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MESSAGE FROM THE EDITOR

SHAYNA WIWIERSKI

2020... the year we all didn't see coming.

Just like every other industry, the COVID-19 pandemic affected the potash sector as well, although to a way lesser degree than other industries out there. In general, 2020 was a fairly stable year, especially so for the multi-billion-dollar Saskatchewan potash sector since mining was declared an essential business early on in the pandemic.

Of course, as we all know, the year 2020 featured disaster after disaster in all markets, with outbreaks happening all over the globe. In fact, in October 2020, a COVID-19 outbreak was declared at the K2 potash mine in Esterhazy, and that just one of a few mines that were affected by outbreaks due to the worldwide pandemic.

COVID-aside, the year wasn't all that bad though. In September 2020, the value of potash in Saskatchewan was up 15 per cent compared to February 2020. As we learn in our Year in Review story on page 20, the year 2020 was very much a year like 2019, with prices overall down slightly from the start of Q1. This past year may have been a downer, but it's looking like it's all up from here.

In this issue of *PotashWorks*, we take a look at what some of the top potash producers are doing, as well as other potash news, like the Government of Saskatchewan amending the Potash Production Tax Regulations, 2020, which will improve opportunities in the potash sector, particularly for junior producers. We also take a look at what some of our favourite suppliers have been up to and what you can expect as we head into 2021.

I hope you enjoy this issue of *PotashWorks* magazine, and as always, if you have any story ideas or comments, feel free to reach out. We also invite you to check us out on our official website, potashworks.com, where you'll find the digital issue of the magazine, as well as current news stories, and our new potash mining directory and buyers' guide.

I wish you all the best and a successful year ahead.

Shayna Wiwierski
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POTASH MINING & PROCESSING CONVEYOR EQUIPMENT

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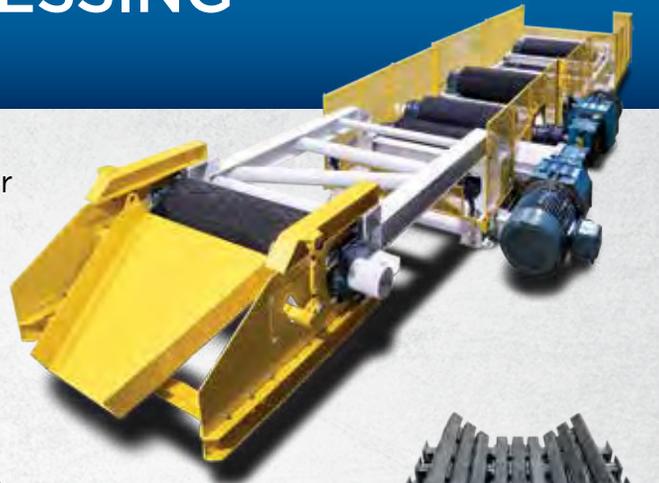
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MESSAGE FROM THE PREMIER OF SASKATCHEWAN **SCOTT MOE**



The past few months have been extremely challenging for our province. The COVID-19 pandemic is the most serious public health crises our province has faced in recent memory. The people of Saskatchewan have made great sacrifices and have displayed tremendous resilience every step of the way. Front-line and essential workers have done a remarkable job ensuring we are safe, while keeping our supply chain stable. Meanwhile, the mining industry in our province has stepped up in a big way, demonstrating remarkable generosity at a time of great uncertainty.

During the pandemic, community groups across the province have received millions of dollars in donations from the industry. Support has flowed through initiatives like Mosaic's Million Meal Challenge, while BHP and K+S collectively donated over \$150,000 to local food banks. I am grateful for the contributions of these companies and many others in our mining sector.

As we look forward, I see a bright future for our province – a future built on a strong economic recovery, driven by hard work and innovation. The fundamentals of the global economy have not changed. The world's population is expected to reach nearly 10 billion by 2050. Saskatchewan has the food, fuel, and fertilizer a growing world requires – high-quality, environmentally responsible, sustainable products, provided through a safe, reliable supply chain.

