

# Foundation for the future

ABB looks at how extended automation can be used to address the challenges facing mining operations in the future

The mining industry is facing an interesting future. The demand for commodities is growing but there are some difficult challenges that must be overcome in order to meet this need. To stay competitive, mining companies must find ways to increase the production rate of their operations, reduce the cost per tonne produced and extend the lifespan of their mine sites or establish new ones. At the same time, they must strive for higher workforce safety and fewer accidents while reducing their energy consumption and carbon-dioxide emissions.

In a traditionally labour-intensive industry that is moving over in stages to full mechanisation, the trend is now to increase the level of automation and transform each mine into a fully controlled, automated operation. Automation is, in short, the future of mining.

## THE CHALLENGES AHEAD

During the past 25 years, many mining companies have grown into multi-national giants and their mine sites are often situated in very remote areas with harsh climatic conditions. It is difficult to bring in experts and recruit and retain competent staff when running mining operations in these areas.

Decreasing ore grades also pose a challenge; it is likely that we will see fewer open-pit mines and more underground mining operations in the coming years. Mines are digging deeper to find orebodies and increased productivity is needed to match higher production costs.

Perhaps the most important issue facing the mining industry is the question of improved workforce safety, especially in underground areas. Mining has, over the years, become much safer, but the number of accidents and fatalities is still at an unacceptable level. Tougher regulations and requirements from authorities will also put improved worker safety into focus.

Rising energy costs are also pushing the mining industry to focus on areas such as energy efficiency and tracking of energy consumption. In many mines there is little, or no, integration between the processing and the power parts of the operation, making it very difficult to determine where energy is actually consumed.

The final challenge is typical for many



ABB's 800xa automation system can cover an entire mining operation

process industries. On each site there are a large number of independent pieces of equipment and systems from different suppliers. Each has its own data and interfaces. Operators and control-room staff look at different screens and have only small, separate pieces of information at hand – no overview. We call this 'islands of automation'.

This lack of unity and integration makes it difficult for decisions to be made in a correct and timely manner. Many plants are far from the vision of having a full, unified view of their production from raw material, to processing, stockpiling and delivery. The result is huge gaps in the mine site's value chain.

## EXTENDED AUTOMATION

In one way, automation is not new in mining. Programmable logic controllers (PLCs) have been around for years, but the automation solutions used in mines are generally more basic than those used in other industries, and are often limited to providing only simple control of motors, equipment or certain parts of processes.

ABB believes that the future of mining lies in extended automation. The key to



this is integration. For example, with a modern automation solution such as ABB's 800xA, an entire mining operation can be controlled. For the mine, this means that blasting and crushing can be optimised together with the grinding operation and the concentrator as a whole, closing any gaps in the value chain.

Mines normally have separate areas/parts of the production process run by local, specialised operators. This is costly and inefficient, and by bringing them together and ensuring that everyone is 'speaking the same language' the following can be achieved:

- everyone has access to all information in real-time through the same viewing platform;
- there is one way to handle all functions and interface systems;
- there is one common language; and
- one way of working.

To facilitate this, each mine will require an automation platform with the capacity to integrate all kinds of products and solutions. For example, System 800xA can handle traditional process-control systems, such as PLCs, distributed control systems (DCS), safety systems and electrical equipment such as drives and motors, as well as production planning, power management, maintenance, asset management, enterprise resource planning and documentation systems. These are integrated into a single control environment.

It is also important that the system can integrate different users, live video, voice and public-address systems, plus web ►

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*Automation promises big increases in the efficiency of mining processes*

► information in a common visual interface. In System 800xA, all information is presented in a uniform way and tied to physical assets.

Even unmanned equipment can be included, helping to reduce the number of people working in dangerous areas of the mine. For the user, all systems are only a mouse-click away; information can also be displayed on tablets or smartphones, enabling flexibility in supervising and controlling each element of the operation.

This also gives better visibility – from mine to concentrator, smelter and stockyard. The result is an optimised operation from mine to port.

### MAINTENANCE OPTIMISATION

A modern asset optimisation system can help mines to go from reactive to predictive maintenance strategies, avoiding unnecessary maintenance and reducing operating costs. Extended automation solutions such as System 800xA can integrate modern maintenance systems from suppliers such as IBM and SAP.

