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MESSAGE FROM THE EDITOR SHAYNA WIWIERSKI

As we move through another year of growth and challenges, it's clear that potash remains at the heart of global agricultural sustainability, economic stability, and innovation. In this issue of *PotashWorks*, we explore some of the most exciting developments in the industry, highlighting how Canadian potash is playing a central role in addressing the ever-increasing global demand for food.

One of the most significant stories in this issue is the milestone reached by Nutrien, which has successfully cut 25 million tonnes of ore using automation in its potash mines. This achievement is not just a testament to the company's commitment to innovation, but also a reflection of the entire industry's drive to improve efficiency and safety while reducing environmental impact. As automation continues to shape the future of mining, it also signals the importance of technological advances in making potash production more sustainable and reliable. This is crucial as the world faces growing pressures to feed a rising population.

Potash, one of Canada's 34 critical minerals, is a cornerstone of global food security. The ability to produce high-quality potash fertilizers is essential in ensuring that crops can thrive in an increasingly unpredictable climate, with less arable land and more extreme weather events. Potash helps plants access nutrients more effectively, supporting growth and boosting crop yields. As global food demand escalates—driven by an expanding population and changing dietary patterns—the need for potash has never been more urgent. Canada, as the world's largest producer of potash, is uniquely positioned to meet this demand and help ensure food security for generations to come.

But the importance of potash extends beyond the farm fields. As you'll read in our feature on Canada's critical minerals, potash plays a pivotal role in maintaining strong trade relationships, especially with the United States—our closest ally and one of the largest consumers of potash globally. The stability of this trade relationship is vital to both countries' economies. With potash demand set to grow, Canada's role as the reliable supplier of choice is more critical than ever.

In this issue, we also take a closer look at the role of potash in supporting Canadian communities. From the skilled jobs created by potash mining operations to the economic benefits that flow into local economies, the industry's impact is far-reaching. Potash production is not just about meeting global needs—it's about investing in our workforce, in technology, and in the future of sustainable practices.

As we reflect on these milestones and stories, it's clear that the potash sector is not just essential to Canada's economy, but also to the well-being of people around the world. From fueling crop production to supporting high-tech mining advancements, potash continues to be a driving force in global agriculture, and it is critical that we continue to innovate and collaborate to meet the challenges ahead.

We also encourage you to explore our official website, potashworks.com, where you can stay up to date with the latest news and insights from the potash industry year-round. Be sure to sign up for our digital sister publication, *The Potash Producer*, delivered three times a year directly to your inbox. This year, we were excited to introduce another digital magazine, *Critical Minerals Review*, offering readers an in-depth exploration of the critical minerals shaping our future—from potash to lithium and beyond. Make sure to sign up at criticalmineralsreview.com.

We are proud to share these stories with you in this issue of *PotashWorks*, and we look forward to the continued growth and success of this vital industry.

Shayna Wiwierski

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MESSAGE FROM THE PREMIER OF SASKATCHEWAN SCOTT MOE



Saskatchewan is blessed with an abundance of a natural resource critical to feeding the world's growing population. Accounting for 35 per cent of world production in 2023, Saskatchewan potash is the highest quality, and the most sustainably produced in the world.

Fifty years ago, few Canadians outside of our province knew of this rich resource lying deep under southern Saskatchewan soil. Now, all of Canada is keenly aware of the importance of this strategic resource and our growing role in feeding the world.

Potash plays an integral role in the province's economic success, responsible for over nine per cent of provincial GDP and directly employing about 6,300 people. It has contributed billions of dollars in royalties and taxes to fund health care, education, and other services vital to our province's quality of life.

Saskatchewan volumes continue to rise, supported by new and modernized capacity built by Nutrien, Mosaic, and K+S Potash. In 2023, the sector sold a record 14.5 million tonnes of potash and expects to beat that record in 2024.

Both locally grown companies and global giants have expressed their confidence in the strength of our province's potash sector by committing over \$35 billion in the past two decades towards new mines and mine expansions. In fact, the BHP Group is investing an estimated \$19 billion – the biggest single investment in the province's history – to build the Jansen mine, which is expected to begin production in 2026. The Government of Saskatchewan has worked hard to create a stable, competitive business environment to encourage investment. Companies know they can count on a consistent and fair taxation and royalty regime. In addition, the provincial government offers several incentive programs to encourage investment in innovation, market development and new capacity. For these reasons, the international mining community – responding to the 2023 Fraser Institute Survey – again rated Saskatchewan as the best province in Canada and the third-best jurisdiction in the world for mining investment.

Our government intends to continue to work with this sector to help it grow in the decades ahead. One of the biggest opportunities and challenges will be to help the industry meet labour needs. The Saskatchewan Mining Association released a labour market analysis in September 2024 forecasting a 35 per cent growth in mining employment from 11,043 in 2023 to 14,892 in 2034. Much of that job growth will come from the potash sector.

This positions the province for an exciting decade ahead with strong career opportunities for the people of Saskatchewan and all the economic benefits that good jobs and investment bring to local communities.

Scott Moe Premier ▲



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MESSAGE FROM THE SASKATCHEWAN MINISTER OF TRADE AND EXPORT DEVELOPMENT, THE HONOURABLE **WARREN KAEDING**

Saskatchewan is proud to have the food, fuel, fertilizer, and critical minerals the world needs. We are a stable, reliable, and sustainable supplier that can ensure food and energy security for centuries.

All of this is thanks to our province's potash producers.

Our province is fortunate to have some of the most successful potash companies in the world. We have a reputation as world leaders in the potash industry because of their innovation and diversity. Their expertise is truly invaluable, and we are grateful they choose to call Saskatchewan home.

In 2023, potash accounted for 23.3 per cent of the province's total export value. And the demand is only increasing with the global population expected to reach 10 billion people by 2050. Year after year, potash exports continue to rise, and in 2023, Saskatchewan's exports grew by 7.4 per cent to 22.8 million metric tonnes. The Mosaic Company, K+S Potash Canada, and Nutrien Ltd. have each planned to increase potash production.

BHP has invested \$14 billion into its Jansen potash mine. Once complete, BHP will have invested \$20 billion in Saskatchewan to create one of the largest potash mines in the world. The Jansen project not only represents the biggest ever investment for BHP, but is also the largest investment in Saskatchewan's history. Investments like these create new jobs to keep pace with our growing economy and support new opportunities that benefit Saskatchewan's strong and vibrant communities.

Investments like these don't just happen, they are the result of continuous collaboration between government and industry. They are what allow us to remain the most attractive jurisdiction in the country for mining investment attractiveness. Saskatchewan's potash industry has made some big strides, especially over the last year. In 2022-23, we surpassed the Saskatchewan Growth Plan target of annual value of potash sales to \$9 billion. Sales were approximately \$10.9 billion, which is the second highest year on record.

Saskatchewan has big plans for growth. To achieve them, we are committed to fostering a competitive business environment and promoting the province's resources internationally. In the last year alone, Saskatchewan exports reached 163 markets. Talk about impressive.

To help chart our path to success, the Government of Saskatchewan recently released Securing the Next Decade of Growth: Saskatchewan's Investment Attraction Strategy. This strategy serves as a roadmap to increasing investment and growing the economy. By focusing on low tax and utility rates, a robust suite of incentives, reducing red tape, removing regulatory barriers, and offering a personalized service, we make doing business easy.

That is what we like to call the Saskatchewan Advantage.

We are connecting the world to Saskatchewan and Saskatchewan to the world. In doing so, we continue to find new ways to innovate while forging new partnerships that benefit both the province and our allies. Through that work, we recognize the potash sector's crucial role in our shared success.

We lead the world in sustainable potash production, and it is something that the people of Saskatchewan can be proud of. We will continue to support the potash industry so we can build and protect our communities. With new investment comes a stronger economy, more jobs, opportunities, and a higher standard of living for the people of this great province. ▲ CMI designs, builds, and integrates mining and industrial solutions that can maximize the productivity and profitability of your company.



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MESSAGE FROM THE MINISTER OF ENERGY AND NATURAL RESOURCES, THE HONOURABLE JONATHAN WILKINSON

Canada's mining sector has long been a cornerstone of our economy and today, the mining sector and its workers are more vital than ever.

Potash - one of Canada's 34 critical minerals, of which we are the world's largest producer - is critical to meet global food security needs. With an evergrowing population and rising demand for food, the use of potash fertilizers is central to maintaining the success of food production by supporting plant growth and increasing crop yield. Potash production is essential to Canada's economy, and Canadian potash is essential for our allies around the world, particularly the United States.

The largest market for Canadian potash is in the U.S., where this mineral is vital for American agriculture, food security, and economic and environmental stability. The U.S. is one of the largest consumers of potash in the world – and Canada currently supplies up to 71 per cent of U.S. total imports. The Canadian potash industry supports a vibrant agricultural sector in the U.S., supporting millions of jobs and helping to keep food production efficient and cost-effective, which contributes to lower food prices for American consumers. Canada's critical minerals are key to the U.S.'s national and economic security – and this relationship is poised to grow significantly in the coming years.

Consumers of potash, very much including the United States, are faced with the reality that if they are not able to access Canadian potash, they would be forced to rely on supply from Russia and Belarus, exposing them to dangerous geopolitical risks in their domestic agricultural sectors. Russia and Belarus are the secondand third-largest producers of potash.

Around the world, the rapidly growing demand for critical minerals presents a generational opportunity for Canada. With demand expected to double by 2040, the nearly \$4-billion Canadian Critical Minerals Strategy is positioning our nation as a global leader in sustainable minerals that will keep countries and economies secure and prosperous.

Potash plays a pivotal role in this vision. It is indispensable for agriculture and food security, ensuring a reliable supply of fertilizers that sustain crops and feed millions. Canada also exports potash to markets around the world, such as Brazil and India.

Saskatchewan: A global potash powerhouse

Canada is the world's largest producer and exporter of potash, accounting for 32 per cent of global production and 41 per cent of global exports in 2023. Maintaining strong domestic production levels ensures that Canada has a reliable, responsibly extracted supply of potash that can position us as a sustainable and strategic supplier within global supply chains. In 2023, Canada's 10 active commercial mines, all located in Saskatchewan, produced an estimated 21.9 million tonnes of potash. Manitoba is also entering the potash market this year with a new mine which is in part owned by Gambler First Nation.

Potash is a critical mineral not only for its economic value, but also for its role in ensuring global food security. Fertilizers made with potash help farmers increase crop yields, reduce food shortages, and improve the reliability of food systems worldwide. With the global population projected to surpass nine billion by 2050, Canada's potash sector will be instrumental in meeting the agricultural demands of the future. Whether it's supporting farmers in developing nations or ensuring a steady supply for domestic agriculture, Canada's potash industry is also making a tangible difference in the fight against hunger globally. Together, our Canadian workers and farmers not only help feed the world, but also consolidate our country's position as a major fertilizer producer and our reputation as a trusted exporter.

In Saskatchewan, the economic benefits ripple far beyond the mines themselves. Mining companies create high-quality jobs, support local businesses, and contribute to provincial and federal revenues that fund critical public services. In the potash sector, research and development efforts are driving advances that improve efficiency and reduce environmental impacts. If our country remains innovative and at the forefront of implementing pioneering projects, it is largely thanks to the workers who carry this sector on their shoulders. We are privileged to be able to count on quality workers who enable our country to remain a world leader in this field.

Advancing sustainability in mining

Canada's leadership in critical minerals is about more than production-it's about how we produce. By prioritizing sound

environmental management, we are building a mining sector that supports a sustainable longterm industry, earns the trust of international partners, and protects the planet for future generations.

Mining companies across the country are stepping up to

adopt greener technologies and practices. From reducing greenhouse gas emissions during extraction to reusing water in processing facilities, Canada's potash sector is proving that economic growth and environmental stewardship go hand in hand, and they can count on the support of our government

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Canadian innovators are also helping position potash as a key ingredient in emerging technologies. For example, companies are exploring the use of renewable energy in mining operations, as well as technologies that capture and store carbon emissions.





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As such, in January 2023, the Government of Canada announced an investment of \$100 million to support BHP's \$7.5 billion project to develop its worldleading low-emissions potash mine in Saskatchewan. BHP will help support advancements in sustainable mining practices with this funding, while creating over 5,000 well-paying jobs that support the demand for Canada's critical minerals.

Canadian innovators are also helping position potash as a key ingredient in emerging technologies. For example, companies are exploring the use of renewable energy in mining operations, as well as technologies that capture and store carbon emissions. These innovations position Canada as a global leader in sustainable mining, ensuring that we remain competitive in a rapidly evolving industry.

By investing in critical minerals projects, we can build a stable, prosperous industry for future generations in Canada, Such investments ensure Canada remains a leader in both potash production and mining. These efforts will also provide critical long-term benefits for the people of Saskatchewan by creating and maintaining highly skilled jobs and co-op terms for students, supporting Indigenous communities through employment and economic opportunities, and cementing Canada's leadership position in potash production.

Building partnerships for success

I am proud to say that Canada's potash industry thrives because of collaboration among governments, industry, communities, and Indigenous peoples. Our commitments and our work are always linked to our desire to have respectful partnerships and shared benefits. For example, we encourage all mining companies to hire as many local residents as possible, and we are advancing economic opportunities for Indigenous communities while upholding their rights and land stewardship practices.

Of course, these partnerships go beyond resource development. They include training programs, employment opportunities, and equity investments that enable Indigenous peoples to participate meaningfully in the industry. By working together, we are not only driving economic growth but also building stronger communities.

In addition to domestic partnerships, Canada's leadership in potash and other critical minerals strengthens our relationships with global allies. As countries around the world seek reliable, secure sources of critical minerals, Canada offers stability, transparency, and expertise. Our exports are building supply chains that power everything from electric vehicles to agricultural systems-underscoring Canada's role as a trusted partner in a shifting global landscape where non-aligned countries work to increase their influence through supply chain dominance.

Building Canada's future together

As global demand for critical minerals grows, Canada is seizing the moment. Through innovation, collaboration, and responsible resource development, we are creating jobs, fostering resilience, and securing a sustainable future for generations to come.

For those working in the potash sector, your efforts are essential to this vision. You are helping position Canada as a leader in sustainable mining, ensuring that our resources contribute to a better world. Together, we're not just mining minerals—we're building a more prosperous Canada.

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THE POTASH APPLE AND **THE POTENTIAL TREE**

BY STEVE HALABURA P.GEO., CEO, BUFFALO POTASH CORP.

I had a nice, sleepy article prepared about winter, feeding the birds, walking the dog, then a soft easement into the Christmas season, mind at rest, nothing to be too concerned about.

But then...

On Monday, November 25, U.S. president-elect Donald Trump declared that upon taking office, he would immediately place "big" (i.e. 25 per cent) tariff on goods entering the U.S. from Canada and Mexico, until such time as both countries imposed stricter border controls to control the flow of illegal immigrants and drugs into the U.S.

Since then, both the Canadian federal and provincial governments have been thrown into a frenzy as they seek ways and means to deal with what seems to be a trade war that was set to commence immediately after Trump's inauguration on January 20, 2025.

What is ironic is that the major North American potash producers, Nutrien and Mosaic, issued their third quarter reports during the first two weeks of November, well before the tariff tumult. In their quarterly reports, both made it clear that the global trade in potash has stabilized after Russia's invasion of Ukraine in 2022, with demand remaining robust and prices having reached a floor.

In other words, they were planning for a somewhat settled year in 2025.

But it doesn't look like it will play out this way.

Nutrien forecasts a global shipment range of between 71 and 74 million tonnes for 2025. U.S. demand is between 11 to 13 million tonnes of finished product, with Canadian producers supplying about 85 per cent of that amount, with the rest coming from Russia and/or Belarus. So, while a significant importer, the U.S. is not buyer number one.

However, to the American farmer, potash is a very critical strategic commodity, especially if you grow corn or soybeans. America cannot meet the demands of its farmers, as its internal production capability is very limited, well under a million tonnes.

So, potash is clearly strategic,

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with American farmers facing a Hobson's Choice: do they buy their potash fertilizer from a nation with porous borders, or buy it from the Russia-Belarus cabal?

What does this mean for potash?

This isn't about potash only, as Canada is the largest external supplier of oil and uranium to the U.S. Many Midwest refineries depend upon Alberta and Saskatchewan's heavy oil as feedstock for gasoline and diesel; and historically, Canada has supplied most of America's uranium since the days of the Manhattan Project.

In trying to understand this, let's ask the question: how would a potash tariff work?

Typically, a tariff is a tax placed by

a government on goods coming into a country, so in the case of potash, the American farmer would pay a 25 per cent tax on potash bought from a Canadian producer – so if the price per product tonne is US\$213 per tonne (FOB minesite) as was reported by Nutrien in its quarterly report, then the price to an American farmer would be about \$53, or US\$266 per tonne. This is higher than the price per product tonne for Q3 2023, where it was US\$250 per tonne.

Stated differently, Nutrien's American buyers will have to pay more for its product than they did a year ago, by about US\$16 per tonne.

Will there be pushback from farmers? There will probably be

some demand destruction, as taught to us by the 2022/2023 price runup – if the price goes up, then demand sharply declines. I bet we will see a potash rush between now and January 20, a build-up of inventory, then cutbacks in applications in the ensuing crop years.

What is the alternative? U.S. buyers could increase their purchases of Russian or Belarusian product, but I doubt there will be a big push to "Buy Russian". Produce more internal resource? I do not believe America has the potash resource to rapidly expand to replace even a small portion of Canadian imports. Tariffs and protectionism may spur a flurry of exploration, or rejuvenation of mature assets, and there may even be subsidization of American-







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produced potash. But if the gas isn't in the tank, not much can be done.

The Canadian federal government has also socialized the concept of tariff retaliation by placing an export duty on strategic and essential commodities like energy and fertilizer, meaning that American buyers would have to pay a tax on imported product, with the extra money going to Canada rather than the U.S. government. In the end it's the same result – a significant increase in an essential input cost.

Canadian producers could also reduce their price by 25 per cent to maintain price stability. However, the North American supply chain is already a crossborder entity – both Nutrien and Mosaic operate a unified supply change that is seamless from Saskatchewan mine to Midwest corn producer, so in the end, the buyer will pay for it anyway.

There are few palatable options. So, are tariffs significant to Canadian potash producers, or is it political noise?

Here is my take on this...

I will hazard a bold prediction, which is that the politics will NOT have a significant impact. My reasoning? Because for all its proximity, the American market is what Ken Seitz, Nutrien's CEO, calls a "mature market". This is not where the growth is.

Both Nutrien and Mosaic make a

point in their 2024 third quarter reports to emphasize that strong growth is to be expected in global markets, especially markets such as Brazil, India, and China. For each market, there is demand by farmers for the application of more, not less, potash, and the development of more, not less, field acreage. A strong incentive for overseas growth is that the price per tonne is now affordable to global farmers and given underapplication of potash when its price was high, there is much ground to regain.

Simply put, 2025 is shaping up to be a year of record demand growth and consumption, with prices – while low compared to 2022 and 2023 – are affordable, thus driving sales.





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Both Nutrien and Mosaic's third quarter results support this conclusion.

For Nutrien, while sales price (FOB mine site) in Q3 2024 was \$213/t, down from \$250/t in Q3 2023, strong growth was shown by a Finished Product (MOP) Sales volume in Q3 2024 of 4.2MMt, up from 3.9MMt in Q3 2023. For Mosaic, Finished Product (MOP) Sales volume in Q3 2024 was 2.0MMt, down from 2.2MMt in Q3 2023. Sales price (FOB mine site) in Q3 2024 was \$215/t, down from \$266/t in Q3 2023. While prices were down from last year, demand was up, thus supporting the thesis that



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potash is affordably priced in the current marketplace.

I am sure we will enjoy much more political theatre in 2025, with potash making the news as a "strategic commodity". If there is pushback from U.S. buyers that results in retrenchment of American markets, the oversupply will no doubt be shuffled to overseas markets that show increasing demand.

Keep in mind, this is breaking news, and nothing is settled. Newly inaugurated President Trump may decide tariffs aren't the way to go, but I doubt he will do that. Or he may decide to exempt certain imports, such as strategically important commodities, and place tariffs on other imports, such as manufactured goods. The Canadian federal government is in a state of turmoil, so its plans are impossible to forecast.

