

TRANSFORMING SASKATCHEWAN'S MINING INDUSTRY

Automation and tele-remote technologies are reinventing the mining industry—and the benefits are compelling.

In recent years, implementation of autonomous and tele-remote technologies by Saskatchewan's leading mining companies has launched a revolution that is changing the very nature of the mining industry. The benefits are evident, from increased productivity and efficiency, to improved environmental sustainability, to greater worker safety.

SABRE OFFERS FLEXIBILITY & SCALABILITY

Orano Canada and Denison Mines Corp., joint-venture partners in the McClean Lake Joint Venture, have successfully completed a five-year test program using Surface Access Borehole Resource Extraction, or SABRE.

SABRE is a non-entry, surface-based mining method that uses a high-pressure water jet placed at the bottom of a drill hole to excavate a mining cavity. Cuttings from the excavation process are air lifted to surface, separated and stockpiled. This new, patented mining method could provide an economically viable way to mine small, high-grade deposits in Canada's Athabasca basin.

"The SABRE mining method is the result of long-term R&D and involves a mix of different equipment, technology and expertise," says Jim Corman, Orano Canada President and CEO. "I'm proud of the work the operational team of drillers, mechanics and engineers completed as they showed how agile this method can truly be."

The SABRE method lets operators on the surface control mining equipment, minimizing the risk of worker injury or radiological exposure. The method is both flexible and scalable. It has a significantly smaller surface footprint than conventional open pit or underground mines. Significant reduction of water usage and power consumption also dramatically reduce future greenhouse gas emissions, making it more environmentally sustainable in the long term.

PIONEERING TELE-REMOTE MINING

Nutrien has a long history of using innovative technology. The company's NextGen Potash program is currently designing and piloting initiatives across its network of six potash mines in



Pilot program using tele-remote technology at Nutrien Cory Mine.

Saskatchewan. Autonomous mining and tele-remote systems use a combination of cameras, communications systems and cutting-edge technologies to give operators an overview of an entire mining system in real time, allowing them to navigate massive underground machines remotely.

The SABRE mining site - Orano Canada.

At Nutrien's Cory potash mine, for example, a pilot program using tele-remote technology enabled a team to efficiently cut in anomalous geology from a surface station. Normally, such "leach ground" would require underground operators to do the cutting in, no more than eight metres at a time to ensure workers were always under bolted ground. This reduced productivity but ensured operators were located in a higher safety environment. In two separate trials in 2021 and 2022, surface operators were able to remotely cut over 3,200 tonnes of leach ground.

It's a milestone that has Tyler Zimmerman, Nutrien's Project Lead, Automation, justifiably pumped. "Our application of tele-remote technology in continuous mining machines is unique within our sector—it's a pioneering approach that sets us apart," he says.

Chad Litzenberger, Nutrien's Mine General Superintendent, agrees. "We continue to move forward by developing technical advancements as one team with an aligned vision. Using tele-remote technology aligns with our safety vision by removing the worker from the active face, creating a safer workplace while also increasing efficiency."

BUILDING A DIGITAL MINE

Automation has played a lead role in readying Mosaic's Esterhazy potash operation for the future. In 2009, the company announced a \$3 billion investment to build the first new underground potash mine (aptly named K3 to follow K1 and K2 that were built in the 60s) in Saskatchewan in more than a half-century. Completed in 2022, Mosaic's expansion project is now the world's largest potash operation and considered to be one of the most technologically advanced, too.

"K3 is built on technology and innovation," says Dustin Maksymchuk, Esterhazy's General Manager. "It's designed to efficiently and safely produce millions of tons of potash to help feed the world."