About a year ago, our government released Saskatchewan's Growth Plan: The Next Decade of Growth 2020-2030. In our Growth Plan, we put forward a goal of increasing the annual value of potash sales from about \$6.3 billion in 2019 to \$9 billion by the end of 2030. This ambitious target underscores our commitment to responsible resource development and reflects our confidence in potash compa-

nies operating in Saskatchewan. The potash industry has been driving growth and progress in the province for nearly 60 years and we are certain it will play a crucial role in the economic recovery to come.

To reach our Growth Plan goals, our government remains committed to an approach that promotes the responsible growth of the sector, including initiatives such as:

- reinstating provincial sales tax exemptions on exploratory and downhole drilling;
- promoting the sector to attract international investment and new exploration companies; and,
- working with the federal government and global leaders to remove barriers to market access.

Our government understands the challenges facing the potash industry. We want the industry to grow and prosper. Potash companies operating in Saskatchewan can count on the support of the Government of Saskatchewan every step of the way.

This includes standing up against damaging policies being imposed by the federal government, such as Bill C-69, the carbon tax, and the proposed Clean Fuel Standard. Producers in our province compete globally and all levels of government in Canada need to ensure regulations and policies allow the industry to succeed.

While 2020 has brought unexpected challenges, including pressure on potash prices, the industry in Saskatchewan is on track to set new annual records in terms of production and sales volume. As Saskatchewan emerges from the pandemic stronger than ever, we can be confident that potash will lead the way. ▲

A dramatic night-time photograph of a construction site. Several pieces of heavy machinery, including a yellow John Deere excavator, a bulldozer, and a wheel loader, are silhouetted against a dark, cloudy sky. Their headlights and work lights are on, illuminating the scene and casting long shadows on the dark earth. The excavator's arm is extended, and the bulldozer's blade is visible. The overall mood is industrial and powerful.

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MESSAGE FROM THE SASKATCHEWAN MINISTER OF ENERGY AND RESOURCES **BRONWYN EYRE**

As Saskatchewan's Minister of Energy and Resources, I am pleased to join with Premier Scott Moe in asserting the key importance of potash to our economy.

The past several months have clearly been a challenge, and my heart goes out to workers and their families who have experienced economic hardship in this and other sectors, particularly as we head into the Christmas and holiday season.

Despite the pandemic and economic uncertainty this past year, which also included a rail blockade and strike, Saskatchewan remains one of the top mining jurisdictions in the world and offers a stable regulatory environment, competitive royalty structures, and high-quality geoscience. Last year, Saskatchewan also retained its standing, according to the Fraser Institute, as the most attractive jurisdiction in Canada for mining investment.

As a government, we remain responsive to the mining sector. In the provincial 2020 Budget, for example, we reinstated the exemption of the Provincial Sales Tax (PST) for exploratory and downhill drilling. I am in personal, regular contact with mining/potash companies, as well as the Saskatchewan Mining Association, and advocate for their concerns—including, most recently, over the proposed federal Clean Fuel Standard regulations, which are expected to have a profoundly negative effect on mining operations.

In Saskatchewan, full-year potash sales for 2019 reached 12.3 million tonnes—the second-highest on record. Sales for 2020 are expected to set a new record of nearly 14 million tonnes. The pandemic has highlighted the need for a safe, reliable supply chain. And as the global economy begins to recover, Saskatchewan has the food, fuel, and fertilizer that the world needs.

Saskatchewan has also seen considerable investment and growth in the potash sector over the last decade. Export capacity and production have steadily increased and, in Canada, the potash sector accounts for approximately \$1 billion in wages annually.

It is also important to mention that throughout the pandemic, we have seen extraordinary generosity—including in the form of monetary and food bank donations, cleaning supplies, and personal protective equipment—on the part of the Saskatchewan mining sector to communities and non-profit organizations across the province. On behalf of the Government of Saskatchewan, I would like to thank you, as a sector, for your remarkable outreach.