I know my favourite saying is "the potash apple does not fall far from the political tree"; nevertheless, U.S. tariffs or not, global demand growth means 2025 will be a good time to be in the potash business!

'Nuff said... ▲





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Our tele-remote (TR) journey began at Lanigan in 2017, where a simple camera was mounted on a two-rotor mining machine.

TRANSFORMING MINING WITH AUTOMATION: **A journey of safety and efficiency** *Nutrien*

Nutrien's network of potash mines has reached a significant milestone of 25 million ore tonnes cut using automation

BY MEGAN ADAMS

In the ever-evolving world of mining, the integration of advanced automation technologies has paved the way for remarkable improvements in safety and operational efficiency. During our transformative journey of mining automation across our network of mines in Saskatchewan, we at Nutrien have reached a significant milestone of 25 million ore tonnes mined using automation. "Reaching 25 million ore tonnes cut through our automation program is an outstanding achievement," says Shannon Rhynold, vice-president, engineering, technology and capital & operations strategy, potash. "We are now on a journey of significant growth, having doubled our tele-remote ore produced each of the last three years. We are on pace to achieve this goal again in 2024 and aim for 40 to 50 per cent automated ore mined by the end of 2026."

Lanigan: The starting point

Our tele-remote (TR) journey began at Lanigan in 2017, where a simple camera was mounted on a two-rotor mining machine. This early phase was marked by excitement, followed by a steep learning curve which drove the collaborative spirit of the teams involved.

"This project has truly been a collaborative effort. Early on, our technical team greatly benefited from the expertise and insights of our operators. Their feedback was foundational, and it ultimately shaped the development of the tele-remote system," says Owen Gunther, automation project lead, Lanigan. "We also relied on our skilled tradespeople, whose practical experience proved vital in adapting the technology to the mining machines for long-term sustainability."

Cory's replication efforts

Our Cory potash mine began its teleremote replication journey in 2020, following extensive collaboration with the Lanigan team. During this period, Cory focused on upgrading existing mining machines with TR technologies while building new TR-enabled miners to expand our fleet. These ongoing initiatives aim to operationalize the technology to support production needs, ensuring the safe and efficient production of potash.



After the successful implementation at Lanigan, Cory replicated the technology, further refining and expanding its application.

"Collaboration within the teleremote project is essential for achieving our shared goals and maximizing the impact of our work. By leveraging the diverse expertise and perspectives within our network, we can tackle complex challenges more effectively and drive innovation," says Tyler Zimmerman, automation project lead, Cory. "Open communication, mutual respect, and a commitment to collective problem-solving are the cornerstones of our approach,

ensuring that every voice is heard, and every contribution is valued. Together, we are not just working on a project; we are building a dynamic, synergistic environment that propels us toward success."

After the successful implementation at Lanigan, Cory replicated the technology, further refining and expanding its application. This replication set the stage for broader adoption across other sites.





We have ambitious plans to further advance tele-remote, Operator Not Present (ONP), and other cutting-edge automation technologies.

Scaling to other sites: Vanscoy and Allan

Taking lessons learned from Lanigan and Cory, Vanscoy and Allan embarked on their own journeys to replicate tele-remote technology. This phase involved intricate application processes and adaptation to site-specific conditions. "Over the past few years, Vanscoy has been able to leverage the lessons learned from other sites, including the development of new technologies and improvements on existing tele-remote technology," says Brian Holonics, automation project lead, Vanscoy. "The sharing of successes between sites has helped Vanscoy expedite replicating their fleet





www.bitservice.ca/ulma www.ulmaconveyor.com and build additional confidence in operationalizing the equipment. We have clearly seen the benefits of utilizing the technology, including improved safety, additional tonnes, and improved performance on both the borer and continuous haulage system."

Mike Siourounis, continuous improvement lead at Allan, says that Allan has benefited greatly from the development work that Lanigan and Cory did on the teleremote system.

"We were able to quickly begin replicating the system to our mining fleet with only minimal modifications to meet site-specific requirements," says Siourounis. "The strong collaboration across the network, including temporary transfers of Allan employees to the Lanigan Automation team, was a significant benefit. The collaboration between the sites continues to provide value as we find further improvements to the automation systems and how our workforce uses them."

Development at Rocanville

At our Rocanville site, the focus has been on advancing from sidepass Operator Not Present (ONP) technology to fully automating the first-pass cutting process. This journey, which began in 2018, aimed to revitalize automation technology that had seen little advancement since the early '90s.

"We embarked on revitalizing our side-pass technology before moving on to the challenge of automating the manual aspects of our first-pass cutting process," says Clayton Lawless, automation lead, Rocanville. "Our efforts have led to significant progress, including the deployment of our prototype Belt Builder and advanced steering systems. These achievements are a collaborative effort between our operations and maintenance teams, aimed at improving flexibility, efficiency, and safety."

Safety and efficiency: A dual focus

The primary objective of our automation efforts has always been to enhance safety within our mining operations. By reducing the exposure of operators to hazardous conditions, our automation technology significantly improves workplace safety. Additionally, these systems bring substantial productivity benefits, such as eliminating downtime during shift changes and enabling safer mining in areas with challenging geology.

We have ambitious plans to further advance tele-remote, Operator Not Present (ONP), and other cutting-edge automation technologies. These future advancements are designed to transform the industry and set new benchmarks for operational excellence.

"I am incredibly proud of our teams for their dedication and hard work in reaching this milestone of 25 million ore tonnes cut using automation," says Trevor Berg, senior vice-president, potash operations. "By embracing advanced technologies and fostering a culture of collaboration and innovation, we are not only enhancing the safety and well-being of our employees, but also setting new standards for efficiency in the mining industry. Our journey doesn't stop here; we will continue to push the boundaries of what's possible by listening to the challenges our employees face and then focusing on thoughtful technological applications that solve those problems from a safety and efficiency perspective."



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POTASH: Ensuring supply and promoting sustainable use

Potassium is an essential nutrient for the development of healthy crops, and in turn, soil health. The primary source of potassium for crops is potash, a critical fertilizer that ensures global food security. But despite this importance. potash has been absent from the U.S. Geological Survey's (USGS) Critical Minerals List since 2018. Forward thinkers in the agricultural industry are actively advocating for its inclusion. Additionally, research-driven innovations for potassium use are focused on its efficiency to align with industry goals.

Why potash deserves critical mineral status

The USGS Critical Minerals List identifies materials crucial to

national security, economic stability, and supply chain resilience. Potash meets all three of these criteria. However, its exclusion has been based primarily on assumptions of supply chain reliability, in particular America's stable trading partner Canada, which provided 87 per cent of U.S. potash imports in 2023.

The assumption of uninterrupted access to Canada's potash overlooks significant supply chain vulnerabilities. For example, 2022 brought disruptions such as truck driver strikes and cross-border vaccine mandates, exposing the fragility of relying on a single primary supplier. With Russia and Belarus together accounting for over 40 per cent of global potash production, the war in Ukraine also illustrated how geopolitical tensions and conflict can impact global markets.

Designating potash as a critical mineral has the potential to spur increased production through the streamlining of the federal permitting process, currently a lengthy and costly process measured in years and millions of dollars. These projects wouldn't be exempt from permitting, but a single agency would be tasked with ensuring the process progresses smoothly and is not unnecessarily delayed with duplicative regulatory burdens.

The U.S. government has in the past recognized the importance of securing fertilizer production
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and supply, most recently in 2022 with the Department of Agriculture's Fertilizer Production Expansion Program (FPEP). Adding potash to the critical minerals list would signal a continued commitment to the importance of both potash and fertilizers as a whole.

Innovations for sustainable and efficient potash use

Efforts to increase potash production and in-field efficiency reflect agriculture's commitment to sustainability. Potassium research and development focus on improving efficiency and supporting long-term agricultural productivity.

• Precision agriculture and 4R Stewardship: The 4R Nutrient Stewardship framework: applying fertilizers at the right source, right rate, right time, and right place has positively impacted on-field potash use. Precision agriculture technologies, such as GPS- guided application and soil sensors, optimize potassium delivery to crops to optimize yields.

The Fertilizer Institute, a U.S.-based industry group representing the entire fertilizer value chain, advocates for policies that incentivize 4R practices and encourage growers to work with certified crop advisors to optimize nutrient management plans.

 Soil testing and potassium management: Advancements in potassium research are helping to optimize in-field management. For example, researchers continue to evaluate soil testing methods for potassium with some research showing that maintaining soil samples at field moist levels could lead to more accurate assessments of potassium availability compared to traditional dried samples. Most importantly, growers and agronomists should ensure they are selecting the proper soil test for potassium to inform



decisions on application. Ensuring the soil test used matches the soil test that is correlated and calibrated to crop yield for specific states is important. If the test is not calibrated to yield, it means the soil test is not tied to actually yield outcomes.

Potassium availability is also influenced by soil attributes like clay mineralogy. Studies show that clay types, such as smectites and illites, impact potassium fixation and release, affecting availability to plants. While mineralogy may be impacting soil potassium, cation exchange capacity (CEC), total clay percentage, and soil texture can serve as proxies to measuring actual clay mineralogy. Understanding variability in soil texture and CEC within fields or farms can help agronomists develop targeted recommendations for potassium use. Growers and agronomists should be sure to use soil testing to tailor potassium applications to specific soil properties to improve efficiency and crop uptake.

Fertilizer use is responsible for half of global food production, and potash is one of the critical fertilizers for producing our food. The demand for potash will continue to grow as earth's population is projected to reach 10 billion people by 2050, making the implementation of sustainable practices in potash production and use more critical than ever. By including potash on the critical minerals list, promoting sustainable practices, and continuing to prioritize innovative research, the U.S. can recognize the critical role potash plays in feeding the world.

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Navigating the energy transition

The International Minerals Innovation Institute (IMII) has been a key player in facilitating the search for energy-efficient and low-emission technologies within Saskatchewan's potash industry.

Technological innovations in Saskatchewan's potash industry

BY AL SHPYTH, EXECUTIVE DIRECTOR, IMII

add Taraca

The mining and minerals sector, like many others, is undergoing a significant energy transition. However, the global trend toward reducing carbon emissions and shifting to more sustainable energy practices has vastly different implications depending on geography, industry, and the specific operations involved. In Saskatchewan's potash industry, this transition is not a one-sizefits-all scenario. The scale and nature of the energy demands vary dramatically between different types of operationsconventional underground mines and mills versus solution mines and mills-each with its own set of challenges and opportunities for

reducing energy consumption and greenhouse gas (GHG) emissions.

While the energy requirements of these operations can differ by an order of magnitude, there is a common thread running through them: the need for commercially competitive technological solutions that can reduce emissions without compromising productivity or economic viability.

IMII's role in driving technological innovation

The International Minerals Innovation Institute (IMII) has been a key player in facilitating the search for energy-efficient and low-emission technologies within Saskatchewan's potash industry. From its early efforts to its more recent projects, IMII has worked alongside industry stakeholders to identify, validate, and promote technological solutions that could help potash producers meet the dual challenge of reducing emissions and improving energy efficiency.

One of IMII's first steps in addressing these challenges was a collaboration with the Saskatchewan Mining Association, resulting in a policy brief produced by the Johnson Shoyama Graduate School of Public Policy. This brief highlighted the unique hurdles faced by the potash industry, particularly its energy-intensive operations and vulnerability to global market forces. Given the long lifespan of capital assets in the industry, including energy infrastructure, the brief emphasized the importance of adopting new technologies that could lower GHG emissions while remaining commercially viable in a highly competitive global marketplace.

Building on this, IMII launched the Alternative Energy System Innovation Challenge. This open innovation challenge aimed to uncover new technologies with the potential to help the industry transition to cleaner energy sources. Two technologies were identified as having potential: Anax Power, which could generate electricity from the down-pressuring of natural gas, and Grengine, which offered a solution for battery energy storage. While both technologies were promising, they highlighted a critical issue: scale and technical readiness. The energy demands of large-scale potash operations in Saskatchewan—ranging from 100 to 500 MW—meant that these solutions, which offered capacities at lower scales, were not immediately practical for widespread industry adoption.

Focus on heat: A key area for emission reduction

Beyond isolated technologies, IMII's efforts have increasingly focused on understanding the broader sources of energy consumption and emissions in the potash industry. Research has shown that a significant portion of emissions (around 30 per cent) in the sector stems from energyintensive processes like product drying, steam generation, and building heating. For the sector, approximately half of all energy consumed by potash operations comes from natural gas, which is used for both drying and as a heat source for steam generation and crystallization processes especially in solution mining operations.

Recognizing this, IMII has worked to bring forward technologies that address heat needs, which are often the largest and most consistent source of energy consumption in the potash industry. Some of the notable emerging technologies that have been identified include:

• Acceleware's Clean Tech Inverter: A technology that uses radio frequency energy to dry potash,

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- ExtractEnergy: A solution that converts low-grade waste heat into electricity, helping to reduce the amount of energy needed from traditional sources.
- Solex Thermal Science: A company that specializes in heat exchange technology that could optimize heat recovery and reduce energy losses in the potash industry.

These solutions, though promising, also reflect the broader need for a deep and multifaceted approach to emissions reductions in the industry. Technologies that focus on clean heat have the potential to provide significant benefits not only to potash producers but to other energy-intensive industries that share similar heating demands.

Collaborating for larger-scale solutions

In addition to exploring emerging technologies, IMII has sought to identify large-scale energy solutions in collaboration with external partners. It has worked closely with SaskPower, the provincial electricity provider, to explore innovative approaches to reducing GHG emissions. Two significant studies have been conducted in partnership with SaskPower: one focused on the potential for carbon capture hubs anchored by potash and power production, and the other exploring the feasibility of small modular reactors (SMRs) as a source of low-emission industrial heat. Advanced SMR technologies are promising because of their ability to generate thermal and electrical energy at an industrial scale. However, the first advanced SMRs are not expected to be commercially deployed until the early-to-mid-2030s. Additionally, the development of carbon capture and storage (CCS) technologies also requires



innovation to bring down costs and improve scalability. These studies highlight that achieving industrial decarbonization by 2050 will depend heavily on technological breakthroughs that address both the feasibility and affordability of these advanced energy solutions.

The road ahead: Innovation and collaboration

Notwithstanding Saskatchewan's potash industry already having lower GHG emissions than other jurisdictions, achieving a successful energy transition will require ongoing technological innovation. IMII recognizes that while progress has been and is being made, there are still challenges in technology that must be addressed for industry to meet its emission reduction targets. Organizations like the World Resources Institute and the International Energy Agency have all pointed out that not enough clean technologies are available at commercially competitive prices or industrial scales.

Ultimately, Saskatchewan's potash industry is at the crossroads of an exciting, albeit challenging, energy transformation. With the right technological advancements and strategic collaboration, the industry can play a leading role in shaping a sustainable future while continuing to meet global demand for this essential mineral. IMII's efforts in fostering innovation are a critical part of this journey, helping to bridge the gap between technology, industry needs, and environmental responsibility.

Al Shpyth is IMII's executive director and has master's degrees in environmental studies and in environmental law and policy.



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Evolving opportunities for women at Nutrien

170 employees gathered at Nutrien's WiNTER K event to explore ways to achieve inclusive teams and create a psychologically safe environment



The Women in Non-traditional Environments and Roles – Potash Conference took place recently in Saskatoon.

When Sabrina Pethick entered the potash industry 15 years ago, she never envisioned a path to her current role as a senior maintenance planner at Nutrien's Vanscoy operation.

"I got a foot in the door in an administrative role covering a maternity leave," says Pethick. "My expectation was to get by for the year to figure out what I was going to do next. But I got familiar with SAP, work orders, parts, maintenance plans, reliability conversations. I started to see there were more opportunities inside the company. I was like 'I can do this...'."

Pethick's story was part of the conversation as she moderated

a panel of Nutrien team leaders at this year's Women in Nontraditional Environments and Roles – Potash Conference in Saskatoon. The event, organized by the WiNTER K group, attracted 170 employees to discuss the opportunities and challenges for women in non-traditional environments and roles.

Pethick's career development is an example of how talent, determination, innovative leadership, and allyship all have a role in changing workplace cultures.

From her initial administrative role, Pethick moved into positions that exposed her to a variety of department functions. While

Sabrina Pethick and Ryan Fairbrother.

working in mine maintenance, she expressed to a supervisor that she wanted to pursue a maintenance planning position – even though it was a role traditionally filled by Red Seal tradespeople.

Ryan Fairbrother, a mill maintenance superintendent at the time and now director of maintenance and reliability in potash, recognized Pethick's potential and advocated for her to be considered for more challenging opportunities.

"I saw – and I think what a lot of people see in Sabrina – is that she had capabilities beyond an administrative role," says Fairbrother, also an event attendee. "Keeping her in there

Nutrien

Today, site teams are more inclusive with women filling leadership positions and working in the trades on the floor.



The event, organized by the WiNTER K group, attracted 170 employees to discuss the opportunities and challenges for women in non-traditional environments and roles.

wasn't going to be the best for Nutrien and it wasn't going to be the best for Sabrina. She is a phenomenal people leader. The technical skills that Sabrina brings in maintenance planning, our SAP system, IT systems, is huge. I believed that Sabrina would be able to extract the specific trade knowledge she needed from the tradespeople themselves."

Pethick reflected on the changing culture in the industry and at Nutrien. When she joined the company, there were few women working at site outside of administrative roles. Today, site teams are more inclusive with women filling leadership positions and working in the trades on the floor.

"That alone is a huge change," she says.

The next steps

One of the most visible changes in recent years is improved access to personal protective equipment (PPE), which was often unavailable in proper sizes for female employees. Through the work of a dedicated group of employees, women now have access to proper-fitting safety equipment.

"There's something frustrating and isolating when you come to work and you don't have the proper PPE or there isn't your size of gloves," says Lyndsay Stobbs, mine maintenance supervisor at the Allan potash facility. "You feel like, 'am I really important here?' Now anybody who needs smaller sizes or different sizes is able to get them. There is something powerful in that – having it here and knowing you belong."

Elora McLeod, mill electrical general foreperson at Allan, feels Nutrien has moved forward but that the work needs to continue to attract the next generation of women to the potash business.

"We have some women at our sites now, which is great, but we haven't seen those numbers dramatically increase," says McLeod. "What got us here won't necessarily get that next group of people here. So how do we get out into the schools more and let people know earlier about this as a career choice? We are doing things to make it safer and less physically demanding to do some of the jobs here. Some of that is just awareness and we have to start earlier."

These are lessons Nutrien will take forward as it explores new ways to engage women currently in the company, to attract younger females considering their career options, and to encourage innovation and allyship across the entire employee base.

"Employees brought to the fore a number of really key issues that I don't think we would have ever really been aware of - like the PPE," says Aaron Fornwald, vicepresident of human resources, NPKCC. "Their work has led to having that dialogue and keeping it at the front of our minds. Now we have to carry on without losing sight of this, ensuring women have a voice." ▲

Unlocking efficiency in potash mining

Leveraging mineral composition to tackle convergence and creep

Understanding each deposit's unique characteristics in potash mining is crucial to maintaining efficient, productive, and safe operations. A significant but sometimes overlooked factor affecting underground potash mines, particularly in regions like Saskatchewan, is how the mineral composition of potash influences creep rate (i.e., the gradual movement and deformation of the rock mass). By studying and planning for these natural behaviours, operators can better predict and mitigate issues that slow production, increase costs, and pose hazards to mine personnel and installed infrastructure.

Mineral composition and creep rate matter

The potash extracted from Saskatchewan's rich deposits



Understanding how the mineral composition of potash influences creep rate is key to maintaining efficient, productive, and safe mining operations.



BY CODY VINING, RESPEC

is often a mixture of minerals, such as halite (a common salt), sylvite (potassium chloride), and carnallite (a magnesium chloride compound), each of which behaves differently under stress.

For example, carnallite creeps significantly faster than halite and sylvite. Thus, areas with higher carnallite content close more quickly, leading to what geotechnical experts call total convergence. Total convergence affects the clearance around mine infrastructure (e.g., conveyor belts), creating the potential need for unplanned maintenance and temporary shutdowns; total convergence and the manifestation of ground-control hazards are typically correlated.

