



Jayanta Bhattacharya
Hony. Chief Editor

Do you know how 5G can change your mining organization? And what bandwidth and satellites have got to do with it!

Background

A rather conservative estimate pegs the global mining industry as a global economic activity, with revenues in excess of USD 500 billion. Why conservative? – because it largely does not include what is not reported, like in small mines and obscure produces like sand, stone and gravel etc that often slip from the government attention. The accurate estimate can be closed to a yearly revenue of USD 1 trillion. The industry can be easily valued at USD 10 trillion, globally - about four times over India’s current GDP. However, exposed to cyclical upsides and downsides, improving profitability in the mining industry requires working relentlessly on accuracy, efficiency, transport and metal extraction. However, conventional incremental improvements in labour productivity are facing diminishing returns, and the industry is gradually turning its attention toward automation as the next area of opportunity. One prerequisite for automation is the introduction of better connectivity in general, including mobile connectivity, in the mines. In recent years mobile connectivity has been proven robust enough to deploy in the harsh mining environment without causing disturbances in the operation. Key features and benefits of mobile communications in the mine are coverage, reliability, low latency, better accuracy in positioning, high bandwidth, and the ability to run many devices, sensors or remotely controlled machines. When mobile communication coverage is offered, the mining industry will be one of the areas ripe for innovation through the development of mobile network-dependent applications.

Where the improvements are now getting recorded

DRILLING

Five drill rigs at Aitik in a mine by Boliden, Sweden have been retrofitted with autonomous operation and remote-control features. As the current connection bandwidth only

allows for medium-quality video streaming, which limits the remote-control capability, this retrofit is limited. A couple of cameras, a control system upgrade for the older rigs and a communication module have been added. Automating a drill rig could increase operating hours from 5,000 to 7,000 hours per year, in effect enabling Boliden to perform the same amount of blast operations with these 5 modified rigs as they could with 7 or more traditional rigs. This automation also eliminates the need for additional staff, service stations, parking areas, transport on busy access roads and dangerous staff transportation within the mine. As well as solving these logistical challenges, automation carries significant efficiency benefits, as Boliden can handle an increased number of blasts with similar equipment and staffing levels.

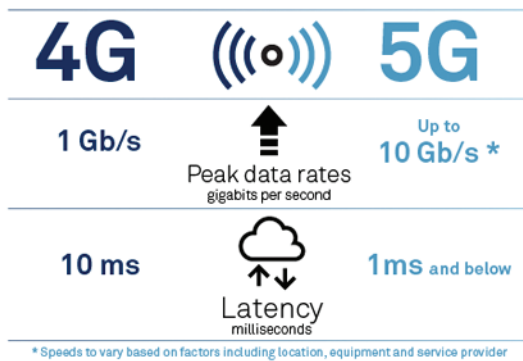


Where 5G comes in

The current technology being used for this in the mining industry is Wi-Fi, which is providing acceptable coverage and performance through careful rearrangement, pointing and dedication of Wi-Fi access points. Boliden has installed such a Wi-Fi communication system to enable the use of drill rigs in Aitik. Although it has delivered a new level of productivity,

the experience has not been flawless. Wi-Fi is not designed for the wide area outdoor coverage required by an open-pit mine like Aitik, and this solution also severely limits the addition of other automated machines, obviously, due to data drops. It has been possible for drill rig connectivity to work as planned with Wi-Fi – bandwidth performance and latency have been manageable. Concerns around stability and the use of unlicensed/unprotected radio spectrum, including a recurring drop in Wi-Fi performance due to external spectrum conflicts, have been addressed through modification of the machine control system in a patchwork solution. A 4G mobile communication system would offer a secure, flexible and future-proof solution for Boliden. But, while 4G can support the current identified use case, only 5G can comfortably handle the most demanding requirements – bandwidth, quality of service, latency and positioning. While some applications only need to send minor amounts of data, others (such as fully remote-controlled machines) need the capabilities and capacity offered through mobile communications such as 4G and especially 5G. Automation is in transition, it will span from one activity to the other. There are many more areas and steps, such as complex drilling maneuvering, automated trucks and automated planning and dispatch, where high-performance communications (for example, 4G and 5G) will be required to handle several 3D video streams and manage highly complex tasks remotely.

COMPARING



Source: S&P Global Market Intelligence | Credit: Faizan Hameed

The social and sustainability value

One persistent complain against the miners is the dusts in the road that they raise. If truck transport can be better optimized and managed, the miners would look more responsible. Smoother transport flow, steadier speed and less movement mean lower dust and fuel consumption, with saving potential to be in the range of 10 per cent. Such an efficiency improvement would reduce Aitik’s annual emissions by approximately 9,400 metric tonnes of carbon dioxide.

Role of satellites

The barriers to 5G adoption in mining are both technical and cultural. The industry’s embrace of 5G is still at an early stage.