A good example of this is the integration of IBM Maximo at Boliden's Aitik mine in northern Sweden. With 800xA, the operator is alerted by a predictive maintenance alarm if a piece of equipment will be needing repair soon. They can access the maintenance system, see all upcoming work orders and easily add new work orders. The engineers in the field can view the same information on their mobile devices and together they will decide on the optimal maintenance plan.

### RESCHEDULING

Rescheduling because of disruptions is a typical mining scenario. If a disturbance is putting production at risk – let us say a drilling cycle has missed a blast round – then the local operator has a scheduling system in place and is notified immediately.

The critical area is clearly marked and the cause of the problem identified. Operators and production management can discuss and run 'what-if' analyses to simulate different solutions. All members of staff see the same information and can jointly decide what actions to take. Everything is done in real-time, with no need to wait and risk the shift's production goal.

### VENTILATION ON DEMAND

Mine vehicles emit diesel exhaust gases that must be ventilated away. In some underground mines, ventilation can account for almost 50% of energy

consumption. An extended automation system will know exactly where each vehicle is, and data, including emission levels, is communicated to the system. The system can then optimise ventilation continuously according to the needs of different mine areas in order to minimise energy consumption and preserve air quality.

Mining is an energy-intensive activity, and extended automation solutions can reduce production stoppages and enable energy usage to be measured in real time. Operators have a single view of process and power equipment, as well as protection, switchgear, transmission and distribution equipment. The result is a reliable power supply and enhanced visibility of the usage and consumption of power in all areas of the mine.

### CENTRALISATION, CONSOLIDATION

The mining industry is gradually moving towards mine control through remote operations centres that co-ordinate multiple areas within an operation and even multiple sites.

Local control rooms may still exist in the future, but the trend is overwhelmingly towards centralised operations – often in company headquarters. With modern control-room designs and extended automation, people with different roles can work together in the same environment. Control-room consolidation means that barriers are torn down and experts can collaborate in one place.

All information from local mine sites is available, and this facilitates collaboration in production planning, resource planning, specialist support, inventories and spare parts, allowing resources to be optimised across multiple sites.

### PROCESSING PERFORMANCE

In ore-processing plants, the largest source of uncertainty is the properties of the ore; plants need to be able to react quickly to any changes. Much better results can be obtained when the ore properties are quantified ahead of time.

Extended automation makes this possible, as material movements and ore grades are tracked all the way from the mine to the processing plant. Ore properties are logged and represented graphically, eliminating guess work. This information is available for other advanced applications as well as to support operators' actions. Material movements are automatically synchronised with inventory management systems that look after the logistics and the supply chain.

Finally, ore information is used by



process optimisation controllers who use forecasts to make predictive adjustments to the grinding and flotation circuit according to the exact properties of the ore. The result is higher equipment utilisation, increased production and lower energy consumption.

### THE FUTURE IS BRIGHT

On the surface, the increased demand for raw materials globally should mean that the future looks bright for the mining industry. But this does not come without challenges. To achieve the projected increase in production volume, more inaccessible deposits with inferior ore content must be exploited. This combined with ever-increasing competition between the mining giants brings with it a phenomenal productivity challenge for the industry as a whole.

In adjacent process industries, these types of challenges have been pronounced for several decades and most have worked tirelessly to streamline production processes, methods and tools to constantly improve production efficiency.

A fundamental precondition for this success is a step-change in the degree of instrumentation and automation, which also increases steadily over time. The automation journey for the mining industry has just begun and in mining, this whole transition must be made several times faster.

By harnessing the full potential of extended automation and by bringing people, equipment and systems together in a fully integrated environment, ABB firmly believes that mining companies can vastly improve productivity, workforce satisfaction and safety. They can also minimise energy costs, work seamlessly both locally and remotely, and optimise the value chain within their operations.

Extended automation is a fundamental set of tools that will enable mining companies to reach the volume and profitability targets of the future. ▼

*Mining operators are having to look to ever more remote and difficult orebodies*

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