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Ruggedised PLCs will boost processing uptime at Lapland gold mine

ABB is currently upgrading the automation system at Agnico Eagle's gold mine in Lapland, with eight of its latest ruggedised PLCs for controlling equipment in harsh conditions and extreme climates. The PLCs will control the sedimentation process of the concentrating mill at Europe's largest gold mine. Agnico Eagle, in northern Finland which is 150 km inside the Arctic Circle near the town of Kittila.

ABB won the original contract for the main automation system at the gold mine, and configured and installed electrical automation based on its 800xA Extended Automation system and industrial IT architecture. The project involved a large amount of ABB automation components including ABB's 800 series operator interface panels and AC500 PLCs for the underground control of pumps, air conditioning, the motors used in ore crushing and processing, etc.

However, a number of items of plant equipment came with automation from other vendors, including PLCs that were supplied with the sedimentation facility that forms part of the mine's concentrating mill. The PLCs were normal industrial grade types, but housed in freeze-protected cabinets located outdoors. Since installation however, this facility has suffered a number of process stoppages because of the environment at the mine - which includes very wet and humid conditions and winter temperatures as low as -40 degrees C. If a process stoppage happens in winter the impact can be severe, as the weather can quickly add to the problem by freezing and blocking pipelines.

There have been some four or five stoppages a year, stemming from power outages, extreme cold temperatures, or water droplets that form on the PLC modules when the cabinet doors were opened. In wintertime, condensation can happen in seconds - almost the instant the cabinet doors are opened and the benefits of the cabinet's ingress protection are lost - because of the very low temperatures and the moisture-laden air around the concentrating mill. The same problem can also happen in springtime, as temperatures can swing between -25 and +15 degrees C from night to day - leading to heavy condensation.

The mine operators decided to upgrade this part of the control system to improve reliability and uptime. They were very happy with the PLCs that provided control in the hot and humid underground environment and turned to the supplier of these - main automation vendor ABB - who proposed a solution based on the XC PLC. XC is an 'extreme conditions' variant of the well-known AC500 PLC family that is installed underground. It has built-in protection against a very wide variety of threats posed by harsh environmental and operating conditions including high and low temperatures, high humidity, low air pressure, salt mist and hazardous gases, and vibration and shock. In this case, the new ABB XC PLCs will be installed at the mine's above-ground processing centre - with some I/O modules located at a remote water pumping location and connected using ProfiNET.

Mining is one of the key target applications for this PLC. The harsh environment at Kittila poses no problem for the XC PLC which can operate in temperatures from -30 degrees C, with reliable system start-ups in temperatures as low as -40 C, more than meeting the problems that might arise. Its circuit

boards have a conformal coating to protect against moisture ingress. And the PLC is protected against vibration and shock and will tolerate a lot of mechanical stress - such as accelerations up to four g from random vibrations up to 500 Hz, or two g from sinusoidal vibration. This built-in protection means that the ABB PLCs are being installed in standard uninsulated stainless steel cabinets - without any need for freeze-protection heaters.

"Ruggedised PLC technology opens up new design possibilities, allowing automation to be sited right where the control I/O is needed, in many cases without high-specification environmental protection - as at this mine is deep inside the Arctic circle" says Risto Haavisto of ABB Finland.

Agnico Eagle's gold mine has an estimated lifetime to 2037; Kittila's reserves are estimated at almost 33 million tonnes. The mine employs over 600 staff and contractors, most of whom are local residents, making a big contribution to the regional economy. Ore was originally mined from two open pits, starting in 2008. Since 2010, the mining has moved underground. Some 3,000 tonnes of ore is currently transported daily to the surface crusher using underground haul trucks via a three km-long ramp access system.

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Caption: ABB's ruggedised PLCs are controlling Agnico Eagle's gold mine concentrating mill part of the sedimentation process.

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