

DATA MANAGEMENT

Digital knowhow

Carly Leonida asks Adrian Beer, senior vice-president of ABB's Enterprise Software product group, some of the most pressing questions relating to the digital revolution in mining

Q What would you regard as the top five digital milestones that we have seen in mining over the past ten years?

The majority of effort has focused on the extractive areas of mining and in the supply chain around outbound logistics of production processes. We have seen significant focus on the productivity of equipment used for extracting ore, ranging from technologies centred on orebody modelling accuracy, combined with blasting optimisation and the efficient use of energy in mining equipment to gather high-quality material, to reducing the amount of waste material mined and handled.

These efforts have driven the evolution of autonomous equipment, as well as increasing tonnes moved for a given asset base. Much of the innovation in this space has been a collaborative effort with equipment manufacturers, though mainly within the medium- to large-sized operations in more of the bulk commodities.

In the supply-chain space, we have seen the big end of town invest heavily in maximising material movements through their existing infrastructure. Port optimisation – managing idle berths, rail optimisation including efficiency in haulage and network efficiency, as well as production-quality management in defining ore 'products' or blends to target key end-user markets for primary raw-material production.

Within smaller operations, we have seen a number of highly focused technical investments where complexity in the orebody demands high levels of efficiency for operations to remain productive. For example, the work ABB has done for smaller mining operations demonstrates the significant cost savings and improvements in operational performance from integrating information technology (IT) and operational technology (OT) between functional areas of the mining process.

Once operational visibility is

achieved, highly optimised and automated production processes significantly improve the overall production outcomes. These solutions seem to be more prevalent when the size of the mining organisation means less 'corporate distance' between the functional areas of the operations.

Often for larger mining organisations, the investment case for technology that spans between functional areas can be difficult to make, as the benefits are not specific to any one portion of the operation. The way performance is managed within the various mining organisations depends on the likelihood of that organisation to invest across the silos.

Q What are the driving forces that have influenced technology uptake?

Many contributing factors have influenced the timing of both the development and adoption of technology. The period of continued growth in resource demands resulted in significant capacity investment – seeing the size and scale of equipment reach maximum capacity – ultra-class trucks, massive grinding circuits, longest heavy haul locomotives, etc.

Capacity constraints of human resources resulted in the drive for automation, combined with increasingly complex networks of infrastructure and greater levels of interdependency between stages of the mining process.

Then, as commodity prices continued to decline, we witnessed a period of optimisation, increasing throughput and maximising profitable production using existing capital infrastructure – getting more tonnes through the existing plant and equipment. Investment was focused on productivity within the existing operating framework.

Finally, today, as we see a sustained period of soft prices and uncertainty about when the demand might return, we are seeing a true



step towards efficiency and productivity where mining companies are now looking to improve their entire network of assets, seeking greater operational visibility, transparency and expanding decision making to a broader range of operational variables.

Q What is the IoT and why is it so important to the future of mining?

IoT stands for the Internet of Things, and is one of the many terms used in the market to describe the greater level of visibility available today due to the connected state of devices, equipment and processes. Where network connectivity, storage of data and computing capacity were barriers in the past to digitising vast levels of data, today it is commonplace for plant and equipment to gather volumes of information throughout the plant.

The importance to mining, as with many capital-intensive industries, is the potential insights that can be gained from analysis of relevant information, and determining real-time and predictive scenarios for optimal decision-making insights within the operation.

The challenge is more to do with the volume of data, the context of that data, and how to access the right information to support decision making within an extremely broad volume of information. ►

Seamless information-sharing between equipment such as this bucket-wheel excavator and the mine's control room (this one is at Boliden's Garpenberg mine) typifies digital integration

"We are seeing a true step towards efficiency and productivity where mining companies are now looking to improve their entire network of assets"

An ABB control centre at a mining operation

Q What does IT/OT integration mean for mining companies, and would you agree that most miners are yet to realise the full benefits?

Most miners, and many other industries for that matter, do not realise the full benefit of IT/OT integration. That being said, there are equally some great examples in the market where IT/OT integration takes place and creates huge operational benefits for those operations.

