

Variable Speed Control of SAG Mill in the Mining Industry

Drive^{IT} ACS 1000 Medium Voltage Drives for Speed and Torque Control of 315 kW – 5,000 kW Motors

Case Study

Mining industry

Agnico-Eagle Mines Ltd., Canada

Application: SAG Mill, 3360 kW

LaRonde Mine

Agnico-Eagle's LaRonde mine has a large gold-silver-base metal deposit and contains the largest reserve resource base of any mine in Canada. Its assumed resource of about eight million ounces is enough to sustain the mine life for 20 years at a production of 7000 tons per day. Agnico-Eagle produces 260'000 ounces of gold from the LaRonde mine.

The LaRonde mine is located in northeastern Quebec, about 600 km north of Montreal.

SAG Mill

In addition to the eight million ounces of gold, the LaRonde mine contains almost 30 million tons of ore. At LaRonde's processing plant the precious metal is extracted from the ore.

As part of the recovery process, the ore, with lime and water, is fed into the semi-autogenous grinding (SAG) mill. In the grinding process the rock is reduced to fine particles which are then processed further.

Highlights

- Reliable operation
- Reduced maintenance cost
- Improved process control
- Longer lifetime of equipment
- Payback on investment period: 1 year



Agnico-Eagle Mines Ltd., LaRonde mine, Quebec, Canada.



View of the SAG mill (3360 kW).



Drive^{IT} ACS 1000 controlling the SAG mill at Agnico-Eagle's LaRonde mine.



Challenge

The power of the existing drive, which was supplied by another vendor, did not match that of the motor. Consequently it was not possible to operate the SAG mill at the required power, resulting in production losses. In addition, the mismatch caused a number of unscheduled plant shutdowns.

Another problem of the air-cooled drive was the cooling as the ventilation in the control room was limited.

Solution

The problem was solved by replacing the existing drive with a water-cooled ACS 1000 medium voltage drive. ABB's ACS 1000 soft starts the motor, allowing a smooth ramp up, and allowing the motor and the SAG mill to run at the required load output. By installing a water-cooled ACS 1000 the ventilation in the control room was sufficient and allowed for a better cooling of the other equipment.

Benefits

Increased SAG mill output

Installing the ACS 1000 provided Agnico-Eagle with the flexibility to expand the milling facility, increasing the output from originally 2000 tpd to almost 8000 tpd. The process control was improved and the expected performance and stability was achieved.

Use of existing motor

Due to the sinusoidal output voltage of the drive, the existing motor could be used without derating.

High starting torque

The drive provides a high starting torque, i.e. nominal torque at zero speed. Its motor control platform is based on Direct Torque Control (DTC) which achieves ultimate torque and speed performance. DTC allows the speed of any standard squirrel cage induction motor to be controlled without the need for expensive and fragile encoders

or tachogenerator feedback devices.

By starting the SAG mill with the ACS 1000 medium voltage drive, a motor with a higher starting torque can be used since there are no inrush currents.

Increased lifetime of equipment

The smooth speed ramp up protects the mechanical equipment, thus prolonging its lifetime and reducing maintenance costs.

Low impact of power supply disturbances

Due to its RideThrough function, the drive system is able to withstand disturbances in power supply.

Small footprint

The use of IGCT semiconductors contributes to the small footprint of the variable speed drive and has proved to be beneficial to Agnico-Eagle because of the restricted space in the processing plant.

Dependable support and service

Due to ABB's prompt and efficient support, Agnico-Eagle was able to exchange the drives quickly and to minimize downtime.

As the SAG mill's operation depends greatly on the variable speed drive, Agnico-Eagle requires around the clock access to drives specialists and spare parts. ABB, the largest drives supplier worldwide, has a global support network, providing assistance and spare parts 24 hours/day, 365 days/year.

Customer Satisfaction

Agnico-Eagle Mines Ltd. states: "Thanks to ABB's ACS 1000 variable speed drive we are able to run the motor and the SAG mill at the required speed. We no longer have to deal with plant shutdowns and are able to expand the milling facility, increasing the output from originally 2000 tpd to almost 8000 tpd. The ACS 1000 fully meets our expectations."

Key features & benefits

The ACS 1000 Medium Voltage Drive offers many benefits as standard, including:

- Highest reliability and availability
- High efficiency, > 98 % including sine filter and auxiliaries
- Lowest lifetime costs
- Small footprint and overall physical size
- Greatest transformer flexibility
- High performance, through Direct Torque Control (DTC)
- Retrofit-ready, for fitting to any standard medium voltage squirrel cage motor, without derating
- Every drive fully factory-tested
- Two-day on-site commissioning
- Full compliance with international standards including EN (IEC), CE, IEEE, and the first medium voltage drive to be UL Listed.



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