

Article

PCS100 - ABB's innovative power electronics solutions for the mining industry



ABB is using its vast technical know-how to bring innovative solutions designed for voltage regulation and power factor correction to two major mining companies. Mines have a huge reliance on electrical power and ABB is supporting the mining industry in lowering energy costs and improving the standard of power quality. ABB's PCS100 STATCOM solution is valuable to large continuous mining operations supports the use of high power electrical mining machines that must be fed over very long cable lengths.

The PCS100 STATCOM solution gives fast acting dynamic voltage regulation (voltage support) for starting continuous borers, extensible conveyor belts and other related industrial equipment. If the mine is affected by low distribution voltage due to long cable lengths, this technology raises the overall voltage at the mining machine, which in turn increases mining machine production and leads to longer motor life.

Mining project one:

One of the mining projects consists of a new mine with the first gold pour scheduled for early 2012, which will produce over 2.5 million ounces of gold in its first 15 years of production. Once at full production in 2012, the mine is forecasting a 15-year mine life with an average annual production of 180,000 ounces of gold. Following the initial two years of open-pit production, the mine will move into underground production with average annual production rising to 190,000 ounces of gold over the remaining mine-life.

Solution adopted

ABB's power electronics team provided a solution which consisted of the design, manufacture and testing of six 4.5 MVar STATCOM units that were assembled in outdoor enclosures. Also included was a one 9.0 MVA ABB step-down oil-filled transformer for one

STATCOM unit (115 kV – 13.8 kV). ABB carried out system studies to confirm the STATCOM performance and also provided on-site training of ABB's PCS100 STATCOM technology. The enclosure made by ABB was a 40' ISO container housing 4 x 2.25 MVA inverter rack and controls.

The STATCOM technology for the project is used to regulate the grid voltage by providing reactive power to the grid in either capacitive or inductive VAr sourcing. This reactive power sourcing is done through IGBT based inverters and the platform used by the ABB team from New Berlin WI, which is the power electronics low voltage inverter system PCS100.

Performance requirements

The STATCOM performance requirements were outlined as follows;

- Regulate the mine 115 kV bus voltage to a reference voltage continuously adjustable between 115 kV and 122 kV.
- Nominal slope adjustable in steps of not greater than 0.5% between 2% and 10%.
- Response time such that 0-90% rise time of the VAr output achieved in less than 100 ms.
- Maintain the system voltage during the duty cycle of a 6000 HP hoist motor. The motor will draw 6.0 MW during the lift cycle, and regenerate 3 MW during the lower cycle. This cycle is repeated six times per hour.
- Redundancy to maintain performance requirements during N-1 STATCOM configurations.

Opportunities

This is the first major project using PCS100 inverters and also using global power products as enclosure integrators. Therefore, close technical cooperation between ABB's New Zealand power electronics team and ABB's New Berlin team was necessary to

assist in quality surveying equipment. The exceptional team work between the inverter factory and our own system integration group in New Berlin, which took care of system studies, system integration including outdoor enclosure design and installation/commissioning enabled ABB's global network to be utilised effectively.

Mining project two:

One of the fastest growing, lowest-cost gold producers, with operations and development projects throughout America is working in collaboration with ABB to expand an old mine that has produced over three million ounces of gold since achieving its first commercial production in 1997.

Background

The need identified was to modify an existing load supply point through a 3.2 km extension of 115 kV transmission line serving the current facility. The total combined load was expected to increase to 20 MVA (18 MW at 0.9 PF inductive), with eight MW located at the new substation. A system impact study was conducted to assess the expansion's impact on the IESO controlled grid reliability with several corrective actions being identified.

The impacts identified were excessive bus voltage fluctuations at the substation during operation of a large hoist motor, and voltage criteria violations at the mine point of connection following a contingency on the IESO controlled grid requiring load reduction.

Action taken

The solution adopted was a ± 5 MVAR ABB STATCOM and one 5 MVAR 13.8 kV capacitor bank, which allowed the mine expansion project to operate at full 18 MW load while meeting IESO post contingency voltage criteria. ABB's PCS100 STATCOM provides dynamic reactive power support to limit voltage sags caused by operation of the 4600 hp skip hoist motor to 1.5% at the 115 kV bus.

Increased network stability and transmission capacity, coupled with grid compliance and a highly reliable modular redundant power electronic configuration, ensures ABB's technology as a safe and reliable choice for mining applications.

See more on ABB's energy storage and grid stabilisation technology at :

www.abb.com/converters-inverters

(Converters for energy storage and grid stabilization)



6 x 4.5 MVAR mining application for Canadian mine