What IT/OT integration simply means, when done properly and implemented effectively, is the ability for an organisation to make holistic decisions about their operations, understanding the impacts to every aspect of their business; understanding the financial impact, the maintenance impact, the production impact, the life-of-asset impact of each operational decision within the process.

It brings together the information-management systems view of the business, the economic insight and drivers of the overall business, and connects them with process control and the operational side.

A good example of a mining company leveraging IT/OT integration is Minera Frisco, which recently implemented our Intelligent Mining System. A key objective of Frisco's project is to achieve significant time and cost savings of up to 20% from better visualisation, automated report generation and, because the data only needs to be entered once, to be available for the whole organisation.

Q What role do data standards have to play in streamlining and optimising mining operations?

Standards can mean many different things, and can bring both benefits and challenges to optimisation strategies.

We often see when a bottom-up approach is employed – typically, OEM-driven by major equipment vendors in the supply cycle of the construction phase – the initial process management layer delivers OT integration capability. However, flexibility to integrate to higher-level systems in the operations layer, planning layer and ultimately in the financial layer becomes increasingly complex.

When the top-down approach is adopted, we often see the starting point as a giant enterprise resource planning (ERP) project, which, if successful, then requires adapting with modules, bolt-ons and add-ons to



try to deliver planning, operations and process-management outcomes.

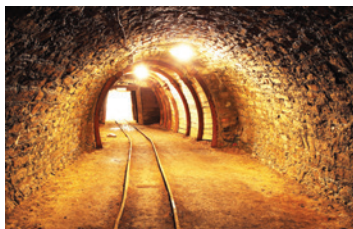
The net result is huge volumes of data but very little contextual information. There is a trend today to build open platforms as large vendors try to address this by creating the standard; however, they today often lack the depth of integration required to span all five layers of the organisation, mainly due to a lack of context or operational understanding of the overall production process.

As you can see, there is no simple solution where the standard can be one of 'one size fits all'. However, consistent use of standards across each layer of the organisation can form the basis for simple integration, to enable context to multiple information sources, which can ultimately allow the application of the latest machine-learning type technology and advanced analytic tools for organisations that have a more holistic view of their overall production performance.

Q Do you think most mining companies currently do a good job of data management or is there more they could do to extract value?

It's hard to say who is doing a good or bad job of data management. Often we see different levels of maturity even in the production processes within a single mining operation – where the outbound supply chain may be highly optimised, and yet the production process could still be a legacy manual process.

One thing is for certain, tasks that are technically very simple to solve such as end-of-month reconciliations still create huge heartburn for many mining companies, which again stems more out of the willingness to



invest in technology at one part of the production process that would benefit another part of the process.

As we have seen a downturn in the sector, it has resulted in wider spans of control by individuals across production processes that may no longer be within their particular domain expertise. By default this is driving more holistic decision making, which will deliver significant savings and benefits to those who can manage across the divides.

Q How does the mining industry compare with, say, oil and gas or manufacturing when it comes to technology investment, and what can miners do to better embrace this?

Mining is often compared with the oil-and-gas sector, where investment in technology for the mining sector has fallen way behind in comparative terms.

In many ways the current market has produced a similar climate to the one that faced the oil-and-gas sector 30 years ago, which created the investment boom in technology for that sector. For many years, the largest players in the oil-and-gas space were not the oil companies themselves, but the technology companies that held the innovations necessary for those oil companies to remain profitable.

While it is unlikely the mining sector would follow suit, particularly because of the multiple disparate processes (and vendors) that make up the value chain, there is still a lot the mining sector can learn from both oil and gas and the manufacturing sectors.

The primary barrier to change is the willingness to adopt technology is organisational. Those mining companies that have successfully embraced technology have first needed to embrace structural change. We see the early innovators adopting entire changes to their operating model, where the traditional KPIs have been replaced with overall performance outcomes.

IoT and IT/OT integration allow KPIs to be tied to organisational goals, not confined to the pit, or the processing plant, or the maintenance or operations team. The future of mining will depend on the willingness to embrace organisational change, as well the adoption of technology to deliver sustainable outcomes for operations. ▀

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Underground at a gold mine: data integration can bring all parts of the operation together