There are several proof-of-concept trials and demonstrations from major 5G vendors with actual mines. But the deployments have not ramped up to large scale rollouts yet. This is due in part to technical issues caused by the remote and dangerous locations of many mines, which means setting up of a cabled fibre connection to a 5G base station, the hub of private 5G networks, is problematic. Access to fibre in remote operations is a key barrier. Low-orbit satellite constellations providing 5G connectivity could be the answer. Satellites will open up 5G to remote operations once latency becomes competitive remote operations – connectivity can be rented and not installed, thus avoiding large upfront costs that can be a burden for smaller operations. Another technical barrier is getting a signal underground, what vendors hope to solve by examining how radio frequency signals behave in underground mines, and by developing network designs and hardware that are suited to underground conditions.

Cultural issues

The minerals mining industry is very conservative. Unlike oil and gas, where one can see a lot of leading-edge technologies, companies like Rio Tinto that rely heavily on technology, remains an exception. Many companies in the sector believe the risks of new technology outweigh the benefits. “These big, often publicly quoted companies, and they are afraid of any stock market value - coming down because of heavy reliance on tech.

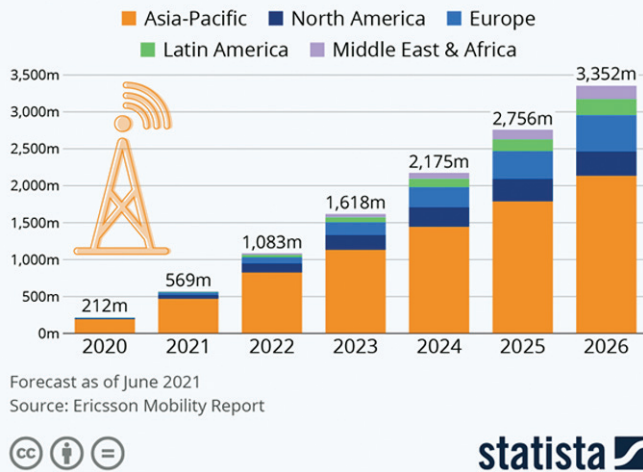
5G and the people dilemma

While 5G and associated technologies could help cut the number of mining-related fatalities each year, it is also likely to change the role of the miner, which could have a real impact on communities that rely on mining for employment, particularly those in developing countries. By using 5G one is potentially shifting the workforce. That can build social pressure on the mines, because jobs will shift to people back home with college degrees, working in the mine control centers, rather than for people in the mines. People of the area will not get job at the mines, unless they are a gatekeeper, security guard or something similar low wage and unstable jobs, because they would not necessarily have the right skills.

This is a big problem for mining companies because it

Global 5G Adoption to Hit One Billion in 2022

Forecast of 5G smartphone subscriptions by region (in millions)



makes it more difficult to convince authorities to grant them a licence to operate. And even partial automation can meet with opposition from staff. The companies that are operating in locations with large local workforces, often in communities with large unemployment rates, fear automation as a replacement for human employment will bring more conflicts.

One benefit of automation could be the emergence of a more diverse mining workforce. The industry is traditionally male-dominated, and often involves unsociable working

hours and travel to remote locations. This has led to a global labour shortage, both quality and quantity, in mining. With replacement of driver-run equipment with driverless or remote-operated equipment, the industry can expand the pool of workers available to it and can expect better employee turnover. With a severe skills shortage impacting parts of the mining industry at present, exacerbated by Covid-19-related travel restrictions, the financial incentive to diversify the workforce and emphasis on family matters has never been greater. But despite this potential opposition, the roll-out of 5G across mining is to accelerate in the coming years. Many mining companies are beginning to understand the value chain benefits of automation. They know it will help them transit to new business and even to attract new partners. The vendors are doing a good job so far of making the case for 5G's value in these scenarios: so one can expect good tidings for automation in mining. Mining companies are rapidly deploying new tools and applications such as telemetry, wireless sensors and operating remotely to enhance safety, gain productivity and improve financial performance. This trend depends heavily on successfully integrating automation and data exchange, which in turn requires reliable connectivity. In 2018 Epiroc signed a cooperation agreement with the global communications technology provider Ericsson. Both Epiroc and Ericsson have a history of collaborating in partnerships and co-development together and with other industry leaders. In this agreement Epiroc and Ericsson set out a goal of jointly helping mining companies achieve optimal wireless connectivity in their operations through standardized 4G/LTE (long term evolution) and 5G/NR (new radio) technologies.

JOURNAL OF MINES, METALS & FUELS

SPECIAL ISSUE ON

THICK SEAM MINING IN CHINA – AN UPDATE

Price per copy

Rs.500.00; £50.00 or \$80.00

For copies please contact:

The Manager

Books & Journals Private Limited

Moon Plaza (2A, 2nd Floor), 62 Lenin Sarani, Taltala, Kolkata 700013

e-mail: bnjournals@gmail.com; pradipchanda@yahoo.co.uk;

www.jmmf.info • Mob: +919239384829