Convergence rates directly impact how long a mined room can remain accessible and safe. An unmonitored or misunderstood mineral composition can lead to the unexpected closure of access routes when the surrounding rock creeps faster than anticipated. These changes can result in costly rework and downtime while operators halt production, remove equipment, and re-cut access areas to continue operations safely. RESPEC's geomechanical models and decades of expertise help operators plan ahead for challenges and focus on operational flow and long-term productivity.

The mineralogy of the rock is critical for rock mechanics modeling and understanding how the rock will creep. For decades, our RESPEC geologists have worked alongside engineers to log potash and salt cores to support these calculations extensively. We focus on critical core aspects, including mineralogy, crystal size, insoluble content, and structural features. These observations are logged into a database to build geological models and resource estimates. The rock mechanics team then creates geomechanical models.

RESPEC's data-driven approach

RESPEC teams can predict cavern closure centres by linking mineral composition to creep behaviour, thus empowering mining operations to forecast convergence and plan accordingly. Our team of geomechanics specialists has developed a mineralogydependent creep law, first introduced in a landmark 2015 study [Vining and Nopola, 2015]. This case study provided an exclusive opportunity to validate a constitutive model's stress, temperature, and mineralogy dependence by comparing convergence rates predicted during numerical simulations to convergence rates measured underground.

Using data from this study and ongoing laboratory and field tests, RESPEC helps mining operators measure and anticipate



specific closure rates while factoring in variables such as stress, temperature, and the mineral makeup of each mined section.

Operators achieve improved efficiency by:

- Planning maintenance downtime: Understanding the specific creep rates for areas high in carnallite or other fastmoving minerals helps mines more accurately schedule downtime for equipment adjustments and infrastructure repairs, minimizing interruptions in production.
- 2. Adjusting design layouts: Operators can proactively adjust room design and equipment placement when mineral composition suggests accelerated convergence, maintaining safety and efficiency over time.

These insights allow mine operators to focus on operational flow and long-term productivity. By knowing the expected timeline for room accessibility, they can prepare for the necessary adjustments before these aspects become critical.

Potash mining's proven partnership

With growing potash demand, proactive planning is essential to keep mines operational and safe. RESPEC has worked in salt and potash geomechanics for over 50 years, bringing our clients academic insight and hands-on experience. By combining sophisticated modeling techniques with our extensive knowledge of evaporite behaviour, we provide potash producers with the strategic foresight to optimize mining schedules, improve safety, and ultimately enhance profitability.



Improving measurement of clays and other slurries online using automation

BY JENNIFER BENTZ, LUCINDA WOOD, AND RUIJUN SUN, SASKATCHEWAN RESEARCH COUNCIL

Clay minerals are extremely small, negatively charged particles that are highly reactive in industrial slurries, wastewater, and soils. The characteristic that affects industrial processes is how reactive clays are with cations in the environment. Termed cation exchange capacity (CEC), this capacity is small in "inactive" clays like kaolinite to very large in "active or swelling" clays like smectite. Depending on which clay minerals are present, the CEC can vary significantly.

Active clay minerals cause significant problems during many plant operations because of their CEC properties, especially in any solid-liquid separation processes where they can lead to decreased equipment performance and increased reagent use.

For tailings management, even small amounts of active clays can prevent the solids from settling and water recovery.

Challenges with measuring clays and other properties of slurries

It is therefore important to measure them accurately and in real time in order to take corrective action.

The difficulty in obtaining the realtime quantification of clay minerals is that they are notoriously tough to measure based on their small size and the very similar crystal structure. The Saskatchewan Research Council's (SRC) Pipe Flow Technology Centre[™] recognized the need for a better approach for industry to make clay measurement simpler, faster, and more reliable – and connected to process control systems to optimize costs.

So how can we get better, quicker, online measurements?

Instead of quantifying the clay minerals themselves, it is much easier and more accurate to measure the CEC. Most industries measure the CEC through a manual laboratory method on a process sample that does not deliver realtime data. Some of the methods such as the MBI (Methylene Blue Index), while straightforward, are time-consuming and subjective.

With advances in technology, it is now possible and cost effective to use a spectrophotometer to measure the colour of a cationic dye (such as MBI or CuTrien) in solution that correlates with CEC values of a process stream. This dramatically improves reliability and decreases laboratory time.

The downside to the spectroscopic method is that the method needs to be adjusted for each application and calibrated each day.

Recognizing the need to further simplify the method for processes and laboratories, SRC has developed an automated measurement platform (AMP) that can connect online with pipelines and potentially other process streams. The AMP performs the spectroscopic CEC measurement from start to finish, including calibration automatic filtering to 0.45 microns.

Instead of waiting hours to days to get results, the AMP can now provide industries with an active clay measurement within 15 minutes, allowing them to adjust their process and process additives quickly and optimally.

Application to potash

Potash is one of the key industries SRC is looking to support with the AMP.

For potash processing, both insolubles and clays can pose challenges. Insolubles in the brine, especially clays, affect separation and flotation, absorb chemicals, and decrease recovery. They may clog filters, wear down equipment and require more reagents.

In tailings management, getting near-real-time data on the clay content of tailings can aid in determining optimum flocculant dosages and prevent settling issues in the tailings.

The AMP can also be configured to perform other analytical measurements, including pH, conductivity, or water hardness. For each new application, SRC tests and validates the platform for the specifics that are unique to each industry (such as the corrosive environment in potash) so that many other online slurry applications can be developed.

To learn more about SRC's Pipe Flow Technology Centre™, visit www.src.sk.ca. ▲

Quality services for every stage of your potash project





Using X-rays to find solutions to potash clumping

BY ROWAN HOLLINGER FOR THE CANADIAN LIGHT SOURCE

When powdered products like sugar, salt, or instant coffee are exposed to moisture, they form clumps and become much harder to use. The same thing happens to potash-based fertilizers and other potash products, where clumping can lead to industrial and agricultural waste. That's why Saskatchewan researchers are taking a closer look at studying why clumps form in powdered products and what can be done to avoid this.

Dr. Lifeng Zhang recently came to the Canadian Light Source (CLS) at the University of Saskatchewan (USask) with other members of USask's Particle Technology Research Lab, and used the BMIT-BM beamline to study in real time how clumps form in potash products.

"This research is the first one actually looking into the caking and clumping phenomena using x-ray imaging," says Zhang. "Previously, other methods or instruments have been used, but they cannot see this dynamic process."

The team used a technique called synchrotron-based X-ray tomography to take detailed 3D images of potash particles and the tiny bridges that form between them, which create the clumps.

"Something other methods cannot see, here we can see it using synchrotron-based x-ray imaging," says Zhang. "I can see that smallscale spread or caking occurring within minutes—that's really exciting."

This research, done in collaboration with industry partner Mosaic, originally set out to study ways of improving the drying process for potash products, but the research evolved when they discovered that clumping was occurring not only after, but also during the drying process. The team's findings were published in the journal *Particuology*.

"This research is just the beginning of improving our understanding of how the clumping phenomena occurs," says Zhang. "We hope that the knowledge from this research will help industry reduce waste or even help, for example, our farmers when they apply this product in the field to reduce waste as well."

Zhang and the team hope to continue working with Mosaic to find ways to improve manufacturing/drying processes. The team also hopes to one day expand their research to study the clumping phenomena in other powdered products. ▲







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Seaway potash exports seeing continued growth trend



Shiploaders at MobilEx Terminal.

The efficiencies of the Seaway. coupled with available capacity and near-perfect reliability measures, have induced a range of dry bulk commodities to see upticks. The 3,700-kilometre Great Lakes-Seaway System offers environmental benefits, including the 99 per cent reliability factor, as it straddles eight U.S. states and two Canadian provinces. This bi-national collaboration is a unique and powerful combination, showcasing how the Seaway's assets can be equally and simultaneously leveraged for the economic benefit of two countries. Realizing this, potash shippers have included the Great Lakes Seaway as part of their supply

Thunder Bay Terminals Ltd. All photos courtesy of the Port of Thunder Bay.

chain. One vessel carries the equivalent of 301 rail cars.

A record-breaking year for potash exports in the Port of Thunder Bay could be reached by the end of the 2024 shipping season. The authority's stats show almost 260,000 more tonnes of potash has moved through the port since the shipping season opened in March, which is topping 2023, a year that was already record setting for potash volumes.

The Seaway has seen year-onyear potash shipment records since 2021 in Thunder Bay, and is poised for the same in 2024, the fourth consecutive year posting increasing volumes. As an entire system, the Seaway's yearly traffic report for 2023 showed total exports at approximately 1.5 million tonnes. The potash is mainly destined to South American and European countries.

"Thunder Bay is the only potash export port on the Great Lakes - St. Lawrence Seaway System, making it a critical junction in the Canadian potash supply chain," says Chris Heikkinen, CEO for the Port of Thunder Bay. "Continued growth in potash exports highlights the port's importance for this commodity and its capability to manage substantial volumes of bulk cargo efficiently."

Investment in port infrastructure, as revealed in the late 2023 release of the Martin Study, has ports even more poised to handle increased volumes of a range of cargoes and commodities, bringing onside the investment in terminals, cargo handling equipment, more advanced technology, and the use of alternative fuels, to further the position as the already greenest mode of transportation.

The Seaway is referred to as Highway H₂O and is anchored by 41 port partners, providing access to key global markets for exporters and direct access into the Heartland of North America for importers. The gateway offers shippers a costcompetitive gateway with a lower environmental impact than competing gateways.

The St. Lawrence Seaway offers a number of incentive programs for shippers to utilize the system. The New Business Incentive offers shippers a 20 per cent toll reduction for new business, along with a Gateway Incentive to induce traffic moving through competing gateways.

"Canada is the world's largest producer and exporter of potash, representing 38 per cent of global production. We export 95 per cent of our potash to over 75 countries," noted Karen Proud, president and CEO, Fertilizer Canada. "Farmers rely on Canadian fertilizer to grow healthy, hearty crops, and our industry relies on Canada's supply chains to get our products to farmers worldwide. In recent years, Canada has increased potash production to offset the decreased output from Russia and Belarus due to sanctions and restrictions. Supply chain partners in the St. Lawrence Seaway play an important role in getting our products to international markets. Reliability in Canada's supply chains is paramount to ensuring that farmers receive the fertilizers they need in a timely manner."

Seaway officials echo this sentiment, citing a major factor for increased potash volumes on the Great Lakes is the ongoing Russia-Ukraine conflict, as countries importing potash from Russia and Belarus have now turned to Canada for their potash needs. Additionally, a series of challenges impacting supply chains in recent years is also causing a shift in potash movements, including



west coast export gateways becoming less viable due to forest fires, flooding, and unplanned shutdowns. This has put pressure on companies to diversify their supply chains resulting in added reliance on the Great Lakes. With climate change contributing to more wildfires out west, supply chains may increasingly rely on the Great Lakes in the years to come. ▲



Mining sector coalition aims to solve talent crisis



Canada's mining industry has long been a cornerstone of the Canadian economy, with mining, quarrying, and oil and gas extraction directly and indirectly employing 694,000 people and making up 7.8 per cent of Canada's gross domestic product (GDP) in 2022. Our nation is rich in the critical minerals needed to transition to a low-carbon, clean economy - however mining is facing labour market tightness caused by long-term social and demographic challenges that undermine industry's ability to respond to growth, including:

- A growing age gap with rising retirements and fewer young people entering the industry.
- Declining educational enrolment, for example undergraduate mining engineering enrollment declined 50 per cent from 2012 to 2023.
- A low mining unemployment rate of 1.7 per cent in September 2024, compared to nearly seven per cent across all industries.
- Continued challenges in attracting and retaining underrepresented groups.

Demand for critical minerals and metals is rising due to their necessity in green technologies and for renewable energy. Furthermore, demand for other commodities like potash, uranium, oil and gas, and gold continues to create additional labour market demand. Juxtaposed with the factors accelerating a tight labour market, it is clear that the mining industry needs a developed, highly educated and skilled workforce. However, the perception of mining as an outdated and harmful industry continues to deter youth from considering mining careers.

In response to these challenges, the Mining Industry Human Resources Council (MiHR) launched the Mining Needs You career awareness campaign in 2021. Mining Needs You shows youth mining's wide range of career opportunities; the need for mining; what modern mining looks like; mining's use of innovative technologies; and industry commitment to environmental sustainability and equity, diversity, and inclusion.

Mining Needs You counters outdated perceptions of mining as an unsafe and dirty industry and focuses on attracting younger workers by highlighting how the industry has evolved and offers roles beyond traditional labour positions. As part of the campaign, MiHR introduced the five-year I Chose Mining. Mining Chose Me. Scholarship Program to provide 10 \$2,500 scholarships to postsecondary students in miningrelated programs. Now in its fourth year, the program recently awarded scholarships to two outstanding individuals: Catherine Condinho, undertaking a Bachelor of Science-Mining Engineering

degree at Queen's University, and Nur Erhalac, undertaking a Bachelor of Engineering, majoring in Mining Engineering Co-Op degree at McGill University.

Both scholarship recipients showcased their passion for mining and how they fell in love with the industry through their compelling video applications.

"My life has changed indefinitely for the better since pursuing a career in mining," said Condinho. "I am so appreciative of MiHR, as their generous support will allow me to pursue my ambitions in this industry."

Erhalac expressed that she is "truly honoured to receive this scholarship" and expressed her "heartfelt gratitude for this recognition. I haven't always been certain about which career path to pursue, but when I discovered the mining industry, I knew it was the right fit for me."

MiHR is now working to expand Mining Needs You. To begin, the Province of Alberta partnered with MiHR in 2024 to assess labour demand for 10 critical occupations in the province's mining, oil, and gas extraction industries – and to use results from this analysis to inform implementation of mining career awareness initiatives in the province based on the Mining Needs You platform. As such, MiHR will be launching a social media video contest in January 2025 for post-secondary students enrolled in miningrelated programs in Alberta – with one \$1,000 scholarship prize available to be won. Contest details will soon be available on MiningNeedsYou.ca.

While these efforts in Alberta are a positive step, challenges facing Canada's mining industry are national in scope. The future of Canada's mining industry relies on a skilled workforce in every mining region across the country. Therefore, MiHR is facilitating sectoral collaboration through the creation of a pan-Canadian coalition that will work together to attract youth to mining education and employment to help deepen the labour pool available to companies to benefit from. In November 2024, the Mining Association of Canada's (MAC)

Board of Directors approved a funding request presented by MiHR to officially establish a coalition and expand the Mining Needs You campaign nationally for one year.

MiHR continues to seek partners to join the coalition and is now developing a project management plan that will include delivering traditional, digital, and industry-specific tactics; risk management, performance and change management strategies; and evaluating the coalition's effectiveness to develop a proposal to extend the campaign an additional four years.

MiHR's Careers Committee, made up of coalition partners, industry, education, and youth representatives, will provide project oversight, input, and guidance. An agency consultant will be selected to work in collaboration with MiHR and partner input to develop the project management plan and execute the implementation strategy. Partners will also be asked to provide in-kind contributions, including staff time, to review and promote materials and senior leaders delivering the coalition's messaging to key audiences.

This collective effort will raise awareness and visibility of mining as a viable, rewarding career option.

Please contact William Meyer, director, communications and career development, MiHR, at wmeyer@mihr.ca to learn more about the coalition. ▲



Harnessing the clean economy

Navigating Investment Tax Credits and legal agreements

BY CHRIS MASICH

As Canada shifts toward a more sustainable future, project owners in the clean economy sector have a unique opportunity to capitalize on Investment Tax Credits (ITCs). These credits serve as powerful financial incentives aimed at promoting investments in renewable energy, energy efficiency, and innovative clean technologies. However, to fully benefit from these credits, navigating the tax and legal landscape is essential. This article provides a detailed overview of ITCs and explores how legal agreements between project owners and construction contractors can effectively manage and allocate risks regarding ITCs.

The availability of ITCs will significantly impact project economics and the ability for project owners to receive desired or accelerated investment returns. Conversely, the unavailability of ITCs will have serious negative implications. Hence, ITCs should be expressly considered in the legal agreements between the project owner and construction contractor and each subcontractor.

Spotlight on the labour requirements of ITCs

The labour requirements associated with ITCs for clean economy projects are crucial for ensuring compliance and maximizing tax benefits. Importantly, if a project owner does not meet the labour requirements, the ITC will be reduced by 10 per cent. For example, if the regular tax credit rate is 30 per cent, the reduced tax credit rate is 20 per cent. Project owners must engage a skilled workforce that meets industry standards, which includes hiring qualified professionals certified in specific fields relevant to the technologies being implemented. Compliance with local wage laws, including minimum wage and overtime requirements, is imperative to avoid legal liabilities. Formal labour contracts should outline wages, working conditions, and obligations to ensure transparency and accountability. Comprehensive record-keeping of hours worked, pay rates, and compliance with labour regulations is essential, as accurate documentation substantiates ITC claims and supports audits. Additionally, projects must adhere to occupational health and safety regulations, providing safe working conditions and adequate training for employees.

The role of legal agreements

Effective management of ITCs necessitates comprehensive legal agreements between project owners and construction contractors. These agreements play a pivotal role in delineating responsibilities, ensuring compliance, and allocating and mitigating risks associated with tax credit claims. To avoid being subject to the reduced rate, the agreements should clearly stipulate the two primary labour requirements: prevailing wage and apprenticeship mandates. Specifically, the agreements should include clauses outlining the obligation to compensate covered workers in line with the prevailing wage determined by eligible collective agreements or, when applicable, the wage standards of similar positions in the area. Additionally, they should establish the need for contractors to make reasonable efforts to ensure that apprentices registered in a Red Seal trade fulfill at least 10 per cent of total hours worked.

Risk allocation is crucial; indemnity clauses should protect project owners from liabilities arising from breaches in these labour requirements, specifying that contractors will bear the financial repercussions of non-compliance, including penalties and corrective measures tied to wage and apprenticeship standards. For construction contractors, this risk allocation will need to be priced. Furthermore, the agreements must address consequences for non-compliance, including the potential loss of the regular tax credit



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rate, financial penalties, and other liabilities stemming from intentional violations or gross negligence. Documenting the election to meet these labour requirements and providing attestations with clear timelines is vital.

Consequences of failing to meet labour requirements

Failure to meet labour requirements can lead to serious consequences for project owners, including disqualification from ITCs, which reduces the financial benefits of the project. All expenditures associated with non-compliant labour may be deemed ineligible, and if tax credits have already been claimed, the owner may need to repay these credits, along with any applicable interest or penalties, to the Canada Revenue Agency. Furthermore, a history of noncompliance can trigger increased scrutiny and investigations by regulatory agencies. Therefore, having a well-drafted legal agreement is essential, as it clarifies obligations, safeguards compliance, and protects against financial losses.

TRELLIE

Conclusion

As project owners embark on clean economy initiatives, a thorough understanding of Investment Tax Credits and the associated legal frameworks is crucial. By establishing clear legal agreements with construction contractors, project owners can effectively manage eligible expenditures and labour requirements, ensuring compliance and maximizing financial benefits. Engaging legal and financial professionals with expertise in ITCs can further enhance these agreements, providing peace of mind and contributing to the successful realization of sustainable projects.

Chris Masich is a partner at McKercher LLP based in Saskatoon where he specializes in commercial transactions and project development. His practice focuses on key sectors integral to Saskatchewan's economy, including energy, renewable energy, mining, natural resources, infrastructure, and agriculture.

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Empowering women in the skilled trades: Saskatchewan Apprenticeship



Kalene Gardipy is a third-year welder apprentice from Beardy's & Okemasis Cree Nation who is focused on achieving her goals and inspiring the next generation of skilled trades workers.

Gardipy's journey into the skilled trades began in high school when she discovered a passion for working with her hands during shop class. After spending several years in the oil industry, she decided she wanted a change one that allowed her to be home with her family instead of living out of a suitcase for extended periods.

Gardipy's family has also been a major source of support, particularly her partner, mom, and late aunt, who encouraged her to pursue a career in welding.

In 2021, Gardipy enrolled in a sixmonth course at Saskatchewan Polytechnic, and in 2022, she became a welder apprentice through the Saskatchewan Indian Institute of Technologies.

