



THE BIG PICTURE

Chris Snell, Mine Site Technologies, Australia, talks to *World Coal* about the benefits of an integrated framework to support automation technologies.

As automation increasingly becomes the way forward for the mining industry, the focus is shifting from automating individual functions to the planning and design of an integrated system that offers mine management more control of their assets.

In the past, companies have often adopted automation technology in a piecemeal fashion without giving due consideration to the future operation of their mine.

There are many instances where an individual system has been installed to provide the remote operation of vehicles, a tracking network or the automation of longwall operations. However, if these are introduced in isolation, each is likely to deploy their own physical network – incurring the complexity, overheads and costs associated with maintaining several sets of parallel infrastructure.



Mine Site Technologies (MST) provides a 360° coverage of mine operations with its ImPact Wi-Fi Digital network and integrated communications technologies.



ImPact core network infrastructure from MST powers today's digital mine.

According to Chris Snell, Mine Site Technologies' (MST) director of engineering, there are a number of dangers for the uninitiated when considering mine automation. These largely stem from a failure to consider the big picture and long-term consequences of decisions, while failing to address the underlying design of the system that supports the automation initiatives.

"We've found in the past that the typical approach taken by many coal

mines ends up with multiple point solutions over time instead of an integrated framework that offers better management of the mine operations," Snell explains. "Our advice is that sometimes it is better to take a step back and consider the longer-term objective, what functions are important to automate and what infrastructure will be required to get there over time. Define the target you want to achieve in, say, three years and make sure the steps along the way don't paint you into a corner."

Snell stresses it is critical to simplify management across operations to avoid the complexity of maintaining disparate systems later on. It is important to understand how data is accessed across multiple functions and applications so it can be used most effectively to actually improve operations. A company must also consider the importance of deploying an easy-to-use solution, otherwise it is unlikely to be properly utilised.

MST specialises in the design, manufacture and deployment of critical solutions for communications networks, vehicle and personnel tracking, production optimisation and safety in underground and surface mining applications.

The company's ImPact Wi-Fi Digital network and operational optimisation solutions provide the core infrastructure and automation-enablement platform for an increasing number of mining corporations.

Big picture automation

Snell says most mines are doing pockets of automation, but few are tackling it on a large scale. "In my book, automation is more than just the remote operation of machines."

"For example, in a coal mine, longwall automation may include full monitoring of the longwall and the shearer, but automation also extends to the control and telemetry network, and the monitoring of gas, as well as controlling the movement of personnel in and out of the mine over the same system."

Snell explains that in several mines where the company installed longwall automation, he installed a fibre network, before being asked to put in gas monitoring products from other companies that required another dedicated fibre network. If the company wanted a tracking network to keep a watch on their assets, there could be a further network installed.

"It is more efficient with an integrated platform because you can monitor the environmental conditions and simultaneously monitor two or three different types

of automation, saving costs and increasing efficiency by using a common platform instead of independent networks.”

“MST can integrate existing fibre cables to a number of locations underground. It’s from these distribution points that the network typically branches. Then we run the intrinsically safe network equipment into the more operational areas of the mine. We can use the fibre that already exists and we can replace existing switches with our intrinsically safe ones, which allow automation systems to keep running in the event of emergencies.”

While longwall automation has been around for a while, there are other important developments now available that could help optimise production. “The development that is currently emerging, is the ability to track in real-time the cycle times and asset utilisation of shuttle cars. This allows actual progress to be compared with targets from the surface.”

“Fleet management systems (FMS) are quite common on the surface, but this new breed of automation network is now enabling solutions in Africa and Queensland where, in real-time, the mine operators can see how many loads have been shuttled to the belts and take remedial action early if they’re not meeting targets.”

Starting with basic communications infrastructure

In the event of problems underground, mobile communications enable a simple phone call to be made, saving time and resolving issues faster.

“We have the ability to enable mine workers to effectively carry mobile phones in an underground mine environment, so if an issue arises they can get the right person at the right time to fix their problem and get back to work quickly.”

A good communications infrastructure is not only labour saving, but also assists in optimising asset utilisation. The simple ability to track where your vehicles and pieces



Information overload is a growing problem in the control room. MST’s integrated approach eliminates the need for multiple screens in order to view key information.



DPM token count monitoring solution from MST automates monitoring of diesel particulate matter in underground mines.

of equipment are at shift change, can save hours for some mines.

