

Pumping life into mining

A company well regarded for its oilfield technology is highlighting to the mining industry a new generation of variable speed drives that further extend pump life while reducing costs, Jamie Wade writes.

As the mining boom places heavier demands on operations, and with increasing competition for equipment and resources driving up costs, maximizing the life and efficiency of equipment is becoming critical.

Pumps are an integral part of any mining operation and mine operators serious about optimizing pump performance will appreciate the benefits of Variable Speed Drives (VSD) that extend pump life and reduce operating costs.

Schlumberger – a company known for its oilfield technology, equipment and services – is delivering a new generation of VSD technologies using integral-output sine wave filter technology for operating both electrical submersible and surface pumps.

The company's new VSD: the SpeedStar 519 Sine Wave Drive (SWD) was designed for the most common pump problems encountered in the field, according to Noel Pereira from Schlumberger's Perth office, who said solutions were integrated into the system in anticipation of those common problems.

"For example, the drive can provide a safe restart of a spinning motor, or deliver a rocking start to free pumps stuck from sand, scale, or debris. It also offers loads, phase-to-phase, short-circuit protection," Pereira told *Australian Mining*.

"Recognising that electrical loading during pump startup is one of the principle causes of reduced run life, the system has been engineered to deliver higher torque per ampere.

"This reduces motor heating and torque pulsation, both of which adversely impact equipment run life.

"By limiting the in-rush current during startup to a maximum of 1.5 times the operating current, all downstream components benefit, including connectors, splices,



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cables, and electrical insulation.

"Under normal operation, superior motor control circuitry keeps the equipment operating at peak efficiency. This includes the ability to maintain unity power factor regardless of loading, mitigation of output harmonics, and speed controls to maintain constant load or pressure."

The end result, says Pereira, is reduced power consumption – as much as 40 per cent through maximum effective use of available power, which is a substantial amount especially for bore fields.

A tailored package with the Schlumberger SWD for electric submersible pumps

has an 18-pulse, low voltage (~400V) capacity and a built-in sine wave output filter that complies with strict Institute of Electrical and Electronics Engineers (IEEE) 519 1992 guidelines.

"This particular SWD VSD increases system efficiency

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and reduces harmonic reflection back to the power supply while prolonging run life of the electrical submersible and surface pumps it drives," Pereira said.

"The key enabler of the new technology's performance improvements is a drive input integral 18-pulse phase-

shifting autotransformer. This innovative feature typically reduces reflected current harmonic distortion to 5 per cent, compared to 25 per cent current harmonic distortion experienced by conventional VSD systems.

"As a result, power system efficiency is significantly improved, and the package footprint of surface equipment is reduced by eliminating the external phase shifting transformer required with conventional VSD systems."

The benefits of VSD technology in regenerating a smoother and cleaner supply power to the motor are widely acknowledged by pump system operators.

"An output filter pushes the resonance band of the downhole system below the drive's carrier frequency, thereby eliminating excessive resonance and minimising voltage overshoots. This benefit is realised in spite of variations in cable length, motor type, or the number of transformer taps," Pereira said.

"The near-sinusoidal output wave form reduces voltage stress levels, motor temperature, and vibration, all of which are known contributors to shortened motor run life.

"The VSD enables the system to start at a much lower speed and then ramp to the desired operating frequency.

"This ensures that the system's elements – such as pump-shafts and motor windings' insulation – are not stressed at start.

"With a Direct on Lines (DOL) setup, for example, starting amperes could be as much as six times the running amp. This means significant stress on motor-windings' insulation that do take a toll on the motor's run life.

"Therefore, VSDs also enable multiple starts as a non-issue."

The Schlumberger SWD VSD and the electrical submersible pump system are also said to protect against lightning strikes or voltage surges by a single, heavy-duty, distribution-grade Metal Oxide Varistors (MOV) disk, which according to Schlumberger, is said to be more effective than parallel MOVs commonly found in the market.

"The SWD, while having a built-in sine wave filter, is easy to operate because it doesn't require site tuning of that filter; the operator simply varies the frequency and the unit adjusts itself for the load.

"This minimizes or eliminates the 'hammer effect' that has been a concern to piping and the pump in the past," Pereira said.