"I love what I do. I was fond of welding right from high school," Gardipy says. "To work on [welding projects] like this, it's a big confidence booster."

While demand for workers in the skilled trades are increasing in Saskatchewan, women continue to be underrepresented in the skilled trade workforce. According to the Kalene Gardipy is a third-year welder apprentice.

Saskatchewan Apprenticeship and Trade Certification Commission's (SATCC) 2023-24 annual report, women only represent 11 per cent of all apprentices. In trades where women are underrepresented, such as construction electrician, plumber, and welder, that percentage drops to just under eight per cent.

To address these gaps, the SATCC has implemented the Women in Skilled Trades Initiative (WISTI) to remove barriers and encourage more women to pursue careers in skilled trades.

Beginning in January 2024 until June 2026, and funded in part by the Government of Canada's Canadian Apprenticeship Strategy, the WISTI offers a number of benefits and supports to help women enter the skilled trades and achieve journeyperson certification in 28 eligible Red Seal trades including carpenter, sheet metal worker, machinist, and welder, to name a few.

One of the benefits aims to reduce financial barriers for new female apprentices. Women who register in one of the eligible Red Seal trades will receive a rebate on their apprenticeship registration fee, as well as Level 1 technical tuition training. In addition to financial supports, the SATCC has also employed two dedicated female mentor apprenticeship services consultants for women apprentices. They offer coaching and mentorship to women thinking of entering the trades, as well as to current female apprentices. They also assist employers in creating more inclusive and supportive workplaces. By providing mentorship and creating a robust network of resources, the SATCC strives to create an environment where women apprentices can successfully navigate and overcome the challenges they may face in these industries.

Katilyn Hitchcock, one of the SATCC's female mentors, knows the importance of having a strong support system to be successful. As a Red Seal construction electrician, she was fortunate to have a supportive employer and mentors throughout her apprenticeship, but she also understands the challenges women face in an industry where they are underrepresented.

"I want to support women in the skilled trades by listening to their stories and providing them with the resources to be successful," says Hitchcock.

"The women I've met with have expressed appreciation for this mentorship program. We are able to provide them with the resources and guidance they need to thrive at work and in technical training, which sets them up to succeed and eventually achieve certification."

Gardipy is an example of how



While demand for workers in the skilled trades are increasing in Saskatchewan, women continue to be underrepresented in the skilled trade workforce.

positive work environments are crucial to success. She has found a supportive and empowering community with her employer, Keys Welding Service.

"The company is super supportive," says Gardipy. "They want you to succeed in the trades."

For Gardipy, positive mentorship has played a key role in her growth as well.

"Mentorship is really important because there are people that push you and become a better person and reach your goals," she says.

Two of her close friends are journeyperson welders, and they have guided Gardipy through the early stages of her apprenticeship, helping her navigate the registration process and settling into her role.

"They helped me register and get

everything in order. I work with them now, and they still guide me today," she says.

Gardipy has found not only a great career but also a fulfilling work-life balance. "I get to come home to my son and partner every night," she says.

Looking ahead, Gardipy is determined to achieve her Red Seal certification and eventually purchase her own truck. In addition, she wants to show young people and women, especially from First Nations communities, that the skilled trades offer a viable and rewarding career path.

"My future here is to inspire the younger generation, so that you can get into a trade," Gardipy says. "It doesn't matter what trade you want; the opportunities are always out there. My advice for others who want to be in the apprenticeship program is 'just go for it!"

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Exploratory sessions offer participants the chance to learn about a few trades at once.

WITT offers supports to women pursuing education in non-traditional careers.

Saskatchewan Polytechnic helps women explore careers in the trades



Women in Trades and Technology, powered by Orano events, leads to new career for participants

Cheyanne Reimer looks forward to starting her career, one she didn't expect for herself. She decided to take a leap and experience handson careers through an exploratory event organized by Saskatchewan Polytechnic's Women in Trades and Technology (WITT), powered by Orano.

"By participating in the WITT exploratory sessions and weekend workshops, I felt so confident going in and learning something I knew nothing about. The

experience helped me realize I could be good at the trades. I felt supported enough to try something I didn't know I could accomplish," Reimer explains.

Exploratory sessions offer participants the chance to learn about a few trades at once, says WITT program head Allison Zerr.

"Through WITT, participants try different options. To help us determine programs to showcase. we use feedback from the community on what they want to

see, and we do the same with the industry to see what the needs are," says Zerr.

With several trade programs in mind, Reimer faced a tough decision about which one to choose to further her education. As she weighed her options, she reached out to Zerr for advice.

"Allison is my mentor. She's the reason I applied for the Welding certificate program. I look up to her greatly," Reimer confides. On track to complete the program

in the spring, she said her next step will be apprenticeship before going for her Red Seal/ journeyperson certification.

Zerr is thrilled to be part of students' learning journeys.

"I'm extremely honoured by Cheyanne's comments. I think back to my mentors and how they've been impactful. It means a lot to me," says Zerr. "That's why I do what I do, to help make a change, guide, and impact students' lives."

Trades continue to be underrepresented careers for women, but Reimer is part of a growing number of women entering the industry. She thinks it's important to pave the way for others. She adds that she loves working with her hands and welding is a very hands-on profession.

"I like to push boundaries," says Reimer. "I want more women to join the trades and feel comfortable in the shop. It has been really exciting to learn with other women. We're all friends. It's a nice support system. It's comforting to know you have people in the same boat as you even though your backgrounds may be different."

Zerr has witnessed a shift in the trades. She started at Sask Polytech as a helper for the Prince Albert summer camp in 2014. Since then, she has gone from being a casual instructor to a fulltime instructor and transitioned to the role of WITT program head in 2018.

"We're offering way more programming. We've gotten to a point where there's more of a need. The WITT, powered by Orano Young Women's



Conference, used to have 20 to 30 participants. Now there are 100 in attendance. We're able to provide more opportunities," she explains. "With the industry pushing for equity and equality, there's increased support for what we're offering. Employers are seeing the advantage of diversifying."

Reimer looks forward to seeing other women in the shop and in the field. Eventually, she would like to make her way back to WITT and Sask Polytech as an instructor. Until then, she has advice for others thinking about joining the trades. "Do it even if it scares you. I was so nervous when I got in. There were so many unknowns. Everything in life is scary, but it's still worth doing, as intimidating as it is," says Reimer. "Welding makes me feel empowered. It makes me feel strong."

WITT offers supports to women pursuing education in nontraditional careers. Learn more about program-specific tutors, mentorship opportunities, dropin consultations, networking opportunities, campus tours, and career development at Women in Trades and Technology (WITT), powered by Orano. ▲

Leading at the forefront for 25 years – An improved reality through modeling and simulation

Potash mines are complex operations, with hundreds of people, thousands of moving parts, and millions of tons of potash produced annually. Digital technology continues to be a major area of growth in modern mining - assisting design, providing automation, and improving safety at every stage of the production cycle. Advanced modeling and simulations are slowly but surely being adopted in the mining industry due to the certainty and intelligence that they provide the end user to make informed decisions about system additions and upgrades.

At March, we continue to strengthen our skills in advanced simulation techniques such as Discrete Element Method (DEM), a first-principles method for modeling the behaviour of granular materials. DEM uses a virtual material model consisting of discrete particles. During simulation, the resultant force, acceleration, velocity, and position of each particle are tracked through time as they interact with structures and other particles. When repeated for a large assembly of particles, this method can replicate the behaviour of materials such as soils, ores, powders, and bulk solids, providing a level insight and understanding not possible using traditional methods of analysis. Leveraging modern advances in parallel computing, it is possible to simulate systems consisting of tens of millions of particles, making DEM a practical tool for the analysis of many industrial-scale problems.

For both greenfield and brownfield projects, DEM simulation can provide a benefit to owners looking to increase efficiency and reduce uncertainty regarding project success. For applications involving flow or processing of granular materials, DEM simulation provides the ability to confirm design performance targets and identify problems early in the design cycle, avoiding costly troubleshooting and post-install modifications. High-detail quantitative analysis allows for processes to be optimized

for performance, capacity, wear, and dust emissions, to name but a few. Simulation can accelerate the development cycle by reducing the number of iterations, prototypes, and experiments to be conducted. It is also a powerful visualization tool, making detailed information accessible to all stakeholders. Physics-based simulation, such as DEM, can provide incredible value to the design process for material handling systems in mining.

The applications for simulation are extensive. March has successfully employed DEM simulation in a variety of applications found in Saskatchewan's potash mines. Some examples include:

- Transfer chutes flow simulation allows our design team to identify and remove flow choke points, ensure smooth transitions to reduce dust generation, and identify areas of high chute or belt wear.
- *Roll crushers* multiple iterations of a crusher's feed chute can quickly be evaluated using DEM to ensure the

For applications involving flow or processing of granular materials, DEM simulation provides the ability to confirm design performance targets and identify problems early in the design cycle, avoiding costly troubleshooting and post-install modifications.



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achievement of optimal crusher performance and service life, maximizing return on investment.

- Hopper flow DEM is perfect for confirming target flow rates from hoppers and feeders, and it is also possible to extract forces on the geometry for structural analysis to ensure components are sized to handle the high storage capacities demanded of them.
- **Conveyors** analysis of conveyor loading chutes can help to reduce belt wear, avoid uneven loading, and prevent belt tracking problems, leading to less downtime and fewer maintenance calls.

While DEM itself is a powerful tool, the most advanced industrial applications often require a multi-physics approach. Coupled simulations address this need. wherein information is exchanged between multiple simulation codes. For example, DEM can be coupled with Computational Fluid Dynamics (CFD) to model processes which involve both fluids and solid particles (e.g., a fluid bed dryer), or with a Multi-Body Dynamic (MBD) software if there is a complex interaction between machine and material. Particle forces on geometry can also be exported for direct use in Finite Element Analysis (FEA) to provide highly accurate loading conditions for structural analysis.

Coupled simulations allow for even the most complex problems to be understood. March has the capability to combine any of these technologies best suited for the application. Check out this video for more information: www.youtube.com/ watch?v=L5TtvNsGSOg

March Consulting Associates Inc. is a multi-discipline engineering company with the digital simulation tools, software, and expertise for any number of applications, from routine to challenges at the forefront of the industry. If you believe these tools could help improve the reality of your project, contact us today.

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Indigenous Manufacturing and Contracting Network (IMCN): Empowering Indigenous businesses and communities



The Indigenous Manufacturing and Contracting Network (IMCN), an Indigenous-led and governed non-profit organization, is committed to advancing economic opportunities for Indigenous communities across Canada. By focusing on the manufacturing and contracting sectors, IMCN works to increase opportunities for Indigenous businesses and individuals while building their capacity and fostering long-term growth.

Driving economic inclusion and capacity building

IMCN's mission is to support Indigenous businesses in the manufacturing and contracting industries by increasing access to capital, investment opportunities, and business development resources. The organization plays a critical role in helping Indigenous entrepreneurs and companies build professional capacity, expand their networks, and create sustainable growth. Through its services and initiatives, IMCN helps bridge gaps and ensure that Indigenous communities have the tools and opportunities needed to succeed in competitive industries.

"Our focus is on empowering Indigenous businesses and professionals by providing them with the resources and support they need to thrive," said Shaun Howdle, IMCN's board chair. "By strengthening Indigenous businesses in manufacturing and contracting, we contribute to the long-term economic prosperity of Indigenous communities, creating opportunities that can be passed down to future generations."

Leadership in industry advocacy and reconciliation

IMCN is the first Indigenous-led, membership-based network in the manufacturing and contracting sectors. The organization advocates for Indigenous businesses and communities, ensuring their voices are



Through its services and initiatives, IMCN helps bridge gaps and ensure that Indigenous communities have the tools and opportunities needed to succeed in competitive industries.

represented in policy discussions, procurement processes, and industry initiatives. IMCN works actively to promote Indigenous values and perspectives in the design and implementation of industry practices, contributing to the broader conversation on Reconciliation.

"Our work is grounded in the belief that Indigenous economic inclusion benefits everyone," Howdle added. "By creating strong partnerships between Indigenous and non-Indigenous industries, governments, and communities, we can build a more inclusive and sustainable economy that benefits all Canadians."

Core services and support for members

IMCN provides a range of services designed to support the growth and development of Indigenous businesses and professionals in the manufacturing and contracting industries:

• Capital access and investment opportunities: IMCN helps Indigenous businesses secure the capital they need for growth, connecting them with funding sources and investment opportunities that fuel long-term success.

- Business development and capacity building: The organization offers resources, mentorship, and training that help Indigenous businesses strengthen their operations, improve efficiency, and increase competitiveness in the marketplace.
- Networking and collaboration: IMCN organizes workshops, conferences, and networking events to help members connect with potential partners, industry leaders, and government representatives.
- Advocacy and policy representation: IMCN actively participates in policy discussions and industry forums to advocate for policies that promote equitable access to procurement opportunities, contracts, and industry development for Indigenous businesses.

A growing network with expanding impact

As an established and influential voice for Indigenous businesses, IMCN is committed to expanding its reach and strengthening its network of members. The organization serves as a convener of Indigenous and non-Indigenous industry leaders, fostering

creating opportunities for Indigenous communities in the manufacturing and contracting sectors.

> collaboration and ensuring that Indigenous businesses have a strong presence in the manufacturing and contracting sectors.

"We are focused on growing our network and expanding our impact," said Howdle. "Our role as an advocate, educator, and resource provider for Indigenous businesses has never been more important, and we look forward to continuing to support our members as they grow and succeed."

Through its work, IMCN continues to be a driving force in creating opportunities for Indigenous communities in the manufacturing and contracting sectors. By promoting Indigenous business growth, advocating for policy change, and fostering collaboration, IMCN is helping to build a stronger, more inclusive Canadian economy.

For more information about the Indigenous Manufacturing and Contracting Network, visit imcn.ca. ▲



Increasing fertilizer demand creates opportunity for profit

Facilities can boost production (and spur long-term growth) with investments that prevent unplanned downtime

Growers are facing the diminishing availability of suitable farmland, and arable soil can lose its natural nutrients over time.

BY ANDREW PARKER, PRESIDENT, CDM SYSTEMS, INC.

stems.

The global fertilizer industry is seeing unprecedented growth and record-setting prices.

And with the global population expected to reach nearly 9.7 billion by 2050, the need for better crop yields will continue to push the demand for fertilizer.

Additionally, growers are facing the diminishing availability of suitable farmland, and arable soil can lose its natural nutrients over time. Those growers will need more fertilizer – which will cause demand and prices to stay sky high.

The upside is significant profits for fertilizer facilities that are able to consistently meet high demand as the global market continues to grow.

Fertilizer market figures:

Annual market value = \$182.2 billion (2021), expected to be \$254.87 billion by 2030.

Compound Annual Growth Rate (CAGR) = 3.89 per cent from 2021-2030. To take advantage of the escalated price and demand on products like potash, urea, and monoammonium/diammonium phosphates, fertilizer operations must produce higher volumes at a faster pace. That's much more difficult with equipment that's prone to failure.


Production interruptions threaten to reduce significant profits

Older machinery cannot efficiently handle rigorous schedules that ramp up production levels – especially for 24/7/365 operations. Thus, fertilizer facilities are seeking ways to eliminate the threat of costly downtime from failed equipment.

That's why dependable conveyors are so critical for fertilizer operations.

The more reliably they function, the more material – whether dry, caustic, or wet – can be transferred from one part of the facility to another. This improved efficiency helps crank up production – and sends profitability soaring.

Certain planned downtime is expected. Whether it's



As of December 2022, potash has an average per-ton cost of \$807.

preventative maintenance, hardware updates, or anything else that requires your attention, facilities can plan for those types of minimal production interruptions. But unplanned outages can be costly.

Even catastrophic.

Production interruptions threaten to reduce significant profits

As of December 2022, potash has an average per-ton cost of \$807. At this price, a small-to-midsize operation could easily lose more than \$100,000 per hour and



CDM Systems, Inc. 19230 Evans St. NW Suite 202 Elk River, MN 55330 | cdmsys.com



potentially millions in lost profits per day if equipment failures occur. Millions. Therefore, it is crucial conveyors are designed specifically for fertilizer and the problems that come with the corrosive nature of material like potash.

The right conveyor design should include:

- Components built to handle increased fertilizer volume
- Optimal operation and design parameters
- Thorough material and environmental data analysis
- Built to handle the stress of increased capacity

The design-to-task efficiency

of the individual components is what leads to dependable conveying. Poorly designed or ill-equipped systems will cost you more in the long term because of the increased frequencies of maintenance and downtime. To keep production strong, operations must successfully manage this threat.

Reliable conveyors contribute directly to expansion and profitability

Facility and maintenance managers understand the need for a conveyor built for fertilizer. With prices high, successfully boosting production capacity helps a business to expand. But how do you get there?

It is crucial conveyors are designed specifically for fertilizer and the problems that come with the corrosive nature of material like potash.

One-size-fits-all conveyor systems may seem like a budget-friendly answer for expanding capacity. But often, such systems are not purpose-built for the application - whether that's the level of capacity, the characteristics of fertilizer, or the intricacies of a site's layout. This inevitably leads to equipment failures. Given the symbiotic relationship between unplanned breakdowns and profit loss, a present-day investment in the right conveyor is key to "big picture" profitability and growth.

This is where the conveyor manufacturer is an important partner.

It is essential to thoroughly understand the properties of an operation to spec out the right equipment for the job. Customengineered conveying systems with flexible chain formulas and durable construction mean your operation is set-up for the long haul.

This gives managers peace of mind. That's because they have a conveyor built to eliminate downtime and keep production – and profits – flowing.







Given the symbiotic relationship between unplanned breakdowns and profit loss, a present-day investment in the right conveyor is key to "big picture" profitability and growth.

Summary

- Global agricultural markets are increasingly dependent on fertilizers
- Fertilizer demand continues to rise, creating major profit opportunities
- High fertilizer output required to meet demand will put stress on handling equipment
- Customized conveyors built for fertilizer are key to meet increased production goals

Andrew Parker is president for CDM Systems, Inc. He has more than 20 years of experience in the bulk material handling industry. He oversees operations including conveyor design and development.

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Enhancing safety in potash mining

Advances in shock protection and evolving electrical codes



The potash mining industry is crucial for global agriculture. providing essential nutrients for crop production. However, the industry faces significant safety challenges, particularly concerning electrical hazards. This article explores recent advances in shock protection, focusing on the use of Special Purpose GFCIs (SPGFCIs) in mining operations. Additionally, we will discuss the latest updates to the CSA M421 Electrical Mining Code and other changes in Canada's electrical standards aimed at enhancing worker safety.

Complex industrial loads require a more advanced form of shock protection

Electrical safety in potash mining is paramount, given the harsh and often unpredictable underground environment. As loads and system voltages increase, the shock hazards are just as prevalent, and costly, as they are for smaller 120V circuits. While shock protection used to be limited to 150V singlephase loads, three-phase loads up to 600V can now be protected with the introduction of the Littelfuse Shock-Block®. These SPGFCI devices are designed to provide sensitive ground-fault protection, as well as groundcheck protection, required in Canadian mining operations to meet the CSA M421 Electrical Safety Standard.

Case Study: Potash mine shaft sinking

During the sinking of the potash shaft for a major mining company, they used a Galloway to provide a multi-level platform for workers to operate equipment and work on the shaft wall. These workers were in close contact with electrical equipment in a rough and potentially wet environment. Welding is one activity involving the use of equipment connected with a portable power cable to couplers on the various levels of the Galloway. After being made aware of the Shock-Block GFCI technology for these industrial voltages, Shock-Block devices were employed to enhance the safety of the welding operations. These devices measure groundfault currents and interrupt the electrical circuit before a worker can receive a harmful shock. In addition, Class C, D, and E GFCIs include a ground monitoring circuit, which ensures a proper

After being made aware of the Shock-Block GFCI technology for these industrial voltages, Shock-Block devices were employed to enhance the safety of the welding operations.



grounding circuit is in place before the circuit can be energized in the first place. The use of Shock-Block technology significantly reduced the risk of electrical accidents, ensuring a safer working environment for miners.

The adoption of the Shock-Block underscores the safety culture that exists in this company and the industry. To learn more, visit Littelfuse.com/ShockProtection.

