

Mount Milligan mill drives

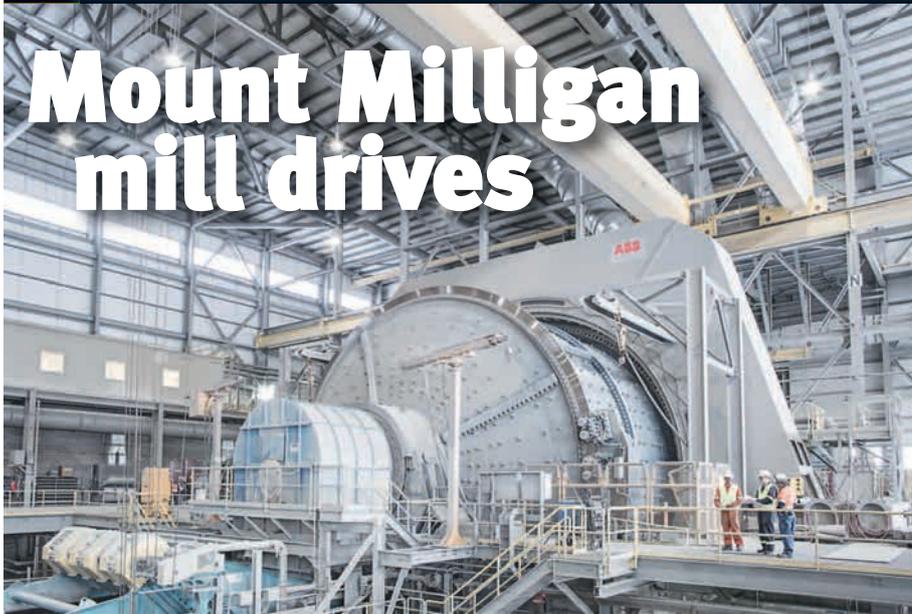


ABB in 2014 completed the delivery and commissioning of variable-speed mill drive systems for one of the most advanced and productive grinding circuits in North America, reports Paul Moore

Mount Milligan is a new copper and gold project located some 1,000 km north of Vancouver in central British Columbia, Canada. The mine shipped its first concentrate in September 2013 and is projected to process 60,000 t/d of copper ore per day over a 22 year operating life. Mount Milligan is owned and operated by Thompson Creek Metals Company, a North American mining company, which took over the mine in 2010 through its acquisition of Terrane Metals Corporation. Mount Milligan's grinding circuit is one of the most advanced and powerful in North America. It consists of a 40 ft SAG mill and two 26 ft ball mills, all made by Metso. The drive systems that enable the mills to operate at benchmark levels of reliability, efficiency and availability were made by ABB, whose solution comprises a 23.5 MW gearless mill drive (GMD) for the SAG mill, and two 13 MW low-speed dual-pinion ring-gear mill drive (RMD) systems for the ball mills.

The GMD system consists of a 23.5 MW wrap-around motor, three cycloconverter transformers, an excitation transformer, a cycloconverter and the ABB control system for the mill and its auxiliaries. Each RMD system comprises two 6.5 MW synchronous motors, one ACS6000 drive, transformers as well as the ABB control system. The cycloconverters, drives and controllers are all housed in three pre-assembled and factory-tested E-houses. All the equipment is certified for use in Canada by the Canadian Standards Association (CSA). ABB was responsible for the design, engineering, installation supervision and commissioning of all three drive systems.

Pushing the boundaries

With a diameter of 40 ft, the SAG mill is one of the largest in operation in the world. ABB states that it has long supported the push towards larger and more powerful SAG mills by developing the GMD systems that make their evolution possible. To date ABB has won orders for GMD solutions for eleven mills of this size and one for a SAG mill with a 42 ft diameter – the largest SAG mill ever built. Several of these ABB solutions, including the 42 ft mill, have a power rating of 28 MW.

ABB says that it is also extending the technical boundaries in RMD systems. The Mount Milligan ball mills are among the first to start production with ABB's new low-speed dual-pinion RMDs. Operating at speeds as low as 175 rpm, with the motors driving the pinions directly and no gearboxes required, these innovative solutions minimise mechanical wear on the mills. This reduces downtime and repairs while increasing the availability of grinding process equipment, thereby raising the efficiency and overall productivity of the process. Since winning the first low-speed RMD orders in 2009, ABB has doubled the power rating of the drive systems from 4.5 MW to 9 MW per pinion.

Drive flexibility

ABB was awarded the drive systems contract by Terrane Metals in 2009. Initially, ABB assisted Terrane Metals with consultancy and made available its expertise in minerals processing and variable-speed mill drive systems to guide and advise Terrane on the best and most appropriate solution for the site. "Flexibility in

The 40 ft GMD supplied by ABB to Mount Milligan

adapting the solution and services to the needs of a young company embarking on such a major project was essential for successful collaboration" states ABB.

