



ABB's long history of making mining operations more efficient

Innovative technologies have improved productivity for mining since the 1890s

ABB's comprehensive automation and power delivery at Boliden's Aitik copper concentrator plant is the latest chapter in the company's rich history of improving the operations of all types of mines and ore processing plants.

The company has provided solutions that make mining operations more efficient, productive and safe for almost 120 years, since delivering the first drives and controls for a mine hoist at the Kolningsberget iron mine in Norberg, Sweden, in 1891. Drives and controls help mine hoists operate more efficiently and consistently as they haul tons of ore from lower levels of a mine to the surface.

Over the years, ABB has made other breakthroughs in mine hoist technology including hydraulic disc brakes, controlled braking and Rope Oscillation Control, all of which have made mine hoists more reliable and safer to operate. ABB has delivered more than 600 new hoists and modernized hundreds of existing plants. A mine hoist delivered around 1930 by ASEA, a predecessor of ABB, to the Zinkgruvan zinc mine in Sweden is still in operation today.

Pioneer of gearless mill drives

ABB pioneered the development of gearless mill drive (GMD) systems, which are giant motor and drive systems that power ore-crushing mills. They are more reliable and energy efficient than traditional mill drive systems, and increase mill productivity. ABB delivered the world's first gearless machine drive to Lafarge Cement in France in 1969. The 6.4 megawatt (MW) equipment is still operating today.

The first ABB GMD system for mineral processing was for a copper concentrator at the Bougainville mine in Papua New Guinea in 1985. Since then, ABB has delivered or has on order 67 GMD systems for its minerals customers all over the world. Over the years, GMD systems have become larger and more powerful: in 2003, a GMD system with a rating of 21 MW was delivered to the Collahuasi copper mine in Chile.



The Collahuasi copper mine installation in Chile in operation.

ABB will deliver the world's highest altitude GMD systems, to operate at 4,600 meters above sea level, for the copper concentrator at Minera Chinalco's Toromocho mine in Peru. The project was awarded in 2009.

The most powerful GMD systems ever built were commissioned in August 2010 at Boliden's Aitik copper



concentrator plant in northern Sweden. At 22.5 MW, each of two GMD systems has the capacity to grind 2,200 tons of ore per hour.

Over the years, ABB has also supplied numerous heavy equipment and large machines for mining operations and material handling. One of ABB's predecessor companies, VEM SAB in Germany, in 1949 delivered its first bucket chain excavator which removes material from the open pit and brings it to the surface for processing. VEM also delivered its first conveyor bridge in 1949 and its first belt conveyor in 1960.



Left picture: The first bucket chain excavator.



Right picture: First conveyor bridge.

The machines equipped by ABB cover the entire production process – from extraction through transport to shipping, with an integrated control system that helps them work efficiently with the other parts of the mining operation.

Reliable power

A reliable and stable source of power is critical to any mining or minerals processing operation. ABB, and its predecessor companies, have been delivering electrical infrastructure and related equipment for its mining customers since electricity became widely available in the late 1800s, helping to bring the industry forward into the modern era.

Automation has been a critical factor in modernizing mining operations, providing the means to precisely control processes and equipment, optimize production throughput, improve worker safety, and operate with the most efficient use of materials and energy resources.

ABB is uniquely positioned to provide all the electrical equipment, including infrastructure, and automation equipment, such as control systems, drives and instrumentation. Since ASEA was founded in 1883, the company has delivered electrical power and control systems to major mining operations in Sweden, including LKAB's mines in Kiruna and Malmberget, and many others.

Globally, ABB has delivered comprehensive electrical and automation systems to numerous high profile mining projects, including:

- In 1992, the Bauxiven Los Pijigaos bauxite mine in Venezuela, providing two bauxite transport and storage plants. The installation included the entire electrical infrastructure



and electrical equipment such as switchgear, transformers, motor control centers, variable speed drives and an ABB Master control system.

- In 1998, the modernization of Cajamarquilla's zinc smelter in Peru, which more than doubled the plant's capacity. ABB's delivery included transformer rectifiers, an induction furnace and a process control system.
- Awarded in 2009 and still under construction, Vale's new Moatize coal plant in Mozambique, which includes ABB's flagship Extended Automation System 800xA, all medium- and low-voltage power distribution systems, drives, motors and other auxiliary equipment.

Modern and efficient mining

The latest example of ABB's comprehensive automation and electrical delivery scope is at Boliden's Aitik copper concentrator plant. The entire site process – including the concentrator plant, conveyor systems and pumping stations - is controlled by System 800xA. ABB's automation and power solutions help to double production capacity at Aitik, Sweden's largest mine, and create one of the most modern and efficient mines in the world.

ABB's experience of delivering comprehensive leading-edge technologies and equipment for the mineral and mineral processing industries has helped these industries develop and thrive and will continue to help them profit well into the future.