CSA M421 Electrical Mining Code

The CSA M421 Electrical Mining Code is a critical standard that governs electrical safety in mining operations in Canada. In 2023, the code updates reflect practical issues experienced in the field and aim to address the evolving needs of the mining industry.

One example is new text related to calculating the touch potential, which is the voltage that someone could be subjected to when touching the metal frame of equipment with a fault inside. This update aligns with the practical challenges faced in larger mining operations, where the scale and complexity of electrical systems have increased.

An important system design parameter contained within CSA M421 code is the use of highresistance grounding (HRG) systems. HRG systems limit the resulting fault current when there is a phase to ground fault, significantly reducing the risk of arc flash incidents, while still allowing protection devices to measure the current and quickly deactivate the faulted equipment.

NGR monitoring

The grounding resistor used in these systems becomes a critical component, as an open resistor will change the system to be ungrounded, and the normal ground-fault protection will not operate. For this reason, CSA M421 has long required continuous monitoring of the neutralgrounding resistor (NGR), and system de-energization when an open resistor is detected. This is another example of the commitment of the mining industry to employ advanced technologies to ensure system reliability and safety.

Following in the footsteps of the mining industry, the Canadian Electrical Code added requirements for monitoring of NGRs starting with the 2018 edition. This marks another step forward in electrical safety, as it is now applicable to all applications and industries across Canada that follow the Canadian Electrical Code.

Conclusion

Advances in shock protection, such as the use of SPGFCIs, and updates to electrical codes, including the CSA M421 and other Canadian standards, are crucial steps in enhancing worker safety. As mining operations become larger and more complex, the commitment to safety must remain a top priority. Through ongoing improvements in technology and standards, the potash mining industry can continue to safeguard its workers and ensure sustainable operations. ▲



A2Z Safety & Training Ltd. – The origin story

In late 2008, Trevor Montgomery, a proud Metis entrepreneur, saw a need for safety training to help others become qualified to work in the oil patch. Beginning with first aid, H2S alive, fall protection, confined space training, ground disturbance, and your typical WHMIS and TDG, Trevor set up his office in downtown Prince Albert. A single instructor and owner, he worked hard to build up clientele while his mom, Barb Heidt, worked alongside to manage the administration tasks. His second-born son Ashton was often in the office helping and learning the ropes. With a few trusted contractors, he was able to offer his services remotely and expanded to taking over a large reception area and three new offices in addition to his classroom.

In the summer of 2010, he met his now-wife Elizabeth at the Prince Albert Exhibition Trade Show. With a psychology background and 10 years of experience in the addictions and mental health field, she was able to provide support and organization to A2Z. She left the public sector to work with Trevor when his mom retired and joined A2Z Safety in the private sector. Taking additional training related to business, she shifted her focus and helped A2Z Safety & Training grow even further. By this time, Trevor had recruited several highly skilled

A2Z Safety & Training has long-standing clients who return to the classroom, have us come to the community, or go on site to location.

instructors which allowed on-site training to flourish. Trevor was also expanding his services to almost all industries of work.

Ashton graduated high school early in 2016. With his experience in the private family business, he left to go work for industry and gain real hands-on experience having most of the theory already mastered. This led him to exponential growth and by 2018 was back working full time in the office and earning the title of junior instructor.

Continually updating and expanding his training, knowledge, and service areas, Trevor goes with the flow of the industry, watching governing bodies of safety training expand and merge themselves. The industry is always needing to be updated with the best safety practices and Trevor ensures his employees and contractors are well trained and have experience in the industry for their teaching. A2Z Safety is a certified provider of Energy Safety Canada, Canadian Trainers Foundation, Global Ground Disturbance. St. John Ambulance, Tourism Saskatchewan, Saskatchewan Trapper Certifications, and is DATAC accredited. A2Z Safety & Training Ltd.'s industry basics are widely recognized throughout the oil and gas, mining, tourism, health, and various ministries of the government sectors.

A2Z Safety & Training has long-

standing clients who return to the classroom, have us come to the community, or go on site to location. At the end of 2024, we closed the year with Ashton as general manager.

As we look forward to the years ahead, A2Z Safety & Training continues to build new training courses and resources to offer with respect to our mission statement.

Our mission is to provide practical, focused, and relevant training programs and services.

You can find us online at a2zsafety.ca, or toll-free at 1-855-756-2884 for information on safety and training. ▲

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Navigating potash processing challenges with robust equipment solutions

Common potash processing

moisture from the environment

poses several challenges during

production. This hygroscopic

quality can lead to clumping,

sticking, buildup, and caking

issues during pelletizing, drying,

handling, and storage. Ultimately

challenges

Clumping and caking

Potash's ability to absorb

BY SHANE LE CAPITAINE | PROCESS SALES ENGINEER, FEECO INTERNATIONAL

Potash's unique qualities, combined with the high capacities at which it is processed, can present significant challenges to producers if equipment is not adequately designed.

In selecting a manufacturer, be sure to find one that is familiar with the specific challenges potash presents, and can design and manufacture equipment suited to its needs.



FEECO

this translates into product loss, increased downtime and maintenance expenses, and in some cases, safety risks.

While facility and product moisture management to abate these risks must be a primary focus at potash operations, equipment should also be designed to minimize any potential clumping or caking. Designing around this hygroscopic nature can be broken down into three primary categories:

Materials of construction: Materials of construction, as well as surface treatments and coatings, play an important

The illustration shows how a coating drum promotes uniform product coating through granule-to-granule contact facilitated by the tumbling material bed. Head section of self-supporting, supercapacity bucket elevator for potash handling.

role in mitigating the potential for clumping and caking in equipment. Smooth finishes, such as the use of polished stainless steel, discourage material from catching and accumulating in equipment.

Managing buildup: Despite careful selection of materials of construction and surface treatments for equipment, some buildup is still possible, requiring further preventative measures.

Potash's sticky nature makes conveyors particularly prone to carryback, or the sticking of material onto the underside of the belt after discharge. This allows material to migrate to idlers and other mechanical components, potentially clogging up equipment and causing corrosion over time. Dual-belt cleaners are recommended to manage carryback and prevent fugitive material from navigating to unprotected components.

Clumping and buildup is also common during the drying stages of processing, where moisture content is generally higher. The use of knockers on rotary dryers and flexible liners in granulation drums is useful in this effort, dislodging any clumped material from the drum's interior.

Product coating equipment selection: Caking of finished potash products is also a serious concern and is widely addressed through coating granules with anti-caking agents.

Producers employing this



technique must consider that the coating is only as good as its application; a granule must be completely coated to prevent moisture from infiltrating the granule and beginning the formation of crystal bridges (the origin of caking).

This need for maximum coating uniformity makes the selection of proper coating equipment essential. In this case, a coating drum can offer more uniform coating compared to alternatives, as a result of the rolling action that occurs in the material bed, which helps to evenly distribute the coating.

Because coatings and granule properties vary widely, producers should conduct testing in a process development facility such as the FEECO Innovation Center to establish process criteria and ensure consistent results.

Corrosive properties

Potash is notoriously corrosive and can quickly degrade equipment if not properly addressed through initial design and construction.

Because increased moisture accelerates corrosive action, corrosion is especially problematic when working with potash in a high-moisture state; any surfaces or components in contact with the wet material should be fully seal-welded and welds ground down to a smooth surface to prevent areas where material could potentially catch and accumulate.

One effective approach to preventing corrosion during the drying process (where moisture content is high) is to construct the inlet area of the rotary dryer with an alloy or stainless steel. This provides protection from corrosion until further down the drum where the material's moisture content has been sufficiently reduced so as not to be destructive to carbon steel.

Heat sensitivity (discoloration)

Potash can also exhibit sensitivity to heat, particularly as a

finished product. If not careful, overheating potash could result in product degradation (increased attrition) and discoloration.

To avoid the risk of overheating potash, FEECO recommends a co-current flow rotary dryer. The co-current configuration puts the hottest combustion gases in contact with the material during its wettest state. This promotes an initial reduction of moisture and then a more gradual, gentle drying action as the material moves down the length of the dryer.

In contrast, a counter-current dryer would expose the product to the hottest combustion gases at the outlet, where the material is in its driest state, increasing the potential for discoloration and product breakdown due to high heat exposure.

The incorporation of a combustion chamber is also useful in maintaining product integrity when drying potash, as it prevents direct contact between the material and burner flame.

Attrition

Attrition, or the breakdown of product into dust and fines, is a concern with any potash product, but it is especially troubling with granules produced via compaction granulation. This is due to the jagged, irregular edges that rub together and break down.

While glazing (spraying the

hot potash with a mist of water to cause crystallization of the granule surface) offers an effective approach to reducing attrition, the effect can be enhanced by conducting the glazing process either within the rotary dryer (at the outlet), or in a separate polishing drum.

In both cases, the rolling and tumbling action of the bed imparted by the rotating drum helps to polish granules, breaking away any loose edges.

Attrition is less of a concern with granules produced via wet granulation methods, but the use of a rotary dryer for the finished product can still offer some benefit, further polishing the rounded granules.



High processing capacities

The large-scale production common in potash processing settings requires equipment that can handle substantial volumes while maintaining efficiency and reliability. Equipment must be robust enough to manage the high throughput, without compromising on performance.

Equipment must be backed by incredibly robust engineering and fabrication, and underpinned by strict quality control practices.

In addition to selecting proper materials of construction, this translates to following tight tolerances, as well as ensuring precision welding and expert fitting. In selecting a manufacturer, request quality control documentation and look for proven reliability through case studies, project profiles, or customer references.

Maintaining potash equipment

As important as it is to choose the right equipment, it is equally important to select an OEM that can support the equipment after the sale; even the most welldesigned equipment must be properly maintained to ensure continued reliable operation.

The demanding conditions potash equipment operates within make regular maintenance and routine monitoring even more vital in minimizing unnecessary downtime and prolonging equipment life.

Conclusion

While potash can be tough on production and handling equipment, designing equipment around potash's unique characteristics and high throughput, as well as following maintenance recommendations, is the best way to ensure reliable, long-lasting equipment. Always work with a manufacturer with proven experience that can tailor equipment to potash production conditions and continue to support their equipment after the sale. ▲





With years of experience working on the heavy-duty equipment that drives potash mining, IPS is highly skilled in servicing the motors that power essential mining processes.

Equipment failure. Lost productivity. Downtime. When you add it up, research indicates the cost of unplanned downtime can amount to as much as \$15 billion in the mining industry on an annual basis and could end up claiming 35 to 50 per cent of your operating budget. So, it stands to reason that minimizing these costs will increase profitability.

"We play a pivotal role in reducing unplanned downtime for our customers in the potash mining industry," says Brad Beebe, vice-president and regional general manager at Integrated Power Services (IPS). "We deliver 24/7 specialized repair and field services for electric motors, generators, mechanical equipment and power management systems to decrease downtime and maintain productivity in mining operations."

Expertise in potash mining

With years of experience working on the heavy-duty equipment that drives potash mining, IPS is highly skilled in servicing the motors that power essential mining processes, from underground borers and belts to surface processing equipment in the mill. The maintenance and repair of large hoist motors, which are crucial for continuous operations, as well as medium-voltage drives, switchgear, circuit breakers, and transformers, are other key areas of IPS expertise.

When time is money

IPS supports potash mining with expertise and reliability

24/7 support

"We provide 24/7 field service support, deploying teams directly to mining sites when equipment issues arise," explains Beebe. "Our field service technicians have extensive experience in conducting on-site repairs, using predictive technologies, performing diagnostics, and carrying out preventative maintenance, even under the most challenging conditions. We're equipped and ready to handle any mechanical and electrical failures in real time."

All major OEMs

IPS has become synonymous with quality, offering comprehensive in-shop repairs and servicing equipment, from the smallest AC/ DC motors to the largest rotating machinery.

"We service motors and generators from all major OEMs, including WEG, Toshiba, and ABB. We stock a wide array of components for these brands," says Beebe. "This ensures that no matter what type of motor or generator a company uses, we will have the tools, parts, and knowledge to repair it properly."

More service centres

The recent acquisition of ABB service shops in Canada has further bolstered IPS's capacity to serve the potash mining industry.

"The integration of these additional service centres into our existing network in Canada has expanded our ability to provide faster, broader, and more comprehensive support," explains Beebe. "We strive to be the dependable advisor our customers can rely on, serving as a single-source supplier to address their most complex problems in power management, electromechanical systems, and rotating equipment."

Long-term partnerships

IPS works closely with its clients to understand their needs and deliver customized solutions that minimize disruption to operations. Whether a customer requires an urgent repair, a detailed maintenance plan, or on-the-fly support in the field, their goal is to ensure they deliver the most efficient and seamless solutions. They focus on building trust and delivering service that exceeds expectations to support the development of long-term partnerships with their customers.

Experience & reliability

In an industry where downtime



directly impacts the bottom line, having a reliable service partner is essential. IPS has established itself as a leading provider of repair and field services for the potash mining sector, offering both technical expertise and a deep understanding of the specific needs of mining operations.

"Our strength lies in our ability

to respond swiftly, rethink strategies, and resolve issues effectively," concludes Beebe. "By providing timely repairs, an unmatched customer experience, and responsive field service, we ensure that our potash mining customers maintain productivity and meet their operational goals."

Custom compressor solution for Nutrien's Allen potash mine





Concerned about air quality and the harmful effects of diesel emissions in confined spaces, Nutrien required a reliable alternative to diesel-powered compressors for their underground operations.

Nutrien selected the Sullair 3709V, a 50 HP model, known for its durability and performance.

At Comairco, we recently had the opportunity to collaborate with Nutrien's Allen potash site in Saskatchewan to deliver a customized solution that meets their underground emission management needs. Concerned about air quality and the harmful effects of diesel emissions in confined spaces. Nutrien required a reliable alternative to dieselpowered compressors for their underground operations.

Unfortunately, nearly all the standard electric air compressor packages on the market are optimized for the manufacturing sector, so many of the components are selected for a relatively clean, indoor

environment. While these packages are rugged enough for the vast majority of industrial sites, they cannot account for the highly corrosive atmosphere of a potash site.

The client specifically requested an electric-powered compressor package that could be easily transported and operated underground. After careful consideration, Nutrien selected the Sullair 3709V, a 50 HP model, known for its durability and performance. Comairco took on the challenge of designing and assembling two specialized compressor packages to meet Nutrien's unique requirements.

Tailored solution to meet specific needs

The project took four months to complete, during which we built two trailer-mounted packages, each with dual axles for easy transportation. Nutrien needed a system that could handle the rugged underground environment, so we incorporated foam-filled tires to prevent punctures and damage. To further stabilize the units, each trailer was equipped with stabilizer jacks at all four corners.

Safety was another key concern for Nutrien. While they opted not to include the full fire suppression system we offered,

Nutrien needed a system that could handle the rugged underground environment, so we incorporated foam-filled tires to prevent punctures and damage.

they did choose to install fire extinguishers. Additionally, we integrated a phase-monitoring panel to ensure correct voltage alignment during connection to the underground power supply. This precaution prevents any risk of phase mismatches, which could damage the compressor.

Sullair's 3709V package includes an integrated variable frequency drive (VFD) as standard. Using the VFD to start the main motor eliminates current in-rush during startup, which eases the load on the underground electrical system. The VFD also allows the compressor to speed up and slow down to match supply to demand, saving significant electricity usage.

Built for the toughest conditions

The compressors were designed to be robust enough to spend their entire lifecycle underground, operating in tunnels ranging from five to eight kilometres in length. One primary use is blowing down equipment, particularly cleaning off the boar heads used in tunneling operations. With the added convenience of 180 feet of cable, the units can be easily



The project took four months to complete, during which Comairco built two trailer-mounted packages, each with dual axles for easy transportation.

connected to the power grid wherever needed.

We also equipped the trailers with additional door latches to ensure the doors remain securely closed during transportation. D-rings were included to facilitate the lifting and maneuvering of the units in confined spaces underground.

Successful delivery and positive feedback

Nutrien has been highly satisfied with the solution provided, especially regarding the ease of use and the attention to detail in the design. The units were delivered and assembled in Regina before being sent to the mine site, and since their deployment, the feedback from Nutrien has been overwhelmingly positive.

Comairco has been a critical supplier to the North American mining industry since 1972, and offers a wide variety of products and services related to air compressors, blowers, and vacuums. Compressor customizations have been an important part of Comairco's business since day one, and they now have the facilities and expertise to offer fully custom packages.

This project exemplifies Comairco's commitment to providing tailored, turn-key solutions that meet the specific needs of our clients, especially in demanding environments like underground mining. ▲

Advancing manufacturing for the potash industry: Standard Machine's strategic investments



At Standard Machine, we understand the critical role that precision engineering plays in the potash industry, where equipment longevity and reliability are paramount.

The Höfler 2000 XL is perfectly suited for the oversized gears commonly required in potash mining machinery.

At Standard Machine, we are deeply committed to advancing our manufacturing capabilities to support the growing demands and technical requirements of the potash industry. This commitment has driven us to make strategic investments in cutting-edge machinery that expands our ability to deliver high-precision, large-scale machining solutions essential for potash mining operations. Our acquisition of the Höfler 2000 XL Gear Grinder and the Fermat WRF 150 CNC Horizontal Boring Mill is part of our strategy to enhance efficiency, precision, and innovation for our clients in the potash sector.

The Höfler 2000 XL Gear Grinder,

one of the most advanced grinding machines on the market, has set a new standard in precision for large-scale gear production. As the first of its kind in Canada to feature wobble compensation technology, it reduces concentricity issues, leading to a significant improvement in both setup time and grinding accuracy. This innovation directly translates into faster turnaround times and more consistent quality-key advantages for the production of potash mining equipment, where gear reliability is essential.

With its extended stroke length and ability to accommodate larger grinding wheels, the Höfler 2000 XL is perfectly suited for the oversized gears commonly required in potash mining machinery. These gears are critical components in the transmission of power and torque within mining equipment, where even a minor defect can lead to costly downtime. By employing the Höfler 2000 XL, we can produce high-precision gears with minimal error, ensuring the durability and performance demanded by heavy-duty mining operations.

In addition to the Höfler 2000 XL, our capabilities are further strengthened by the Fermat WRF 150 CNC Horizontal Boring Mill. This machine is designed to handle massive components up to 10 feet in diameter and weighing as much as 44,000 pounds, making it ideal for the potash industry's heavy-duty requirements. The Fermat WRF 150 offers unparalleled precision, achieving tolerances within 0.0005 inches. Its versatility allows us to efficiently perform both roughing and high-precision machining on components of varying sizes. This capability enhances our flexibility and allows us to meet complex and specific demands from our potash industry clients.

These recent investments underscore our dedication to supporting the potash industry with solutions that meet the highest standards of quality and reliability. The Höfler 2000 XL and Fermat WRF 150 are essential assets in our production process, allowing us to deliver components that are built to last, even in the harshest mining conditions. For our clients, this means equipment that not only meets precise technical requirements but also maximizes uptime and operational efficiency.

At Standard Machine, we understand the critical role that precision engineering plays in the potash industry, where equipment longevity and reliability are paramount. Our state-of-the-art machinery, coupled with awardwinning project management, reflects our commitment to delivering manufacturing excellence. We continually invest in the best technologies and expertise to provide innovative, high-quality solutions that keep our clients' operations running smoothly.

As we move forward, Standard Machine remains focused on expanding our capabilities and reinforcing our position as a trusted partner in the potash mining sector. Our dedication to quality, innovation, and reliability ensures that we meet the evolving demands of the industry, consistently delivering value to our clients. ▲



The evolving role of custom machine shops in potash mining



Venebles is investing in cutting-edge manufacturing technologies with advanced programming capabilities, enabling us to achieve unmatched precision and efficiency.

The potash industry, like many others, is constantly evolving. As technology advances and the demand for efficiency, sustainability, and precision grows, custom shops like Venables Machine Works play an increasingly vital role in shaping the future of this sector. At Venables Machine Works, we've been at the forefront of these changes, embracing new innovations and refining our approach to meet the unique needs of potash production.