Terrane had initially decided to award the mill drive systems contract to two separate suppliers: one for the SAG mill GMD system and the other for the two ball mill RMD systems but ABB considered this unnecessary, when it was possible to get a fully integrated and optimised solution for the entire grinding circuit from a single supplier.

ABB GMDs and RMDs use the same type of controller and human machine interface, which means that graphically they have the same look and feel and ease of operation. They share many of the same features and maintenance functionalities (such as frozen charge protection and remover, controlled rollback, automatic positioning and inching), and can be serviced by the same ABB mill drive maintenance centre in Canada, one of five dedicated mill drive hubs that ABB operates worldwide. ABB also standardised the two mill drive solutions by using the same type of equipment whenever possible, thereby reducing the amount of engineering documentation and simplifying operations and maintenance for staff at the site.

Logistical challenges

One of the biggest challenges for ABB was transporting the mill drive systems to Mount Milligan. Transportation to the remote site had to be carried out in winter, when the unpaved access road to the mine was frozen and able to bear the weight of heavy trucks. The largest and heaviest component in the ABB solution is the huge GMD stator, which wraps around the SAG mill. Normally, ABB designs the GMD stator to be transported in four parts and assembled on site. But due to the weak access road to Mount Milligan, ABB designed and transported the stator in five parts. Each part was 13 m long and weighed 100 t, and had to be able to withstand extreme winter temperatures as low as -40°C. ABB equipped each stator part with a specially designed heating system that automatically switched itself on whenever the temperature fell to -10°C.

The 80 km of unpaved access road were just one phase of a long and challenging journey that began in Europe. From there the stator parts, E-houses, motors, transformers and drives were shipped to Halifax in Nova Scotia and then transported by rail from one end of Canada to the other, a distance of around 5,600 km.

ABB supervised the mechanical and electrical



ABB and Mount Milligan staff during maintenance

installation of the three drive systems and commissioned them on schedule and incident-free. All three ABB mill drive systems achieved full load smoothly and without setbacks. The mine reached full commercial production in February of 2014. Full support during ramp up was ensured by keeping ABB service engineers on site – two local specialists taking turns – until the end of the year, making sure qualified assistance is always at hand if needed. This contract has been extended until March 2015.

Investment protection

To protect its multi million dollar investment in the mill drive systems and ensure that they continue to operate with maximum efficiency and reliability, Thomson Creek Metals signed an ABB service contract. ABB has a comprehensive portfolio of service offerings for variable-speed drive systems for grinding applications. It ranges from long-term service agreements to individual service products like spare parts, training, engineering and consulting, as well as state-of-the-art services like remote monitoring and remote diagnostics.

Thomson Creek Metals have opted for a service contract that covers the full scope of the ABB solution: the GMD and RMD systems, transformers and all the equipment in the E-houses. The contract is designed to minimise the risk of costly unscheduled breakdowns, extend the life cycle of the drive systems, and optimise process performance. It includes remote diagnostics, which combines remote connectivity, advanced monitoring and diagnosis, data security and global technical support in a simple, widely proven package. Quarterly reports and regular site visits by ABB

experts for preventive maintenance purposes are part of the agreement.

“We have established a good working relationship with our Canadian support from ABB as well as the 24-hour support out of Switzerland”, said John Hollow, Vice President, Technical Services for Thomson Creek Metals. “It is working well and we are seeing significant improvements in the reliability of the mill drive equipment, in part due to the collaboration with vendors and design engineers. It has allowed us to continuously improve the processes, to reduce the unscheduled downtime and to achieve our designed run times and power usage at a faster rate than was originally anticipated.”

State-of-the-art features

Each ABB GMD and RMD solution provides a comprehensive range of functionalities that are critical to mill operations. “The gearless mill

drive system is a proven, reliable solution”, said John Hollow, “we look at the gearless mill drive as being able to provide us with the reliability that we need to be able to optimise the process and to achieve our production numbers.”

Furthermore he stated “since our ore is variable throughout the ore deposit, being able to adjust how much power we put into every ton of ore makes it more cost effective. So, utilising the variable-speed drive, particularly on our ball mills, lets us really optimize the cost associated with processing that kind of ore.”

The start sequence is completely controlled by the drives for a safe and smooth start that eliminates the risk of dropping a frozen charge and is friendly to both the mechanical components and the electrical network. Stopping is equally smooth and includes controlled rollback to bring the mill to the rest position where both speed and torque are zero.

Variable-speed ensures the best results in terms of grinding efficiency and operational flexibility. Despite changes in ore grade and liner wear, the required quality of the product can be maintained. Variable-speed can also reduce wear and tear of the liners and ball charge. The ride-through functionality makes it possible to keep the mill in operation during short power outages, while contributing to process stability.

For fast and easy maintenance of the mill, ABB has created dedicated maintenance functions that harness the benefits of variable-speed drives and are activated via the mill controller. These include creeping (for visual inspection, manual positioning and flushing), automatic positioning to allow liner replacement, deformation protection for longer mill stops, and frozen charge remover. **IM**

Mount Milligan processing plant