“At shift change, the deputy can hand over a printout from our system that tells him exactly where every piece of equipment and vehicle is located. Workers can then get to their jobs faster,” says Snell. “Without that system, workers might only be able to say where they think they parked a particular piece of equipment. If their replacement goes underground and doesn’t find it

there, that can mean considerable production time is lost.”

Automating for improved safety and production optimisation

The provision of a safe working environment is a fundamental consideration for mining companies. However, systems that can reduce risk and lower safety incidents are at the same time contributing to a higher output for the mine.

“We’ve built an automated token count solution around diesel particulate monitoring (DPM) in underground mines, which safeguards against workers being submitted to emission levels above the indicated threshold for a ventilation district,” says Snell.

“We have turned that into something of a fine art. We’ve automated the process so that a vehicle wanting to enter a particular district has to stop at a designated point where the token count for that specific vehicle is checked against how many more are allowed. They are then either given permission to go in or refused entry. By using automation, the mining company achieves greater accuracy with their measurements. They’re able to optimise and get the maximum complement of vehicles into a particular district.”

Ultimately, because they’re measuring on a real-time basis, the exposure to DPM for workers should be lower and the company is able to track it with reports, enabling them to demonstrate they have kept within the limits. If they go over, then the system allows them to know who was in the area at the time, what caused the problem and take action to ensure it does not happen again.

Taking the first steps on the road to automation

One of the principal challenges facing a company considering automation is to understand the automation initiatives that will deliver most value.

The automation initiative has typically been driven by the mine engineering department, but Snell says he has not seen many coal mines looking at it holistically and taking a long-term strategy in terms of infrastructure and integration.

“There is little integration in the US coal market, yet mining regions, such as Russia, have some consolidated systems that integrate the gas monitoring, the tracking and the data communications.

“Australia is reasonably well advanced, particularly in longwall

automation, gas monitoring and tracking (to a lesser extent). For example, a large Queensland mining operation has implemented a core network with fibre network underground and distribution using the MST system. They are using RFID tracking, installing the DPM system and plan to install a proximity system integrated with the network. We use the same network to run the auditing of the proximity detection for the continuous miners and longwall operation.”

According to Snell, it is usually the newer mines that might look at automation from a total platform point of view from the outset. However, in many cases, the question of how the end user can control the system is overlooked.

“Apart from the fact that these pieces of automation software from different vendors often will not work together, they also don’t provide a simple interface to mine operators,” says Snell.

He warns that unless the systems are simple to use and can easily be set up with rules, alarms and notifications, then it is likely they will not be properly utilised. If the organisation does not take the critical step of thinking through the business process and setting up the systems to optimise that, then they will not derive the potential business benefits.

To remedy that situation, MST has built templates into its packages so that the most common functions are already set-up and basic requirements come pre-configured.

According to Snell, MST was committed to providing a single automation-enablement platform and easy access to data. “Our goal is to enable simplicity and convergence, not just for the network but for the applications as well. A mine shouldn’t need five different screens in order to view key information – the last thing you want in the control room is information overload. That’s why we have a single interface called MineDash, which we see as a providing a window into mine operations.”

“It is possible to view automation systems data, find out where people and vehicles are, view the DPM levels, while also being able to handle alarm management, view video cameras, make phone calls underground and even see who is on the phone – all on the one platform.”

Not all networks are created equal

There has been a trend over recent years for corporate network providers to attempt to move into the operational space. Snell believes, however, that the pendulum has swung back in favour of a dedicated operational network as distinct to the corporate network within the underground mining environment.

The MST network is designed to sit on the operations side of things and gives those in charge of operations the ability to manage their own network, which is something they do not have if a company buys bits and pieces and puts it underground.

Snell describes success as developing a system that an electrician with minimal computer skills can manage and maintain. It should be easy to use in the control room, and electrician-friendly underground.

Conclusion

While it is important to consider different design criteria for the operations network versus corporate networks, they still need to be linked together. This is where MST provides added value to a mining operation.

MST aims to bridge the divide between operational and corporate networks for a mining company and ensure that data flows between them. The MineDash application allows dashboard access to data for the operational team and enables access for head office executives to simply log in via the corporate network.

As the corporate office demands more access to mine operations information in their drive to optimise output and minimise costs, MST provides a window into operational data to satisfy requirements at both the mine management and corporate executive level. ^W