As we move toward economic recovery beyond the pandemic, our government will remain committed to the potash sector. Our goals, set out in our 2020-2030 Growth Plan: The Next Decade of Growth, aim to increase export capacity and keep our traditional sectors strong. ▲

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MESSAGE FROM THE MINISTER OF TRADE AND EXPORT DEVELOPMENT **JEREMY HARRISON**

On behalf of the Government of Saskatchewan, I want to thank you for the opportunity to contribute to this issue of *PotashWorks* magazine.

Potash is one of the largest and most important industries in our province. The sector employs 5,000 people directly in communities across the province, and in 2019 had sales totaling \$6.5 billion, which is 22 per cent of the total Saskatchewan international merchandise exports. The value of potash exports increased by 86 per cent between 2009 and 2019. Major markets during that period included the United States, Brazil, China, India, and Indonesia.

Despite the economic challenges associated with the global pandemic, potash exports have remained strong. In September 2020, the value of potash was up 15 per cent from February 2020, an increase of 35 per cent from the same time last year.

As Minister of Trade and Export Development, I've seen how COVID-19 has hit economies hard across the globe, including Saskatchewan. COVID-19 has impacted many businesses across the province, including those in the potash industry. Thankfully, companies in our potash sector took action early to protect workers and it's had a limited impact on the industry.

Prior to the start of the global pandemic, our Government released Saskatchewan's Growth Plan, which includes ambitious goals and actions for expanding our international exports. The Growth Plan commits to establishing international trade offices in India, Singapore, and Japan in 2021. These offices will not only help to promote Saskatchewan products like potash, but it will also help attract investment to our province.

Recent and current expansions in the Saskatchewan potash industry will help us achieve our Growth Plan goals. K+S Potash Canada is the newest potash mine with production occurring in the last two years. There are a number of other companies, including BHP Billiton, Yancoal, Rio Tinto, and JSC Acron who are all in various stages of developing new mines.

Potash deposits in our province are high-quality, and production costs are comparatively low. The regulatory environment in the province is well-known for being investment friendly, and that has helped us to create the largest potash industry in the world.

Saskatchewan has been in the potash business for 60 years. I am confident this key sector will continue to succeed for many more years to come, creating jobs, investment, and exciting opportunities for workers, businesses, and communities right across our great province.

In closing, I want to thank everyone in the potash sector for all you do in helping to create a strong Saskatchewan. ▲



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LOOKING BACK AT 2020

A YEAR IN THE POTASH INDUSTRY

BY STEVE HALABURA P.GEO., HALABURA POTASH CONSULTING LTD.

“Potash” is a generic term describing various forms of potassium-bearing fertilizer products. The most common of these products is “Muriate of Potash” or “MOP”, which is potassium chloride (KCl) in a high-grade form. MOP provides the potassium macro-nutrient in the formulation referred to as N-P-K, or Nitrogen-Phosphorus-Potassium. MOP is the product that will be referred to in this article.

The potash business in 2020 was largely stable, however lacklustre from the producers’ and investors’ viewpoint of enjoying significant price

gains. While there were complications caused by infrastructure and logistics difficulties induced by the COVID-19 pandemic, global demand remained generally strong, although there were regional differences in potash sales. The effect upon potash caused by the COVID-19 pandemic was the same as for other bulk commodities, as lockdowns and reduced staffing created slowdowns in transportation and distribution. As for positive developments, there were more recognition by analysts and the investment community that potash is indeed a unique business. In the words of BHP Billiton,

potash is a “forward-facing” commodity, whereby the trend toward increasing awareness as to environmental responsibility and engagement with local communities and stakeholders bolstered, rather than degraded the business.

2020 was very much a year like 2019, with prices overall down slightly from the start of Q1. The global price opened with contracts in the USD\$220 to USD\$235 per tonne range, with Canpotex China contract prices currently at USD\$230 per tonne. For North American markets, potash opened

Mosaic's new K3 Esterhazy mine is now in production, and while it will for the near-term replace production decreases from the older K2 and K1 mines, it does have the ability to increase production to meet any supply-demand imbalance, and by 2024 be ready to completely replace the older, high-cost mines.

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While there were complications caused by infrastructure and logistics difficulties induced by the COVID-19 pandemic, global demand remained generally strong, although there were regional differences in potash sales. PHOTO BY THE MOSAIC COMPANY.

