



“Having to train people in mining methodologies sometimes works, and sometimes it doesn’t.”

Mining activities will also be impacted by the changing rockface and environment the deeper down you go, Rusk said.

“Rock temperatures increase as you go deeper and deeper, and the gradient is higher in some places, meaning it gets hotter faster in some places.”

Working in these kinds of environments also means that workers will need to take additional precautions, he said.

Ensuring that all staff remains hydrated while in the deep sections is critical, he added. At one mine, mining operators implemented a rule requiring all workers going underground to bring a drinking container with them.

“Those kinds of things, you like to be as proactive as you can,” Rusk said.

Mining at deep levels will also require that operational processes and workplace collaboration is at high-functioning levels, and that every member of the team understands this need.

“Just by going deeper, you have to be better at what you’re doing,” Rusk said. “The logistics have to be planned. Bad habits that survive in a shallower situation are not going to serve you well in a deep situation.”

Training and orientation must also be a priority, because ground conditions will change even if the fundamental geology does not.

“In the exact same geological situation, there will be different outcomes at depth,” Rusk said.

At one mine, a rehabilitation crew which was responsible for bolting rock bolts in old drifts to make the area safe for movements experienced a rock burst.

“We later found out that these two particular individuals had never worked in the deeper part of the mine, and were not aware it was a risk,” he said.

Solid communications systems throughout the deep mine are also a requirement for safe operations, Rajant Corp’s Todd Rigby said.

“Mines often have unstable ground conditions and install different types of monitoring solutions,” Rigby said. “Sensors are great, but you have to have a reliable means of pulling that data back out of the mine.”

“So in looking at solutions to mitigate risk, or even to improve operational efficiency, it all starts with having reliable communications.”

Rajant has recently commissioned a fleet of Explora XL robots, complete with a wireless below-ground communication network, to a mine at a depth of 1.7 kilometers in a past-producing U.S. mine.

The mine had collapsed in 2021 due to the failure of old pillars. No one was injured, though air, dirt, and rocks were propelled at nearly 200kph through portals and ventilation raises.

To re-establish an underground communications network at the mine, channel partner PBE Group installed Rajant’s kinetic mesh industrial wireless BreadCrumb nodes at surface. These nodes provide a high bandwidth link from the portal to an emergency operations centre. The centre is responsible for monitoring the robot fleets’ activities, which included remote surveying.

“Our Kinetic Mesh network is unique in that it’s really the only network on the market where the BreadCrumb radio nodes can act independently without a Master Control Node or Master Controller,” Rigby said. Other networks operate under static configuration, meaning companies try to project the best configuration for all future needs, Rigby said.

“Our instaMesh wireless networking protocol adapts to mobility and self-optimises to operate at peak performance in all conditions,” he said.

Expanding mines at depth will become easier with more technologies available to keep workers and equipment out of harm’s way.

The mining industry has a bit of a bad reputation regarding how it views technological developments, Rusk said.

“The mining industry has been using autonomous equipment in underground mining for 20 years,” he said.

Silver Hammer’s Lekstrom feels that mining still has a long way to go in taking advantage of technological advances.

“We tend to be a little behind the times,” he said. “If you go into an underground mining, you’ll still see people hand shoveling. There’s still a lot of manual intervention that has to happen underground.”

Large mining companies such as Freeport-McMoRan and BHP are making efforts to incorporate more innovation into mining processes, and Teck has established four research and development hubs throughout Canada, with three hubs in British Columbia and one in Ontario.

What the industry needs is direct relations with tech companies to incorporate their businesses and methods, Lekstrom said.

“If you look at the collective brain power in the tech sector, the problems they solve in a week could be exponential” for mining, he said.

“There’s a huge opportunity for better integration of blockchain into mining, and there’s a lot of tech we could use for remote sensing and geophysics for exploration,” he said.