Thriving in the age of digital transformation

One of the most significant trends influencing the future of

custom machine shops is the rise of Industry 4.0-an era of automation, data exchange, and smart technologies. Today's modern manufacturing facilities are no longer just places where parts are fabricated or repaired; they are now becoming datadriven environments where machines communicate and operate more efficiently. At Venables, we're investing in cutting-edge manufacturing technologies with advanced programming capabilities, enabling us to achieve unmatched precision and efficiency. These innovations not only increase speed but also minimize waste, supporting our commitment to

As the potash industry faces more complex challenges, the need for highly customized machinery and fabrication solutions has grown.

more sustainable operations.

Emphasis on customization

As the potash industry faces more complex challenges, the need for highly customized machinery and fabrication solutions has grown. No two potash facilities are exactly the same, and their equipment needs to be just as unique. At Venables, we've always prided ourselves on our ability to provide tailor-made solutions, but the future will demand even more flexibility and innovation. Whether it's modifying existing equipment to improve performance or fabricating entirely new machinery from scratch, the future of custom shops like ours

lies in solving specific, niche problems for our clients.

Workforce evolution: The role of expertise

As technology evolves, so too does the role of the workforce. Skilled tradespeople will always be the backbone of manufacturing facilities, but the future requires a blend of traditional expertise and modern technological knowledge. At Venables Machine Works, we're committed to fostering this balance by training the next generation of machinists and fabricators, while also staying connected to the rich history of craftsmanship that built our reputation. We recognize the importance of building upon

our inclusive hiring policies by incorporating practices aimed at identifying and eliminating potential bias, ensuring a diverse workforce that reflects the evolving nature of our industry. The experience of long-time employees is crucial in mentoring newer workers and passing on essential skills while embracing modern innovations.

Preparing for what's next

The potash industry's future is marked by a need for greater efficiency, sustainability, and customization. Custom machine shops manufacturing facilities like Venables Machine Works will be instrumental in this transition, serving as partners to companies that need



The potash industry's future is marked by a need for greater efficiency, sustainability, and customization.

specialized equipment to thrive in an increasingly competitive market. Whether it's through cutting-edge technologies, sustainable practices, value add through reverse engineering, or a commitment to craftsmanship, we're preparing for the next era of fabrication and machining. ▲

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Reducing downtime by up to 70 per cent for mining and production machinery



West End Radiator's promise is to reduce potash and salt mine equipment downtime by 70 per cent.



The MESABI radiator (pictured) had reached the end of its service life.

What's one thing every mining operation has in common? Hands down, their incontestable need to be in constant operation. Equipment downtime comes at a staggering cost. And frankly, there just isn't time (or money) for it.

West End Radiators (WER) knows this firsthand, so their promise is to reduce potash and salt mine equipment downtime by 70 per cent. This includes anything from a complete radiator rebuild for any heavy-duty OEM, to manufacturing a custom aluminum or copper-brass core that can withstand high heat and constant debris in an extreme work environment. The heavy-duty radiator shop has been in business for the last 65 years, with three locations in Saskatoon, Estevan, and Winnipeg.

But how do they promise mines 70 per cent less downtime? By delivering on the fastest lead times in the industry. In just days, WER can build a new heavy-duty industrial radiator for any open-pit or underground mining equipment. This is compared to the two- to threeweek turnaround competitors offer. Hence, 70 per cent less downtime when you choose WER.

For an even closer look at this, check out a radiator rebuild WER did for a MESABI mining haul truck.

The MESABI radiator (pictured on the left) had reached the end of its service life. The haul truck in which the radiator came out of was due

WER started by using the shops' significantly large overhead cranes to remove the huge radiator off the flat deck trailer it arrived on.

for a complete rebuild, which happens approximately every two years if it's being used 24/7 and in extreme conditions.

As a preventative measure, WER's shop technicians identified that the radiator needed to be completely rebuilt to withstand the next extreme tour of duty.

So, they started by using the shops' significantly large overhead cranes to remove the huge radiator off the flat deck trailer it arrived on. These cranes can easily hold up to 4,000 lbs; one of the many tools that sets WER apart from competitors.

Once the radiator was in place on the shop floor, the team began the inspection, testing and rebuild in process. Then they removed every tube and seal from each

WESTEND

RADIATORS

of the cooling frames. The frame was then flushed, cleaned, and prepped for installation of new seals and tubes.

Finally, the individual frames were pressure tested to ensure there were no leaks. Next came reassembling the entire radiator and painting it with a fresh coat. Then they put the shroud back on so it was ready to be shipped back to the client and get into operation again.

No matter the size of the mining radiator, West End Radiator's heavy-duty certified mechanics are ready to take on the job. They've designed all of their service shops to be able to adapt quickly when a rush job comes in with overhead cranes that can easily lift thousand-pound radiators.



Their team of 30+ skilled technicians specialize in servicing and rebuilding radiators, cores, charge air coolers, and oil coolers for all types of mining equipment, including but not limited to haul trucks, loaders, diggers, drilling equipment, generators, and light towers.

To learn more, visit westendrad.ca. ▲

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Transforming conveyor load zones in the mining industry

The belt conveyor has revolutionized mining by replacing labour-intensive, time-consuming methods of transporting bulk materials. However, anywhere there is product in motion, there will be challenges.

One key concern in conveyor systems is belt damage in the loading zone. Jagged lumps of material can tear or abrade the belt, while foreign objects such as scrap metal and roof bolts may puncture the belt, causing extensive rips and jams. Additionally, the impact of loaded materials can damage idlers and conveyor structures, leading to costly downtime.

Over two decades ago, Richwood Inc., headquartered in Huntington, WV, USA, introduced a groundbreaking innovation to address these challenges: the original, full belt width, Impact Saddle®. This innovation revolutionized conveyor belt support technology by replacing conventional impact idlers with a design that offers continuous support across the entire belt width. Today, Richwood remains at the forefront of conveyor solutions, leading the way in belt protection and dust containment for mining and industrial operations worldwide.

A stable foundation for dust and material containment

In addition to preventing belt damage, Richwood's solutions have evolved to meet the growing importance of environmental compliance and operational efficiency, particularly in the mining sector. A trustworthy foundation at transfer points is now critical not just for belt longevity but also for controlling dust and material spillage. The Impact Saddle[®] is a key component to a well-designed impact area. It minimizes belt sag and ensures proper alignment, reducing the risk of dust emissions and material loss. By keeping material securely on the belt, operators can improve productivity and meet stringent environmental and safety standards.

From innovation to industry standard: Replacing impact idlers

Traditional impact idlers, which use rubber-coated rolls to absorb energy, were initially designed to protect idler rolls rather than conveyor belts. These systems leave belts unsupported between rolls, making them vulnerable to punctures, tears, and premature



failure due to flexing at junction points. Impact Saddles® eliminated these vulnerabilities with their fully supportive design, which features a seamless surface across the belt's width. This advancement has since become an industry benchmark for effective belt protection.

Impact Saddles® provide continuous support that protects the belt from tramp materials that can penetrate and rip the belt. The smooth, curved trough design supports the belt over the entire surface, preventing punctures and tears caused by sharp or heavy debris. This unique design eliminates the hazards commonly seen in alternative systems, such as bar slider beds or typical impact idlers:

Bar Slider Beds: Typical issues include pinch points and support gaps between slide surfaces that create belt hazards that can lead to wear and failure. This is seen in Image 1.

Impact Idlers: Unsupported areas between rollers result in idler junction points where stress concentrates, increasing the risk of belt damage and early failure, as seen in Image 2.





Full belt support: Preventing compression and elongation damage

Belts typically fail when their compression or elongation limits are exceeded. When an unsupported conveyor belt stretches under the impact of falling material, it becomes more susceptible to punctures and tears.

The Impact Saddle® eliminates this issue by providing continuous support, controlling both compression and elongation stresses to preserve the belt's integrity.

Managing impact energy

A three-pronged approach in the design of the saddle allows it to manage impact energy:



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+1 (304) 525-5436 Located in Huntington, WV USA Richwood's commitment to innovation ensures that its solutions evolve to address the most pressing challenges in mining, including belt protection, dust containment, and environmental compliance.



By keeping material securely on the belt, operators can improve productivity and meet stringent environmental and safety standards.

Distribution: Impact on one segment is spread evenly across the entire segment's area, reducing localized stress.

Isolation: Each segment is supported by rubber cushions, isolating impacts to specific zones and preventing energy transfer to other parts of the belt.

Absorption: The system uses materials like UHMW segments and rubber cushions to absorb and dissipate impact energy over time, as seen in Image 3 on the previous page.

More than two decades after its introduction, the Impact Saddle® continues to set the standard for conveyor belt support systems. Richwood's commitment to innovation ensures that its solutions evolve to address the most pressing challenges in mining, including belt protection, dust containment, and environmental compliance. By choosing technologies like the Impact Saddle[®], operators can extend belt life, reduce maintenance costs, and maintain environmental and safety goals.

With its proven track record and continued innovation, Richwood remains the leader in transforming conveyor load zones with systems that are reliable, efficient, and useful for compliance—even in the most demanding conditions.

For more information, contact info@richwood.com. ▲

CAB[®] Products: A true legacy in manufacturing





CCABH employs persons with disabilities while manufacturing high-quality products for customers worldwide.

Beyond the production floor, CCABH's impact extends into the community, where its efforts support economic growth and provide employment opportunities for individuals of all abilities.

The total years of service the administrative staff at the Cambria County Association for the Blind and Handicapped (CCABH) has cumulatively performed is astonishing. Not many companies can boast about the number of staff and production employees who have worked there for over three decades, but CCABH can.

Established in 1927, CCABH is the proud manufacturer of CAB® Products. With over 350 years of service between a handful of the current administrative staff, CAB® Products is the definition of an experienced manufacturer of metal hooks and hangers.

CCABH is a 501(c)(3) non-profit with a dedicated mission for their community in Western Pennsylvania. CCABH employs persons with disabilities while manufacturing high-quality products for customers worldwide. CCABH offers a supportive environment which promotes vocational and employment training, independence, and community involvement through rehabilitative, recreation and low-vision services, and education for the prevention of blindness.

Dating back to 1977, CCABH first started manufacturing hooks and hangers for the mining industry. CAB® hooks and hangers quickly rose in popularity because of their durability, strength, and reliability. They were designed with the safety of miners in mind and were manufactured from only the highest-quality raw materials. Due to the increase in demand for its hooks and hangers, CCABH had to expand. As manufacturing increased, the staff had to grow as well. CCABH's loyal staff has always been passionate about the organization's mission to provide employment opportunities for individuals with disabilities. As any employer knows, employees come and go, but at CCABH, employees often spend a lifetime, driven by a dedication to help individuals with disabilities and the ever-growing demand for CAB® Products.

Many current staff members have celebrated their 20th, 30th, 40th, and 50th anniversaries with CCABH. President/CEO Tara Bosserman, who recently celebrated her 30th anniversary, is joined by many other dedicated CCABH employees who have also celebrated milestone anniversaries in 2024.

CAB® continues to manufacture metal hooks and hangers for the mining industry with as much commitment as they did 47 years ago, even though CAB®'s products are sold into many other industries, including solar, electrical, utility, maritime, pipeline, and traffic communications. This enduring commitment to excellence has solidified CAB® Products as a trusted name in the mining industry. CCABH's ability to adapt to changing markets while maintaining its core values is a testament to its leadership and dedicated workforce. Beyond the production floor, CCABH's impact extends into the community, where its efforts support economic growth and provide employment opportunities for individuals of all abilities. CAB® Products not only represents high-quality manufacturing, but also stands as a beacon of inclusivity and innovation in Western Pennsylvania and beyond.

The Millwright Regional Council: Building a safer, cleaner future





Left: The Millwright Regional Council (MRC), part of the UBC Millwrights, is a leading force representing millwrights across Canada.

Inset: In clean energy, millwrights are critical to the installation and upkeep of wind turbines, hydroelectric systems, and even emerging technologies like Small Modular Reactors (SMRs).

Millwrights are the skilled tradespeople at the heart of industrial construction, installation, and maintenance. Known as "the precision hands of the trades", millwrights specialize in precision work, ensuring that equipment and machinery operate efficiently and safely. From turbines and conveyor systems to robotics and other advanced machinery, their expertise is indispensable across industries such as mining, clean energy, manufacturing, and more.

The Millwright Regional Council (MRC), part of the UBC Millwrights, is a leading force representing millwrights across Canada. The council champions safety, training, and professionalism, ensuring its members are equipped to meet the demands of evolving industries.

Millwrights in mining and clean energy

Mining and clean energy projects depend on millwrights for their success. In mining, millwrights handle heavy machinery such as crushers, hoists, and conveyance systems, maintaining efficiency and minimizing downtime. As the mining sector embraces more sustainable practices, millwrights are adapting to work with greener technologies, ensuring the industry remains competitive and environmentally responsible.

In clean energy, millwrights are critical to the installation and upkeep of wind turbines, hydroelectric systems, and even emerging technologies like Small Modular Reactors (SMRs). Their ability to handle complex mechanical systems with precision and safety makes them ideal partners for contractors and project developers committed to building Canada's green energy infrastructure.

Safety and training: Setting the standard

Safety is the cornerstone of the MRC and UBC Millwrights. Their commitment to stringent safety protocols ensures that every project, regardless of its size or complexity, is completed with the wellbeing of workers, partners, and communities in mind. Members undergo extensive safety training as part of their preparation for the field, equipping them to handle hazardous situations and maintain compliance with rigorous industry standards.





Above left: The MRC and its members are building a safer, more sustainable future.

Right: The Millwright Regional Council's dedication to training is unmatched.

The Millwright Regional Council's dedication to training is unmatched. Through partnerships with contractors and industry leaders, the MRC continuously updates its education programs to meet the demands of modern workplaces. Apprentices and journeypersons alike benefit from state-of-the-art facilities and programs that cover not only core mechanical skills, but also leadership skills and emerging areas like mechatronics.By focusing on mechatronics—an interdisciplinary field combining mechanics, electronics, and computing—the MRC ensures its members stay ahead in industries increasingly reliant on automation and precision technology. This forward-thinking approach positions UBC union millwrights as essential contributors to Canada's future economic growth and innovation.

A commitment to excellence

The Millwright Regional Council embodies a commitment to professionalism, quality, and partnership. Its members uphold the highest standards, offering contractors and project developers a safe, skilled, and reliable workforce. Through initiatives like the Introduction to Millwrighting (ITM) program, the MRC also opens doors for underrepresented groups, ensuring the next generation of millwrights reflects Canada's diversity and strength.

Whether it's powering Canada's mines, harnessing clean energy, or driving technological progress, the MRC and its members are building a safer, more sustainable future. Their precision, dedication, and vision make them indispensable in transforming industries and supporting prosperity across Canada. ▲

MECHANICAL EXPERTISE *Driving Mining & Clean Energy Success*



At the Millwright Regional Council, we partner with union contractors who deliver unmatched expertise in the mining and clean energy sectors. Our highly skilled and safety focused workforce is dedicated to driving success in your operations, ensuring quality and reliability every step of the way.



Discover how we can support your next project

Rail solutions for efficient potash transport

When it comes to transporting large volumes of potash, railcars are among the most efficient and cost-effective solutions available. A single train can carry the equivalent of up to 300 truckloads, making rail transport ideal for bulk commodities like potash. Additionally, rail shipping offers a lower cost-per-ton-mile compared to truck transport, making it a preferred choice for potash producers looking to optimize their logistics and reduce expenses.

The Greenbrier Companies is uniquely positioned to support potash producers and shippers in achieving greater efficiency in their transportation operations. As a leading supplier of rail transportation equipment and services, Greenbrier leverages its engineering expertise and innovative solutions to enhance the movement of products around the globe. Our extensive experience in building and repairing rail equipment ensures we provide unmatched service and support to our customers.

One of our standout solutions is the 4,650-cubic-foot covered hopper railcar, specifically designed for potash service. This Centerflow® railcar features a curved-sided design that minimizes product buildup, a common issue with granular products like potash. With three compartments and gravity outlet gates, it ensures smooth unloading, boosting operational efficiency, and reducing loading and unloading times. The railcar also boasts a stubsill design, which offers a higher load limit and increased capacity, making it perfect for transporting large quantities of potash. This design accommodates varying load requirements and enhances shipping efficiency. With strategically located repair facilities, we ensure quick turnarounds and minimal disruption to operations.

Rail transport offers significant cost savings, reduces carbon footprints and supports sustainability goals, making it the smart choice for potash producers.

For more information on how Greenbrier can enhance your potash transportation operations, visit gbrx.com/potash. ▲

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This 4,650 cubic feet capacity covered hopper railcar has a curve sided design with three compartments and gravity outlet gates specifically designed for potash service. This Centerflow® railcar features the higher load limit provided by a stub-sill design. Various interior linings, roof hatch configurations and outlet gates are available.

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Embrace workforce differences to gain a competitive edge

BY ANDREA HANSEN, PRESIDENT, SUTTON BENEFITS & PENSION

Today's workforce in the industrial and mining sectors is more diverse than ever, spanning multiple generations and various cultural backgrounds. From seasoned Baby Boomers who have been in the industry for decades to tech-savvy Gen Z employees and local Indigenous workers to international recruits, industrial and mining companies need strategies that embrace these differences.

By focusing on generational and cultural diversity, companies can improve recruitment, retention, and overall workplace culture in ways that address the unique demands of their sectors.

The four main generations in the workforce — Baby Boomers (1946-1965), Gen X (1966-1980), Millennials (1981-1996), and Gen Z (1997-2012) — each bring unique communication preferences and work styles.

Baby Boomers may prefer face-to-face interactions or radio communication on the job site, valuing these methods' connection and clarity. Gen X often prefers structured emails, while Millennials and Gen Z are accustomed to quick, digital communication methods, such as instant messaging and mobile apps.

To accommodate these generational preferences, companies should adopt a multichannel communication strategy. Ensuring regular inperson or phone communication on job sites helps older generations feel connected and informed. At the same time, digital tools like messaging apps, mobile project management platforms, and self-service portals provide the flexibility that Millennials and Gen Z value.

Addressing diverse needs with flexible benefits

The industrial and mining sectors often involve remote or demanding work environments where a one-size-fits-all benefits package might fall short. Companies in these fields can



better meet the needs of a diverse workforce by offering customizable benefits that cater to generational, cultural, and family needs.

Baby Boomers nearing retirement may prioritize comprehensive healthcare and retirement savings plans. In contrast, younger employees working in isolated areas might value mental health support, flexible schedules, or financial wellness programs. Offering tailored savings programs — whether for homeownership, travel, or further education — allows employees across demographics to feel that their personal goals are being supported.

Inclusive benefits that offer parental leave and family care options ensure that employees balancing work and family responsibilities feel supported. Additionally, childcare support and meal planning services can help employees manage their work-life balance.

Indigenous employees or

Gen X often prefers structured emails, while Millennials and Gen Z are accustomed to quick, digital communication methods, such as instant messaging and mobile apps.

international workers might benefit from health and wellness plans that align with their cultural practices, such as access to culturally sensitive health services or dietary options that reflect their backgrounds.

Translating employee communication materials and benefits summaries into employees' first languages, particularly when rolling out new programs like group retirement savings plans, can significantly improve understanding and engagement. You can also identify champions within the employee group to help with communication.

Building an inclusive culture

Companies in the mining and

industrial industry, which often operate in remote or culturally sensitive areas, can benefit from cultural sensitivity training for leadership, especially when working with Indigenous communities or international teams.

Organizing on-site cultural appreciation events, team-building activities, and cross-cultural mentorship programs can help bridge gaps between employees from different backgrounds. These activities create camaraderie and enhance mutual understanding which is especially important in industries where collaboration and clear communication are critical to operational success.

By prioritizing diversity, equity, and inclusion (DEI) initiatives, industrial and mining companies can build a reputation as inclusive employers, giving them an edge in attracting and retaining talent in a competitive labour market.

Creating an inclusive environment in the industrial and mining sectors goes beyond meeting diversity targets. Building a business where employees feel valued and included through thoughtful communication and tailored benefits attracts and retains talent.