In its forecast to 2022, the Food and Agriculture Organization of the United Nations (FAO) reports that world supply of potash will grow from 52.7 million tonnes in 2020 to 54.2 million tonnes in 2022. PHOTO BY THE MOSAIC COMPANY.

the year at USD\$375 per tonne, and by the end of September it was USD\$338.

In Asia, low palm oil prices led to weak demand from southeast Asian potash purchasers. In Europe, political tension in Belarus over the summer caused some supply difficulties, however the fall fertilizer season was normal. China and India markets also remained largely flat, with local disruptions due to COVID protocols. However, North America enjoyed a better-than-average crop year, leading to increased demand, and a draw-down of inventories, so while prices were down, increased sales volumes led to better financial performance by the big producers such as Nutrien and Mosaic.

Overall, world demand remained strong in 2020. In its forecast to 2022, the Food and Agriculture Organization of the United Nations (FAO) reports that world supply of potash will grow from 52.7 million tonnes in 2020 to 54.2 million tonnes in 2022, while demand will grow from 38.7 million tonnes in 2020 to 40.2 million tonnes in 2022, which suggests an even supply/demand balance in the near-term. Global production capacity is forecast to grow from 63.5 million tonnes in 2020 to 64.6 million tonnes in 2022, which is an increase of 1.1 million tonnes.

Given forecasts of continued strong demand into 2021, and with no new significant supply anticipated for the year, forecast prices are closer to USD\$275 to USD\$285. Nevertheless, one must be careful not to be too bullish when forecasting future supply, as there are several factors that could affect this balance. Mosaic's new K3 Esterhazy mine is now in production, and while it will for the near-term replace production decreases from the older K2 and K1 mines, it does have the ability to increase production to meet any supply-demand imbalance, and by 2024 be ready to completely replace the older, high-cost mines. The same can be said for Saskatchewan's K+S Bethune mine and Nutrien's mining operations, all of which are capable of production expansion should there be a strong need for more potash supply. It is not yet time to expect a return to the years 2000 to 2005, where a significant disconnect between potash demand and supply led to the "Great Potash Boom" and wild price appreciations.

In Canada, BHP Billiton Canada Inc. (BHP) continued to delay its decision to commit its intended investment into the Jansen project, pushing back its decision deadline from February to mid-year 2021. The amount of the investment to finish Phase 1 of the mine is USD\$5.3 to \$5.7 billion, with construction expected to take five years.

Overall, its intended investment into the Jansen project is some USD\$17 billion. BHP claims Jansen will be able to produce at around USD\$100 per tonne. Full expansion of the project would require an additional three phases with each phase costing some USD\$4 billion each, thus creating a "monster mine" capable of producing some 16 million tonnes of potash per year.

Expansion plans for global, new potash capacity remained slow in 2020, in part due to continuing capacity surpluses. Raising the capital required to build large (three Mtpy) mining and production facilities remains a challenge, with the global situation in 2020 doing nothing to ease investor tensions. Trade tensions between the US and China have not only affected trade, but also impeded in the funds transfers that allow China to make investments overseas. Until these concerns are eased, numerous large projects will remain stalled well into 2021.

In 2020 the need for food security was brought into full view of the average consumer by disruptions to the food supply chain caused by the COVID pandemic. This was not simply a function of availability, quality, and affordability, but also of timely production and delivery of consumer food products. On a local level, we can all remember empty shelves in super-