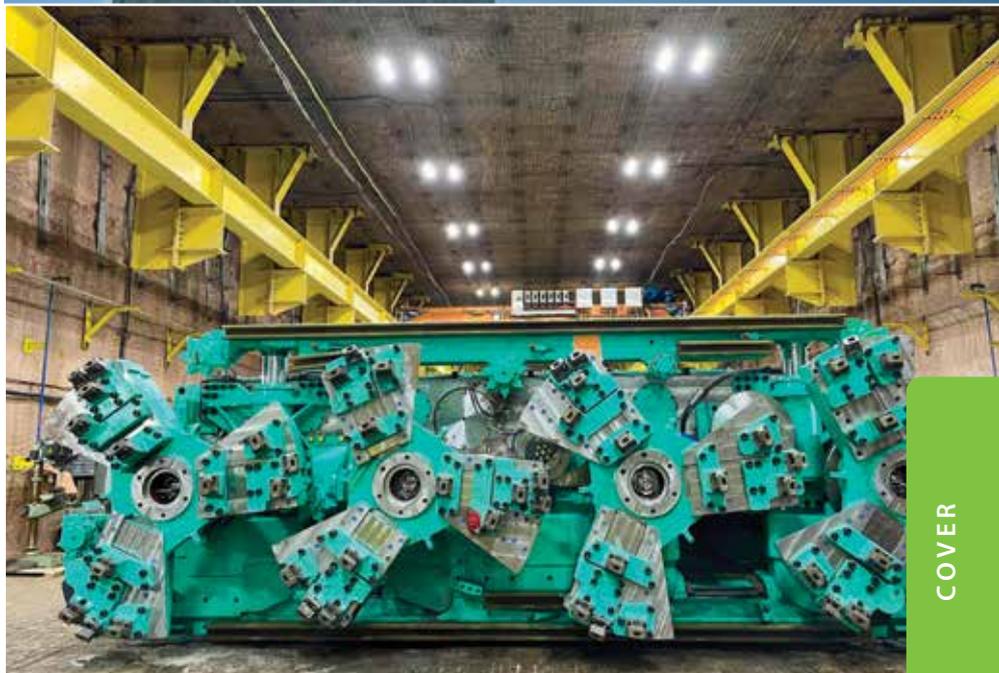
As new state-of-the-art infrastructure brings potash ore from a kilometre underground to surface, its flow is monitored and run from a technology-enabled surface-based facility called the Integrated Operations Center, or IOC. A network of cameras and sensors allow employees in the IOC to view the ore's movement, including over an 11-kilometre conveyance system that transports ore from the new mine to mills for processing.

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Mosaic K3 shaft

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The IOC is improving production capabilities and increasing reliability by integrating our operations and using technology to deliver real-time information so we can make better and faster decisions,”
Maksymchuk says.