This positive, healthy workplace environment benefits everyone involved and strengthens the company's competitiveness. Ultimately, investing in employees' well-being and satisfaction is not just good for them — it's smart business. ▲

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Enhance your conveyor operation with West River Conveyors HDPE conveyor rollers and frames



For any mining operation, conveyor systems are critical, especially when it comes to handling materials in corrosive environments. In the United States, one of our longstanding customers operates an underground conveyor system that conveys salt-a material that is exceptionally harsh on traditional steel rollers due to its corrosive properties. Seeking an alternative to the high-maintenance, corrosion-prone steel rollers, the customer turned to HDPE (highdensity polyethylene) conveyor rollers.

This article explores the challenges our client faced with using steel rollers on their underground conveyor and the impact that switching to HDPE rollers had on their operation.

The problem

Operating in a high-moisture, saltladen environment is demanding for any conveyor system, but for steel rollers, it's particularly challenging. Salt's corrosive nature can cause steel rollers to rust and seize up, potentially causing the rollers to become nonfunctional and inflict damage to the conveyor. This customer's steel rollers suffered heavy corrosion, requiring frequent maintenance to keep the rollers operational. The customer needed a solution that could resist corrosion, reduce maintenance costs, and operate reliably in a harsh underground setting.

The solution

West River Conveyors suggested switching to HDPE conveyor rollers. Known for their inherent resistance to corrosion, rust, and chemical damage, HDPE rollers offer several advantages over steel in corrosive environments. Key benefits of HDPE rollers include:

- 1. Corrosion resistance: Unlike steel, HDPE doesn't rust or corrode, making it an ideal choice for environments with high moisture or corrosive substances like salt.
- 2. Lightweight: HDPE rollers are significantly lighter than steel, simplifying handling and installation, and reducing the overall load on the conveyor system.
- 3. Low noise operation: HDPE's material properties help dampen

operational noise, contributing to a quieter, more comfortable work environment.

4. Reduced wear on conveyor belts: The smooth surface of HDPE rollers minimizes friction, extending the lifespan of conveyor belts.

For the salt mining operation, these characteristics aligned well with their needs. Though HDPE rollers generally support lighter loads compared to steel, the customer's salt conveyor system was well within HDPE's loadbearing range, making this solution a good fit for their application.

The result

The HDPE rollers met and exceeded the customer's expectations in the underground salt environment. Since installation, the customer reported:

- Minimal corrosion: While the steel rollers quickly corroded and seized in the salt-rich conditions, the HDPE rollers remained free from corrosion, maintaining smooth, consistent operation.
- Improved longevity: With no rust or corrosion buildup, the



The underground salt conveyor with its original steel rollers.

The underground salt conveyor with its new HDPE rollers.

HDPE rollers continue to operate efficiently with minimal need for maintenance.

• Enhanced work environment: The lightweight, low-noise HDPE rollers contributed to easier handling and a quieter operation, enhancing worker comfort in the underground setting.

With reduced maintenance and

improved reliability, the HDPE rollers have proven to be an effective, cost-efficient solution for the customers' needs. This article shows how HDPE can be a valuable alternative in harsh, corrosive environments where steel might struggle.

West River Conveyors successfully implemented HDPE rollers into this underground salt environment and achieved notable improvements in corrosion resistance, maintenance reduction, and operational noise. For any mining industry dealing with corrosive materials, HDPE rollers can offer a practical alternative to steel. Our team at West River Conveyors can help you find the ideal conveying solution for your unique application. ▲

Though HDPE rollers generally support lighter loads compared to steel, the customer's salt conveyor system was well within HDPE's load-bearing range, making this solution a good fit for their application.

Proudly celebrating 60 years serving the potash industry

For any organization that's been around a long time, it's interesting to learn about how they've adapted to changing industries. The history and development of bits, and Bit Service in particular, taken place over the last 60 years. Over those years, Bit Service has been designing, manufacturing, and servicing radial bits for the underground potash industry. We're proud to have been around for this long and excited to continue seeing the development of the industry.

From its start in Esterhazy in 1965, Bit Service began answering the growing need for a local supply chain partner to the potash mining industry in Saskatchewan. The industry quickly evolved from an exploration and greenfield landscape to a thriving productive underground mining sector. With this evolution, we have seen many changes in boring machines, the configuration of cutting assemblies, cutting methods, and ore conditions. The mining machines have gotten larger and more powerful, the number of bit locations reduced to



increase cutting forces, as well as mining methods changing to increase efficiency in response to geological conditions. We have responded to these changing needs with redesigned products providing the quality and cutting efficiency expected, given the new demands placed on the customer's boring machines.

Radial bit changes have been far from subtle over the years. In many cases, they have involved a complete redesign due to a need for changes in geometry for the bit body or cutting surfaces. This takes lots of close communication with the end-users, as well as the ability to integrate this into the cutting assembly of the machine effectively.

Through long-time partnerships with some amazing manufacturers, we have been able to reinforce and complement our line of bit offerings—components used in our manufacturing of complete cutting assemblies for all facets of underground potash mining—supporting front-end equipment. Extensive conveying equipment from the cutting face, now through the mainline belt, all keep us strongly connected to supporting the local mining industry. It is this level of integration which enables us to implement the changes required by the mining properties, ensuring that all affected components perform well together during times of redesign and beyond.

The ability to change with the industry in the responsive fashion required is a testament to both our exceptional team at Bit Service, but also an amazing culture within the potash industry that values a committed and talented local supply chain. Like any resource industry, there are cyclical periods of both heavy growth and challenging times for the sector. Being able to stay focused on the longterm health of the relationship, rather than merely attempting to gain revenue from a booming cycle, is where the success in this industry lies.



Through it all, we have had the unique opportunity to be at the forefront of an industry vital to the growth of our province. We're happy that we've been able to stick around, support the economy here in Saskatchewan, and help provide jobs here at home. In the upcoming years, we're excited to see how the industry changes again, how we adapt to problems as we have done so far, and to continue supporting our employees and supply chain. ▲

> Celebrating 60 years as a proud supply partner to the Saskatchewan potash mining industry.



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30 years of Canadian expertise: Multicrete, an introduction

With over 30 years of experience providing concrete, shotcrete, and grout solutions, Multicrete prides itself on offering highquality materials, equipment, and support as your one-stop-shop for cementitious projects. With our unmatched selection of raw materials, service excellence, and providing innovative solutions, Multicrete's expertise in civil construction is offered yearround - no matter the weather. Below we explore our potash mine works and an overview of Multicrete's innovation in properly curated mixes, how we help as a full-service provider, and our continued safety efforts in the industry.

Multicrete, a full-service provider

As a full-service provider, all necessary materials and equipment for mining necessities are provided – this includes powders, custom and standard equipment, underground batching equipment, grout mixing, mine deliveries, and on-site material handling provided for your potash mining needs. Many variables, as well as unique requirements arise while working in mine operations, and addressing these requirements is of the utmost importance. Being a full-service provider greatly enhances these abilities. Partnering with Multicrete provides expert recommendations, keeping the mining sites operating efficiently, reducing costs and applying it all to the highest safety standards possible.

The introduction to potash backfill

Mine sites and mining operations

are often noted jobsites that Multicrete practices in, helping and providing construction expertise for proper mine operations. Mine sites often come with plenty of challenges, but with the proper backfill materials and equipment, undergroundready potash processing is easily presentable.

Our backfill equipment can crush 12-inch-minus potash into a well-graded sand which is then mixed into a potash/brine slurry. This is then pumped up to 1000 metres in distance and up to 100 metres in elevation. The potash slurry boasts

Visual image of underground-ready potash processing and backfill equipment.


% Passing

-Lower Limit

-Upper Limit

The processed potash, blended with brine water in an optimal mix determined on-site, was found to be stable and ideal for both pumpability and flowability during placement. When lab cured at 28 to 35°C the material had bleeding of 10.8 per cent in three hours after mixing. The product had a compressive strength of 0.112 MPa.

Engineered design mixes

Mine sites are made safer and completed more efficiently with engineered design mixes and expertly analyzed specifications. Each job site comes with its own unique requirements and



and fire-resistant rated belts.

Through both on-site and lab

trials, Multicrete has developed

a system of processing for best

flowability and strength.

The chart above shows a

curve.

gradation envelop along with

the processed potash gradation

Gradation

Do you have issues with water **EROSION** in your potash mine. Multicrete Group has a solution – potash backfill. We can backfill voids using **POTASH**, **REDBED**, **LIMESTONE BACKFILL** using brine as mixing water.

FRESH WATER VOID



For more information contact: Dwayne Sandercock at 306-292-6367

% Passing

0

significant engineering properties

in rheology and compressive

strengths. The processing and

mixing equipment are specially

designed to fit in any shaft with a maximum height of eight-feet-

six-inches. Dust mitigating addons

are also available. The all-electric

system complies with all mining

regulations regarding fire safety,

with a sire suppression system



Fresh water void - before and after.

characteristics - Multicrete supplements this with sitespecific analysis, custom systems, mixes, and equipment for the job. This also may come with site improvements and recommendations from some of our trusted engineers. No problem is too tough to handle, as any project's toughest demands are adjusted and met. From creating new materials, to utilizing mixing techniques to minimize dust, Multicrete strives for innovation, benefiting the concrete industry and our practices, especially within mine operations.

Multicrete is your one-stop partner for concrete and grout solutions, including shotcrete products, rental equipment, and project management. Our team of experienced engineers, diligent project managers, and certified nozzleman are here to make sure every project is completed on time and on budget.

Multicrete continues to implement collaborative and innovative efforts further improving the landscape of construction, potash, and mining operations empowering the industry.

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A wall of mud and knowhow

Kelly Panteluk Construction Ltd. (KPCL), a Saskatchewan-based heavy civil contractor, focuses on construction activities that are on or below the earth's surface requiring the use of a wide array of earth-moving equipment associated with the building of dams, dykes, tailing ponds, canals, roads, and rail spurs to name a few. While KPCL is highly proficient at moving large volumes of earth materials to build earth structures, it also has in-house expertise in several specialized areas of earthworks construction. Nowhere is this more evident than KPCL's proficiency in constructing cut-off walls.

Cut-off walls are non-structural underground barriers with extremely low permeability that are used by engineers as a control to prevent the migration of groundwater between controlled and uncontrolled groundwater systems. In Saskatchewan, cut-off walls are typically constructed at mine sites looking to contain the long-term migration of potentially impacted groundwater within the mine's footprint.

Soil-bentonite cut-off walls are the most common type of wall construction in North America and have been used extensively throughout Saskatchewan to control groundwater migration.

Conventional wall construction consists of excavating a vertical walled trench with a long reach excavator and stabilizing the trench walls during construction by maintaining a thick bentonite slurry (mud) within the trench. The trench is subsequently backfilled by displacing the slurry in the trench with a low permeability material usually consisting of native soils excavated from the trench that have been mixed thoroughly with bentonite clay - an absorbent highly swelling clay. A few of the keys to successfully constructing a cut-off wall include: selecting an appropriate location, physical parameters such as trench width



and depth required to tie the wall into an impermeable layer of soil, slurry and backfill specifications, and installation methods.

As noted, specially-equipped long-reach excavators are required to excavate deeper slurry walls to a maximum depth of about 26 metres (85 feet). Trench depths beyond this are achieved using a hydraulic clam shell bucket attached to a large crane. The bentonite slurry is typically prepared using an onsite mobile batch plant that produces the required mud consistency, and the slurry is subsequently pumped into the trench. The soil bentonite backfill is normally prepared on the surface adjacent to the trench using a combination of small hydraulic excavators and dozers to mix the bentonite and native soils together until the desired homogeny is achieved before placing the mix into the trench and displacing the slurry.

Over time, KPCL has built up a wealth of knowledge

and expertise in cut-off wall construction methods with the successful completion of a number of Saskatchewan installations. While every wall construction is unique, some of the challenges remain the same from project to project such as consistently maintaining the main excavation tool to maximize uptime due to excessive wear and tear, extracting large boulders within the confines of the trench excavation that are larger than the dimensions of the trench, ensuring high-quality slurry consistency during excavation, and maintaining a safe work site.

For each project KPCL undertakes, it brings a client perspective, getting the project completed efficiently, economically, and safely. By way of a recent example, KPCL combined two cut-off wall construction methods to overcome a few site-specific challenges, utilizing the strengths of each methodology to complete the project. For this project, KPCL first conventionally excavated a slurry wall to a depth of nine metres, successfully removing a layer of boulders from the trench. Once the boulder lag was removed, a large, specialized chain trencher was inserted into the trench to complete the cut-off wall to the design depth which extended up to 30 metres (100 feet) below the surface. The trencher was utilized to cut through a very hard soil formation below the boulder lag and in which a conventional long-reach excavator or hydraulic clam shell would have significantly reduced productivity. The combination of these two methods ultimately saved the client time and money as the trencher was faster and more efficient than if the entire trench was excavated conventionally, while the upper nine metres of trench was conventionally excavated as the trencher could not contend with the boulders.

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Incident investigations

Consultion Services Limited

Despite your best efforts with supervision, training, and inspections, unexpected problems are still going to occur on your work site. Your safety system can dramatically reduce your company's losses due to injuries or property damage, but it may not eliminate them entirely. Incident investigation is an essential step towards making changes that can prevent recurrence of accidents from similar causes.

Incident investigations are critical in identifying, controlling, and eliminating hazards that exist in the workplace. For an investigation to be effective, it needs to be structured and systematic. It will require the use of trained investigators that can separate themselves from the incident.

Most companies conduct investigations as a part of their safety system. Yet, the purpose of doing investigations is often poorly understood. As a result, they can degenerate into fingerpointing, blame-fixing, and fault-finding exercises which seldom determine the real reasons for what happened or arrive at any effective solutions to the problems involved. Even when the purpose is properly defined, investigations are often poorly done. Perhaps the greatest reason for this is not

understanding the many real values to be gained.

Historically, safety managers have told us that any incident should be investigated promptly and thoroughly. This includes injury, occupational illness, damage, spill, fire, near misses, etc. Many people will have interest in such losses and their effects on the organization. Suffering, cost liability, and lost production cause concern. Such losses may also point to serious deficiencies in the safety system which needs to be corrected.

In practice, it is often difficult to convince employees to investigate all near misses, as this can create a bureaucratic nightmare. What should be done is an evaluation of the potential severity of the incident. Taking into consideration that resources inside each organization are limited, we would want to ensure that they are being used effectively. The cause factors make the incident occur. The severity of the actual loss in each event is often a matter of chance and may vary according to very slight differences in circumstances. So, the practical approach is to first identify the potential loss of each incident, as this will dictate the level of investigation that is required. Each organization, of course, must define what potential losses are significant to its resources, its people, and its public relations.

After establishing the level of investigation that is required. designating the investigator or investigation team is the next step. As with any type of problem solving, the person with the most interest in the problem is the obvious first choice. The person with a vital interest finds solutions that work. There is also another important consideration in the choice of the investigator. The person must be able to stay objective and not have any conflict of interest. The findings must be truthful and relevant, or the problem isn't really solved.

Where does any manager or supervisor get the time to conduct a thorough investigation? The time used in an investigation is part of the cost of an accident. If that is true, then why spend that time and add the cost? It's not an easy decision. While we must work toward minimizing the costs of accidents, they will repeat if the investigation fails to identify the causes. Managers simply must provide the time, understanding that inadequate investigations will cost them even more time.

The purpose of an investigation is to find out what caused the incident so it and similar occurrences can be prevented in the future. The primary goal is to gather information for the future, not to assign blame for what has already happened.

Investigations also help measure the effectiveness of the company's safety system. The examination of actual events can reveal hazards not previously discovered; comparisons across time can reveal trends that might otherwise be missed.

An investigation should answer the who, what, when, where, why, and how questions that will surface as a result of an incident. The why and how are subjective and will help the investigator to formulate conclusions and corrective actions to prevent recurrence.

To be effective, corrective action

must be applied to each cause identified during the investigation. Each corrective step should be assigned a target date for completion. The corrections may be implemented in stages, depending on the hazard priority, training priorities, budget, and so on.

An incident is not something that just happens unexpectedly. It is a signal that something is out of order with conditions on your work site or with what your employees are doing. An investigation is necessary to find out what that "something" is.

It should be a thorough examination that tells you not only what happened in this case, but also how and why it happened this way. The goal is not to find someone to blame for what happened, but to get information you may not get in any other fashion. With thorough reporting and analysis over time, investigations can reveal important trends, and point to valuable corrective actions.

An investigation, therefore, is not just a reaction to a specific incident. It has a much broader role in the health and safety of your people. By providing information about what happens on the work site, it can improve the quality of your training, the effectiveness of your supervision, and the overall performance of your safety management system. ▲



Precision Electro-Mechanical celebrates 20 years in service to the Saskatchewan potash industry



Certified with ISO 9001 since 2015, PEM's quality control process ensures that each motor leaving the building meets their meticulous repair standards so that you can be confident in the product you are receiving.

Precision Electro-Mechanical (PEM) is a local, family-owned, one-stop-shop for all your electric motor repair and purchasing needs. This year, Precision is celebrating 20 successful years in business. In these past 20 years, Precision has had the opportunity to build relationships, develop expertise, expand and invest, all in an effort to serve their customers and their community better.

20 years of building relationships means that countless industries across Saskatchewan trust PEM with their motor purchases and repairs because they know PEM will put them first and deliver on their promises. This looks like: PEM maintaining an exclusive partnership with WEG Canada to distribute WEG motors to northern Saskatchewan mines. farms, and other industries; a commitment to reducing downtime for the Saskatchewan potash mines over the years by offering timely after-hours service in emergency situations; assisting farmers who are in desperate situations to save their crops by repairing their equipment quickly in busy seeding, growing, and harvesting seasons: working with cities to maintain electricity, waste, and water sectors running smoothly so that city services

aren't disrupted for residents. PEM and their staff are dependable and are committed to providing their customers with the best service possible.

20 years of expertise means that PEM has developed a skilled and honest team of employees and management who are able to efficiently and correctly diagnose motor failures, discuss repair options and costs in a realistic, transparent, and financially feasible way, and deliver solutions that are timely, particular, and reliable. This is the expertise that you can trust when you work with PEM. 20 years of expansion has led to a 40,000+ square-foot shop that has the space to accommodate over \$15 million worth of modern and state-of-the-art equipment and technologies that are needed to handle any and every task. This allows for every part of the job to be completed in-house to optimize guality control and efficiency. PEM routinely utilizes their Schenck balance stands, automatic winding machine. VPI tank, regenerative dynamometer, full machine shop, and sand-blasting booth in their motor repairs to deliver refurbished motors in a like-new quality back to their customers. Certified with ISO 9001 since 2015, PEM's quality control process ensures that each motor leaving the building meets their meticulous repair standards so that you can be confident in the product you are receiving.

20 years of investment looks like PEM widening their services to meet their customers' needs. such as putting up buildings to accommodate necessary indoor, temperature-regulated motor and equipment storage for their customers, donating tens of thousands of dollars back to the local community yearly, committing to customer and employee safety daily, and lastly through developing and expanding environmentally friendly practices. Amongst all the green practices PEM has adopted, they have chosen to invest in a revolutionary regenerative dynamometer to reduce electricity usage in their load-testing by nearly 90 per cent.

Precision Electro-Mechanical is fully equipped and ready to handle the tough jobs. They will repair your motor right the first time, and will put you, the customer first. Precision staff would like to thank Saskatchewan, and specifically the Saskatchewan potash mining industry for a wonderful first 20 years in business. Precision is looking forward to continuing to serve the community and the Saskatchewan mining industry in an even greater capacity in the years to come. Building relationships, developing expertise, expanding capacities and abilities, and investing in customers and community; this is Saskatchewan, this is the PEM difference.



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Mining for savings How durable PPE can deliver protection and savings

In the world of mining, where worker safety is paramount, the quality and durability of protective clothing are critical considerations. Investing in durable, high-quality safety clothing made from sustainable fabrics can yield significant cost savings over time.

The financial impact of durable safety clothing

1. Reduced replacement costs

One of the most immediate and tangible benefits of durable safety clothing is the reduction in replacement costs. High-quality well-constructed safety garments are designed to withstand the rigors of harsh work environments, including extreme temperatures, washing and care, and physical wear and tear. Lower-quality alternatives require frequent replacement, while durable safety clothing can last significantly longer, resulting in fewer purchases over time. Larger organizations have experienced year-overyear savings in the hundreds of thousands of dollars, following their transition into a high-quality, inherent flame-resistant clothing program.