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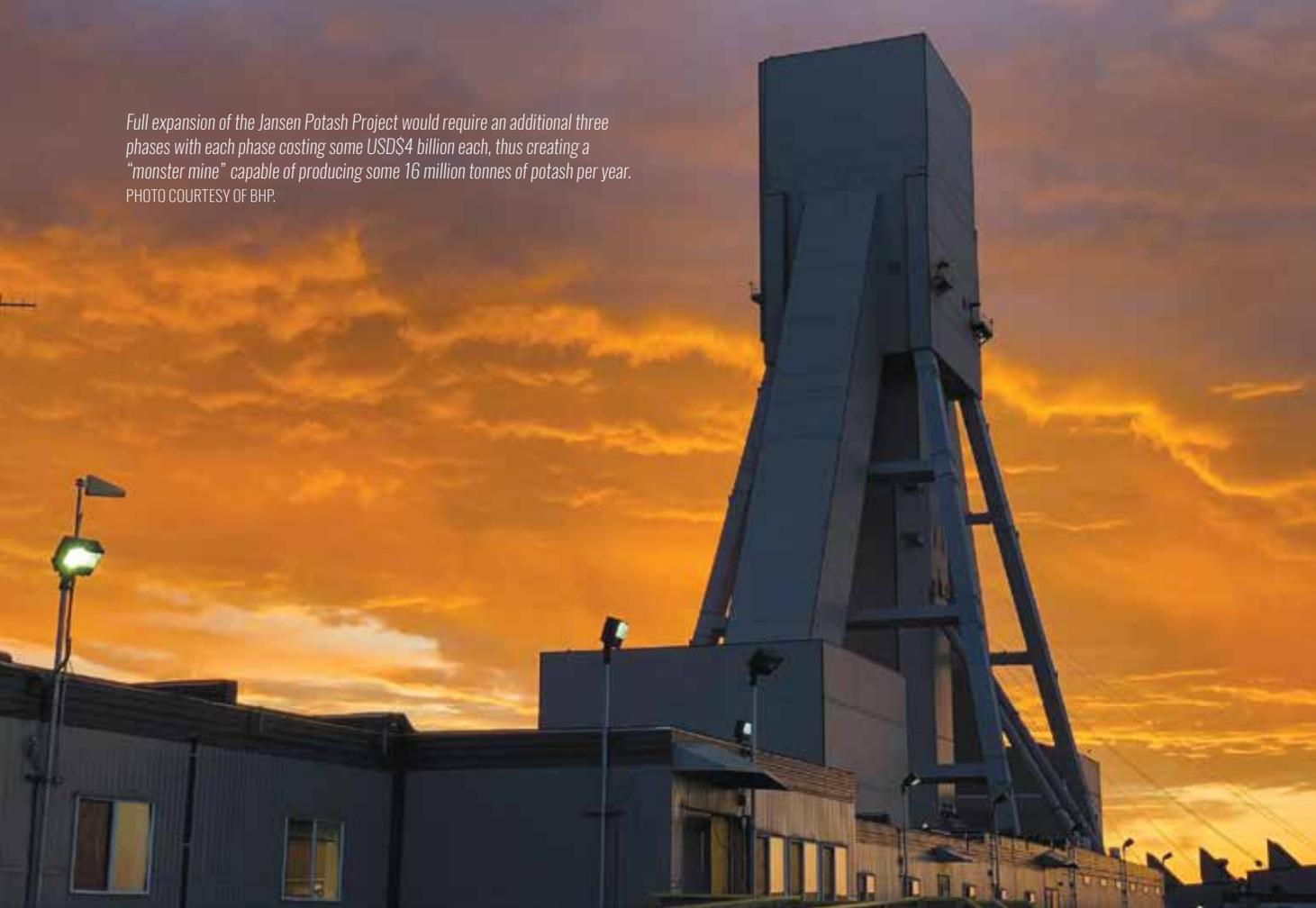
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Full expansion of the Jansen Potash Project would require an additional three phases with each phase costing some US\$4 billion each, thus creating a “monster mine” capable of producing some 16 million tonnes of potash per year.
PHOTO COURTESY OF BHP.



The most promising new technical development was announced by Western Potash Corp. (Western), that began the “active” phase of mining in 2020.

markets this spring, including shortages of basic staples like flour and toilet paper. While on the global level fertilizers are impacted by increasing world population, decreasing arable land base, and a decrease in available cultivated acreage due to changes brought about by climate shifts, on a local level, supply chain disruptions caused by shuttered production plants, increased logistical burdens, and imbalances between producers and processors all contribute to the “empty shelf” problem.

