.

Best solution

“Our flywheel solution now ensures that the inertia of the flywheel keeps turning the pump and eliminates air pockets and water hammer if power is interrupted. It is just the kind of reliable, mechanical solution that is required in this isolated rural area,” adds Ruan.

The entire project was completed in just a few months from order in October 2017 to acceptance in 7 June 2018. The project was commissioned by Partners in Development as the consulting engineers with Derek Vorster from Mercury Intertrade as the main contractor.

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Captions

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Ruan Nel

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A unique flywheel water pump system that is able to continue pumping long enough to mitigate the possible effects of water hammer in the event of power failures was developed by KSB Pumps and Valves

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