2. Lower maintenance and repair expenses

Durable safety clothing requires less frequent maintenance and repair. High-quality materials and construction methods ensure garments can endure daily use without degrading. For large organizations, the savings in maintenance costs can be substantial. Employees spend less time repairing or replacing wornout gear, allowing them to focus on their primary tasks, enhancing productivity.

3. Enhanced employee productivity and morale

Comfortable, well-fitting, and durable safety clothing can positively impact employee productivity and morale. Workers who are confident in their gear are more likely to perform efficiently and with greater peace of mind. This confidence can reduce the likelihood of accidents and injuries, leading to fewer work disruptions and associated costs.

The role of sustainable fabrics and high-quality construction

1. The benefits of inherent fabrics

Inherent fabrics, such as those used in MWG Apparel's RIPGUARD[™] line of flame-resistant pants and outerwear, are designed to be both environmentally friendly and highly durable. These materials often have superior resistance to wear and tear, extending the lifespan of the clothing. By investing in garments made from inherent fabrics, organizations can contribute to conservation while reaping the economic benefits of reduced replacement and disposal costs.

2. Importance of high-quality construction

The construction quality of safety clothing is equally important. Highquality stitching, reinforced seams, and robust fastenings ensure that the garments can withstand the demanding conditions of industrial work. Manufacturers who prioritize quality construction implement control measures to ensure their products meet high standards. For large organizations, this translates to fewer instances of clothing failure, reducing the risk of accidents and the costs associated with them.

Case study: The RIPGUARD™ line

MWG's proprietary RIPGUARD™ line of pants, bibs, and coveralls is an excellent example of how highquality, durable safety clothing can provide cost savings for large organizations. These flameresistant styles are made from an innovative, ripstop fabric designed for maximum durability. Ripstop fabric is built to withstand rips and tears that could compromise the fabric. The superior construction of the RIPGUARD[™] line ensures that the garments remain intact and effective for extended periods, even in abrasive working environments, like potash mining.

The cost savings achieved through the durability of safety clothing are clear. By investing in higher quality garments, companies can reduce replacement and maintenance costs, enhance employee productivity, and ensure a safer working environment. The RIPGUARD[™] line serves as a prime example of how durable safety clothing can deliver both economic and safety benefits.

In the long run, the financial advantages of durable safety clothing make it a smart and sustainable choice for any large organization committed to protecting its workforce.



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GNB Global: Fabric solutions to mining's toughest challenges



Mining operations face a host of challenges, from extreme weather to tight timelines and rising costs. GNB Global is at the forefront of addressing these issues with innovative tension fabric structures designed to overcome the unique hurdles of the mining industry. With rapid deployment capabilities, durability in extreme environments, and costeffective solutions, GNB Global's buildings are transforming the way mining companies operate.

One of the most significant challenges in mining is the need for fast, reliable infrastructure. Delays

GNB Global's fabric buildings are designed to withstand extreme conditions, including high winds, heavy snow, and corrosive environments commonly found in potash and mineral extraction sites.

in constructing traditional buildings can disrupt operations and increase costs. GNB Global's fabric buildings are engineered for rapid deployment, allowing mining companies to establish essential facilities in a fraction of the time it takes for conventional construction. Whether it's a storage facility, workshop, or employee break space, our buildings can be installed quickly and efficiently, keeping operations on track.

Harsh environments are another constant in the mining world. GNB Global's fabric buildings are designed to withstand extreme conditions, including high winds, heavy snow, and corrosive environments commonly found in potash and mineral extraction sites. These structures are built with durable materials and advanced engineering to ensure longterm reliability, no matter the environment.

Cost pressures also loom large for mining companies, and GNB Global offers a cost-effective alternative to traditional building methods. Our tension fabric structures provide the same functionality as permanent buildings but at a lower cost. Additionally, their energy-efficient design—featuring natural light and optional insulation—helps reduce ongoing operational expenses.

Flexibility is key in mining operations, where the landscape and needs can change rapidly. GNB Global's modular and relocatable buildings offer unmatched adaptability. These structures can be expanded, reconfigured, or moved to new locations, ensuring they meet the dynamic demands of any mining project.

Safety and compliance are non-negotiable in the mining industry, and GNB Global delivers on



GNB Global's fabric buildings are engineered for rapid deployment, allowing mining companies to establish essential facilities in a fraction of the time it takes for conventional construction.

Our buildings provide well-ventilated, weather-protected spaces that enhance worker safety and productivity.

both fronts. Our buildings provide well-ventilated, weather-protected spaces that enhance worker safety and productivity. With minimal foundation requirements, these structures can also be installed in compliance with environmental regulations, minimizing the impact on the surrounding landscape.

At GNB Global, we're more than a building provider—

we're a partner in your success. Our team of engineers, project managers, and installation experts work closely with clients to ensure every project is tailored to their unique needs. Whether you're in mining, data centres, or the military, GNB Global's fabric structures are the smart choice for overcoming challenges and hitting the 'easy button' for your next project. ▲





Northern Resource Trucking: The evolution and expansion of a home-grown Saskatchewan trucking company

NRT was established in 1986, when Trimac and Kitsaki partnered to create a company to handle their Key Lake Mining Corporation contracts.

It has been nearly 40 years since Northern Resource Trucking (NRT) began making waves in the province of Saskatchewan. Today, those waves are rippling beyond the borders of Saskatchewan as the company evolves and expands toward a diversified future in the swiftly changing transportation industry.

NRT was established in 1986, when Trimac and Kitsaki partnered to create a company to handle their Key Lake Mining Corporation contracts. In the beginning, Kitsaki owned 51 per cent of NRT, and was heavily invested in growing opportunities for northern residents, while Trimac held 49 per cent of the company and provided management expertise.

The little startup grew quickly over the next few years. Saskatchewan had never seen anything quite like NRT's unique model, built on the goal to provide specialized service to resource development companies while empowering Indigenous business ownership and hiring.

This unique approach has turned out to be key to the company's evolution and expansion over the years.

In 1994, NRT expanded its base of northern ownership even further, leading to 41 per cent of the company being sold to a number of Indigenous groups, as well as the birth of a new and improved business model as NRT became Northern Resource Trucking Limited Partnership.

From the beginning, NRT has been very dependent on the uranium industry, due to the specialized nature of their contracts with Cameco and Orano. When uranium prices began to plummet around the turn of

Partnership At Work

The NRT fleet safely and professionally navigates equipment across a vast and challenging terrain; meeting the transportation needs of the industry giants. Hauling items such as:

- Acid
- Construction materials
- \cdot Molten sulphur
- Propane

- Cement
- Lime_
- Fertilizer
- General freight
- Groceries
- Explosives
- Mining machinery
- Fuel



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In 1994, NRT expanded its base of northern ownership even further.

NRT was built on the goal to provide specialized service to resource development companies while empowering Indigenous business ownership and hiring.

the new millennium, NRT started to feel the pinch of that dependence and first began to explore ways to diversify its services.

One of the company's first experiments in diversification was the creation of Woodland Cree Logging during a lull in uranium mining. The company became one of Weyerhaeuser's larger harvesting contractors north of Prince Albert until the pulp mill's eventual closure in 2005.

Weyerhaeuser's withdrawal from the province coincided perfectly with a rebound in uranium pricing, and NRT was ready to jump back into the fray as Cameco fired up increased operations.

The company had learned its lesson, though.

Specialization is great when the getting is good, but diversification provides a safety net against market and industry volatility.

So, from 2011 to 2017, while the uranium industry continued on a slow upswing, NRT kept an eye on ways to expand beyond the volatile market.

In 2017, using the unique NRTLP business model as a guide, the company joined Big Grassy River First Nation to form Big Grassy Logistics to provide service to the New Gold Rainy River gold mine near Emo, Ontario.

Again, the timing proved fortuitous, because 2018 brought another downturn in Cameco's production.

While NRT did suffer considerable loss of revenue

in this time, the road was already being paved for diversification away from the volatility of the mining industry.

NRTLP opened a new branch in Winnipeg for a wide range of transportation services and formed Piwapisk Hauling Limited Partnership with eight Manitoba First Nations to haul lime to Ruttan Mine for wastewater treatment.

Since then, Cameco has begun to increase production again and Orano has remained steady, but NRT continues to keep an eye on future expansions.

Since it's humble beginnings, NRT has paid over \$15 million to its original partners and has trained and hired northern Indigenous people, even financing some of them to become owner operators, creating jobs and contributing to reconciliation.

It is this Indigenous partnership model which is at the centre of NRTLP's expansion into Manitoba and Ontario. The business opportunities for Indigenous groups, and the job creation and flow of money into Indigenous communities that are made possible by partnerships like the NRTLP model, are a key part of the company's strategy and growth.

Just how far will this next stage in the company's evolution take them? NRT's next big project includes a terminal in Thunder Bay to take advantage of mining opportunities in Northwestern Ontario and a new strategic plan that will see revenue grow to \$105 million by 2029!

Registration now open for PDAC 2025: The World's Premier Mineral Exploration and Mining Convention



The Prospectors & Developers Association of Canada (PDAC) is pleased to announce that registration for the PDAC 2025 Convention, taking place March 2-5, 2025, at the Metro Toronto Convention Centre, is now open.

The 93rd annual PDAC Convention will feature cutting-edge programming and a worldclass trade show with over 1,100 exhibitors. Building on the success of PDAC 2024, which attracted nearly 27,000 attendees from 138 countries, this year's convention offers unmatched opportunities for collaboration, learning, and innovation in the sector.

"With more than 600,000 square feet of exhibits, groundbreaking programming, and exceptional networking opportunities, PDAC 2025 will bring together the world's most influential industry leaders," said Raymond Goldie, PDAC president. "This year's convention emphasizes advancements in mineral exploration and mining technology, sustainability, and shaping the future of mining by strengthening partnerships with students and Indigenous communities."

Highlights of PDAC 2025

Engaging exhibits: Discover over 1,100 exhibitors at the Trade Show and Investors Exchange, showcasing the leading companies, technologies, and investment opportunities in the industry.

Thought-provoking programming: Engage in technical sessions, short courses and keynotes covering topics such as commodities, geoscience, capital markets, and advancements in exploration and mining.

Fostering Indigenous collaboration: The critical role of Indigenous partnerships is showcased through programs focused on land stewardship, economic empowerment, and meaningful engagement with key stakeholders.

Inspiring students and earlycareer professionals: Expand your horizons and connect with industry leaders through educational opportunities, networking events, and mentorship programs designed to support the next generation of industry professionals. *Far left: The PDAC 2024 attracted nearly 27,000 attendees from 138 countries. Photos courtesy of PDAC.*

PDAC brings together the world's most influential industry leaders.

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About PDAC

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Engcomp

Celebrating 20 years of Engcomp

A journey of curiosity and excellence

This year marks a significant milestone for Engcomp, a leading engineering consultancy firm based in Saskatoon, Sask. Celebrating its 20th anniversary, Engcomp has grown from a small, ambitious engineering startup into a trusted advisor in Western Canada's heavy industrial and mining sectors. This journey, highlighted by innovation, resilience, and a clientcentric approach, is a testament to the company's unwavering commitment to excellence.

The genesis: Curiosity as the catalyst

Engcomp was founded on June 1, 2004 with a mission to redefine engineering consultancy. The core ethos of the company has always been curiosity. From the very beginning, Engcomp's DNA has been infused with a hunger for knowledge, a thirst for exploration, and an unwavering commitment to excellence. This spirit of curiosity wasn't just a buzzword; it was the driving force behind every decision. Employees at Engcomp didn't merely accept the status quo; they questioned it. They delved into the unknown, seeking answers, uncovering hidden possibilities, and challenging conventional wisdom, all while remaining accountable to the company's clients and their projects.

Trailblazing solutions: Where creativity meets technical prowess

Engcomp's team thrives on challenges, seeking solutions that not only are technically acceptable but solutions that lead to an exceptional customer experience. Whether it's mining engineering, mechanical design, structural analysis, or process optimization, Engcomp's portfolio brims with success stories. The secret? A blend of technical prowess, calculated risk-taking, and a dash of curiosity. This approach has led to innovative solutions that have left a lasting impact on their clients and the industry at large.

A legacy of innovation and resilience

Over the past two decades, Engcomp has built a reputation for delivering high-quality, reliable solutions. The company's journey has been marked by numerous milestones, including significant projects with major clients such as Nutrien, Cameco, Orano Canada, Gensource Potash Corporation, ADM, Bunge, and countless others. These projects have not Engcomp's culture is built on a foundation of excellence, integrity, and community engagement. The company fosters an environment where curious minds can thrive, solve complex problems, and achieve their greatest professional potential.

only showcased Engcomp's technical capabilities, but also its ability to adapt and thrive in a constantly evolving industry.

Client-centric approach: The heart of Engcomp's success

At the heart of Engcomp's success is its client-centric approach. The company treats client projects as if they were their own, investing in their success and building long-term relationships based on trust and mutual respect. Engcomp's engineers listen to their clients, understand their unique needs, and deliver solutions that exceed expectations. This commitment to client satisfaction has been a cornerstone of Engcomp's growth and success over the past 20 vears.

A culture of excellence and community engagement

Engcomp's culture is built on a foundation of excellence, integrity, and community engagement. The company fosters an environment where curious minds can thrive, solve complex problems, and achieve their greatest professional potential. Engcomp is also deeply committed to giving back to the community, supporting various initiatives and organizations that make a positive impact on society. Engcomp's Indigenous Engagement Strategy has been recognized for its progressive and meaningful elements.

Looking ahead: The future of Engcomp

As Engcomp celebrates its 20th anniversary, the company is not resting on its laurels. Looking ahead, Engcomp is poised to continue its journey of innovation and excellence. With a strong foundation, a talented team, and a relentless pursuit of knowledge, Engcomp is well-positioned to tackle the challenges of the future and continue making a difference in the engineering landscape. Engcomp's 20-year journey is a remarkable story of curiosity, innovation, and resilience. From its humble beginnings to its current position as a trusted advisor in Western Canada's heavy industrial and mining sectors, and across the world, Engcomp has consistently pushed the boundaries of engineering consultancy. As the company looks to the future, it remains committed to its core values and continues to strive for excellence in everything it does.

For more information about Engcomp and its services, visit www.engcomp.ca. ▲



As a trusted engineering firm, Engcomp is driven to provide clients with innovative solutions to meet their complex project needs. Proficient in overseeing and completing projects from conceptual design and feasibilitystudiestodetailedengineering, we specialize in risk analysis, cost estimating, and project planning.



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Kristian Electric keeps potash equipment running

Kristian crane service technician, Keith Bida, works on a repair and rebuild of a Demag P-Series wire rope hoist.

With over 60 years of experience repairing welding and lifting equipment across Western Canada, Kristian Electric understands the vital role optimal equipment performance plays in the field. Since expanding into Saskatoon in May 2014, they have established themselves as a trusted service provider and distributor for the potash mining industry in Saskatchewan. Offering a range of services including equipment repairs, preventative maintenance, inspections, and equipment sales, Kristian Electric is dedicated to supporting mines across Saskatchewan by ensuring their equipment stays reliable and operates efficiently.

Welding equipment in the potash industry is subject to intense working conditions, not only due to the high demands of potash production, but the unique material characteristics of potash itself. As a resource with a mildly abrasive and corrosive nature, welding equipment used in potash processing is particularly subject to material buildup that can quickly inhibit equipment performance. As Saskatchewan's authorized service centre for welding brands including Miller, Lincoln Electric, and Fronius, Kristian Electric regularly receives units from across the mining industry. Like all industrial equipment used in potash production, regular preventative maintenance is key to producing consistent high-quality results and avoiding downtime.

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Kristian welder service technician, Steve Carruthers, smiles in the Welder Service Engine Bay as he starts working on a Miller Bobcat engine-driven welder generator.



Kristian Electric Saskatoon's showroom is fully stocked with welding and overhead lifting equipment.

used in the potash industry also require regular inspections and preventative maintenance to address potential issues before they escalate. Kristian Electric's crane division provides service solutions for cranes and hoists, including detailed digital inspections, load testing services, and proactive repair recommendations to ensure optimal functionality. Their expertise in addressing the specific demands of the Saskatchewan potash sector allows them to deliver reliable and cost-effective solutions.

Regular preventative maintenance is the cornerstone of Kristian Electric's approach to supporting the potash industry. Like welding equipment, potash fines can also accelerate wear and tear on lifting equipment, making maintenance essential for minimizing unexpected downtime and production delays. By developing tailored maintenance schedules, their team works to minimize unplanned downtime and extend the lifespan of critical equipment. From welding machines to overhead cranes and hoists, Kristian Electric's services are designed to meet the rigorous demands of potash production.

In addition to maintenance and repair, Kristian Electric offers a wide range of equipment sales and spare parts. Their extensive inventory includes welding and plasma-cutting supplies from leading brands such as Miller, Hobart, Hypertherm, and CK Worldwide, as well as cranes and hoists from trusted manufacturers like Demag, R&M, Gorbel, and J.D. Neuhaus. With decades of experience, servicing welding and material-handling equipment gives their team a hard-earned advantage when recommending and procuring solutions tailored to each customer's needs.

Kristian Electric's expertise extends from the shop to the field, offering on-site services and emergency repairs to reduce operational disruptions. Their commitment to customer service and technical excellence has made them a trusted partner for Saskatchewan's potash industry. By combining their knowledge of welding equipment and crane and hoist services, Kristian Electric delivers customized solutions that keep mining operations running efficiently and safely.

As a leader in equipment repair, maintenance, and sales, Kristian Electric proudly supports the potash sector by ensuring critical welding and lifting equipment operates at peak performance to meet evolving industry demands. ▲



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At your service: These roots are a reason to choose Ludman to partner with you to improve your profitability



Ludman roll compactors.

When Ludman Industries was founded in 1968, it began as a component supplier for Allis Chalmers Compactors. The company seized the opportunity to continue the legacy when Allis Chalmers sold it the product line in 1986. Since then, Ludman has become the original equipment manufacturer (OEM) that is synonymous with roll compaction and granular potash. Serving the Canadian potash industry propelled it to decades of building robust machines with rugged designs. Its identity of focusing on service and parts continues to this day. Due to increased competition in the potash market, miners are looking to Ludman for ways to increase production and lower their cost per tonne with existing operations. Getting more production out of the compactors is easy; just increase the thickness of the flake. However, this effort could lower the production of the plant. If cake hardness is sacrificed for capacity, more material will be recycled, and overall production could drop.

The relationship between compactor roll speed and plant production forms a parabolic curve. The ability to vary roll speed allows an operation to find the point at which plant production is maximized. While the gains may be modest, they directly enhance the profitability of the operation. Ludman Industries normally recommends Variable Frequency Drives (VFD) for compactors and can retrofit existing operations. Variable speed also allows for roll timing and many other benefits if the compactor is equipped with independent drives. Roll timing aligns the peaks and valleys of the opposing roll corrugations which produces a sine wave cake of uniform thickness. Cake with uniform thickness produces less fines because of its equal uniform hardness. Ludman Industries offers rebuilt, or replacement rolls with a proprietary De-Aeration Pattern machined into the surface to allow air to escape during the compaction process. The principle is akin to how the treads of an auto tire create a path for water to pass when driving in wet conditions. Force feeders also work well with some minerals to increase cake hardness.

Production can be increased by reducing equipment downtime. The expert maintainers who can detect pending equipment failure by sound or touch are retiring at a rate much faster than they can be replaced. Equipment instrumentation is offered The expert maintainers who can detect pending equipment failure by sound or touch are retiring at a rate much faster than they can be replaced.

by Ludman, allowing plants to move from reactive to predictive maintenance. Ludman also offers a consigned inventory program where they store, assemble, and maintain spare inventory in a climatecontrolled environment.

Ludman's customer-centric approach, commitment to innovation, and reliability has led to a proven track record. Ludman's advantage is that we have an established reputation for over 55 years, and over 100 if you count Allis Chalmers' legacy. Ludman's design is original to the industry and continues to evolve amid automation featured today. They have had great success, leading for many years, and continue to transform the industry with significant projects in process today. Ludman is poised to be on the cutting edge of Canadian potash into the future. ▲



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