The above challenges affecting the big mine sub-sector also affected the small mine sub-sector. By small mine sub-sector, I mean those junior resource companies that are seek-

ing new and innovative methods to mine potash and implement a business model that uses smaller, modular mine and production facilities to make an MOP product that is sold to a specific end-user who may or may not be a co-owner of the facility.

In Canada, progress by the smaller greenfield projects was focused upon organizing financing for specific projects. The most promising new technical development was announced by Western Potash Corp. (Western), that began the “active” phase of mining in 2020. Initial work was reported to be the construction of a sump using “cold” mining, which was then followed by “hot” selective mining. No news has been released by the com-

pany as to the status of the project, or whether successful selective solution mining was achieved.

As for the other small mine greenfield projects, including Gensource Potash (Tugaske Project), CanPacific Potash (CanPacific), Encanto Potash Corp. (Muskowekwan Project), Yancoal Canada (Southey Project), Karnalyte Resources Inc. (Wynyard Project), Canada Potash Corp. (Kirin Project), and Canada Golden Fortune Potash Corp. (Broadview Project), all continued work focused on enhancing the feasibility of their projects while exploring options for financing.

One glimmer of hope for finding new sources of capital by this sub-sector is in part driven by the recognition by larger institutional investors of the importance of food security, and in part by the demise of investments into the oil and gas and cannabis sectors. There is pent-up demand by firms to place capital, and fertilizers

BHP Billiton Canada Inc. (BHP) continued to delay its decision to commit its intended investment into the Jansen project, pushing back its decision deadline from February to mid-year 2021.
PHOTO COURTESY OF BHP.



remain one of the few bright spots. The financial sector has not yet fully grasped the potential opportunity; however, 2021 may be an increase of capital placed into more advanced small mine sub-sector projects, including the division of greenfield big mine projects into a small mine and a big mine component.

As at the close of 2019, 2020 will exit

largely as a year that showed nothing dramatic other than continued recognition by all players in the industry of that one unchanging, unarguable demand driver: population growth. It is beyond cliché to state the obvious that the eight-billion people to be on the planet by 2050 expect to be fed, and with climate change decreasing the amount of arable land, this will increase demand for fertilizer. However,

for the investor, this is cold comfort – the potash business is notorious for the inability of producers to set their own prices, so to be profitable, successful companies must continue their focus on reducing operating cost per tonne by means of constantly evolving technology, streamlining the production and logistics chain, and supporting only the most efficient operations. ▲

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The Mosaic K3 project, serviced by Prairie Machine equipment, exclusively uses WEG motors in their mining machines, with these motors being provided by Precision Electro Mechanical.

Teamwork benefits the mining industry



Precision Electro Mechanical became a distributor of WEG motors in 2003.

For close to two decades, Prairie Machine, Precision Electro Mechanical, and WEG have been in partnership, supporting the potash mining industry with high-caliber products and superior client care. The key to this long-standing relationship is a business model founded on trust and a vested interest in ongoing commitment to quality.

“When a group of companies have enough trust in each other to expose their vulnerable side, they can act as one company,” says Marc Taillon, CEO of Precision Electro Mechanical, an electric motor and pump servicer located in Saskatoon, Saskatchewan. “Members of a company trust each other, and this trust surrounds them,

separating them from those outside the team. But what if there was this same trust between companies and this barrier was removed? Removing along with it any doubt that one would take advantage of the other? That's what I believe we have."

It starts with WEG, a world-class motor manufacturer that continuously invests in innovation and efficient solutions. With over 60 years of experience, they are recognized globally as the leaders and innovators in the electric motor marketplace. Precision Electro Mechanical became a distributor of WEG motors in 2003. A locally run business, they are celebrated for providing non-stop professional service and have built a highly respected team. Lastly, bring in Prairie Machine, a leader in the manufacturing and supply of heavy-duty equipment and technical solutions for the mining industry. The Mosaic K3 project, serviced by Prairie Machine equipment, exclusively uses WEG motors in their mining machines, with these motors being provided by Precision Electro Mechanical. Together, these three businesses form a community of purpose - to do the right thing and look after their clients, building a solid foundation of trust that everyone has come to believe in.