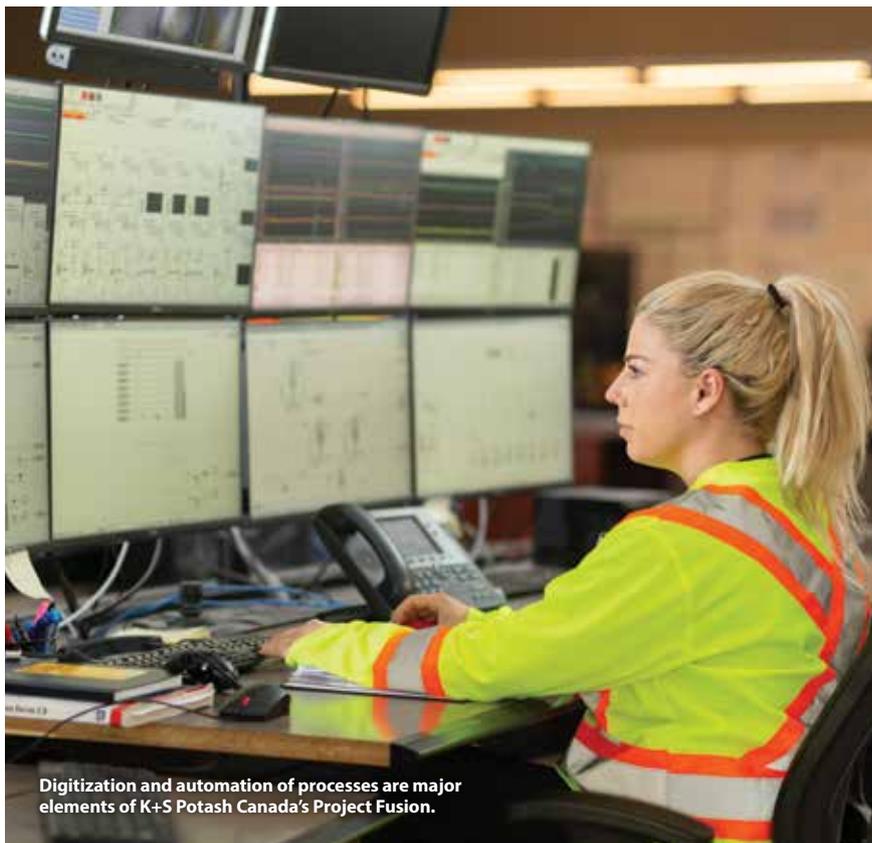
13TH MINER in shop, Mosaic Esterhazy

technology to deliver real-time information so we can make better and faster decisions,” Maksymchuk says. “This journey isn’t over. We continue to explore innovative, technology-enabled opportunities to increase safety, efficiency and connection across our operating footprint, building a ‘digital operation’ to power us into the future.”

TECHNOLOGICAL FOUNDATION FOR GROWTH

Over the next few decades, K+S Potash Canada (KSPC) is planning for a sustained increase of potash production at Bethune mine, doubling the current production from two to four million tonnes per year. Currently in the feasibility stage, the long-term growth plan is looking at using advanced technology systems to increase production while reducing energy use and water consumption per tonne.

But technology is already playing a role in the foundational work for future growth. Paige Martin, a Program Manager in the IT Department, is leading a team working on a variety of technology initiatives that will further digitize KSPC’s operating strategy and drive business improvement.



Digitization and automation of processes are major elements of K+S Potash Canada's Project Fusion.

Supporting Learners in Saskatchewan



Orano Canada is deeply committed to supporting education in Saskatchewan. We believe in empowering youth, especially through initiatives like the Indigenous Student Achievement Pathways program at the University of Saskatchewan, Saskatchewan Polytechnic Women in Trades and Technology, and our Northern Scholarship offerings.

Every summer, we proudly welcome students to gain hands-on experience at our operations, but the mentorship doesn’t stop there. Orano takes pride in hiring trainees that complete our programs, offering them a promising start to their professional careers.

Supporting further education and skills training benefits not only Orano but more importantly, the entire province of Saskatchewan.

Source: Saskatchewan PolyTechnic WITT, powered by Orano



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Employees at K+S Potash Canada using drone technology.

“Internally we call it Project Fusion,” says Martin. “The goal is to identify all of the transformational technology capabilities that we can implement now to empower us for sustainable growth in the future.”

Digitization and automation of processes are major elements of Fusion’s current state, with programs and apps enabling the workforce to have more immediate access to information, real-time trend analysis

and data-driven decision making, ultimately helping drive an organizational culture of collaboration.

“There are really impressive, cutting-edge possibilities when it comes to technology in our industry,” Martin adds. “By focusing on our foundational elements now, we can enable KSPC to implement and sustain future innovation. I’m really proud of what we’ve been able to accomplish to-date and I’m excited to see the progress we make as we continue our digital journey.”

LOOKING FORWARD

From uranium to potash to critical minerals, from exploration to extraction to processing, technology is helping Saskatchewan’s mining industry meet growing world demand for vital resources—safely and cost-effectively. That’s good news for Saskatchewan’s economy. And it’s not just the industry’s bottom line that will benefit.

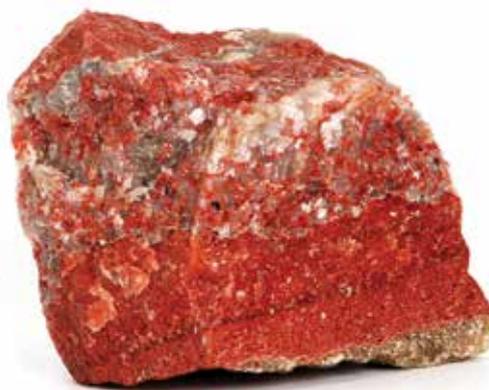
BHP’s new Jansen Potash project is being developed as a gender-balanced, world-leading low emissions potash mine. Foran Mining’s McIlvenna Bay project is designed to be a carbon neutral copper mine, delivering critical resources to support electrification and global decarbonization. Arizona Lithium is using proprietary technology to establish itself as a leader in lithium brine development, an essential element in EV batteries.

Through implementation of new technology, Saskatchewan mining companies are reducing their environmental footprint while building opportunities for globally sustainable growth. 🌱

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