"The focus for all of us is high-performance, high-quality products backed by the best-in-class support," says Kipp Sakundiak, general manager and partner at Prairie Machine. "This shared approach makes it easy for excellence to become a habit. And these same virtues - the support, the trust, the expected standard of excellence - that we have with each other is then passed onto our clients."

This unique team of companies have built a successful business partnership, taking on complementary roles that are integral to their ability to find solutions for the mining industry.

"WEG has been fortunate to partner with Precision Electro Mechanical and Prairie Machine to develop cutting-edge, high-quality products for the potash industry. It is because of our trust in each other and our close collaboration, that we have been able to supply exceptional solutions for extremely difficult mining applications," comments David Wassyng, vice-president of VJ Pamensky Canada Inc./WEG Canada.

"All this highlights the importance of people. We are accomplishing great things because of the group of people in each of our companies that are willing to work together to get to that next level," Taillon concludes. "The end result is a group of well-respected businesses, amazing service, and all-around client satisfaction." ▲



THE POWER OF TEAMWORK

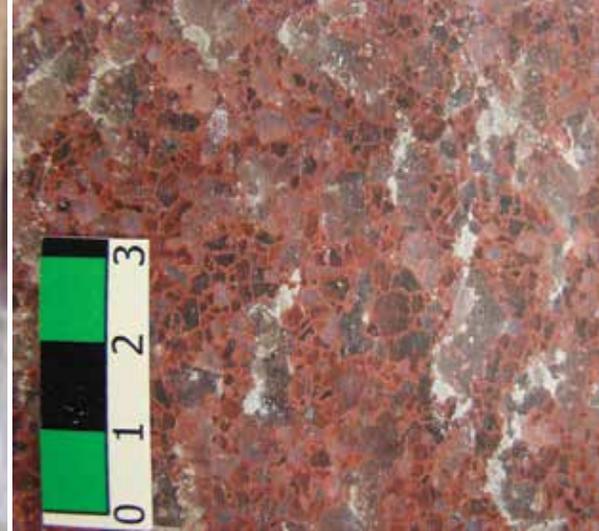
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Above: The Saskatchewan potash sector accounts for approximately 30 per cent of world production and directly employs approximately 5,000 people.

Left: The new Potash Production Tax Regulations, 2020 will offer incentive tax credits of 40 per cent of eligible expenditures for qualified R&D projects and approved market development programs.

PHOTOS PROVIDED BY THE GOVERNMENT OF SASKATCHEWAN.

AMENDED POTASH REGULATIONS **seek to attract new innovation and investment**

The Government of Saskatchewan has amended The Potash Production Tax Regulations, 2020, which will improve opportunities in the potash sector, particularly for junior producers, around innovation and research and development (R&D).

The regulations will offer incentive tax credits of 40 per cent of eligible expenditures for qualified R&D projects and approved market development programs. The amendments will allow companies to take full advantage of the credits by removing expiry dates and enhancing eligibility requirements.

“These changes will promote the expansion of Saskatchewan’s potash sector and ensure that our province remains the preferred jurisdiction in which to pilot innovative technologies,” said Energy and Resources Minister Bronwyn Eyre. “As we move into economic recovery, we want

to attract and foster new, sustainable advancements in our province’s world-class resource sector.”

Qualified R&D projects must demonstrate improved production efficiency, mitigate environmental impacts, reduce physical risks to employees and mine operations, or develop new and improved potash products. Companies must develop new markets or expand existing ones to be eligible for market development credits.

“We are very pleased to see clear leadership with respect to the amendments to the Saskatchewan Potash Production Tax Regulations,” said Mike Ferguson, Gensource Potash Corp. president and CEO. “The amended regulations dovetail with the leadership in innovation that Gensource is deploying at its Tugaskie project. Gensource welcomes the amendments to the regula-

tions and look forward to providing long-term economic benefit to the Saskatchewan community while demonstrating real-world ESG leadership.”

Adds Giles Hellyer, president of BHP Canada Inc., “We welcome the amendments that recognize innovation and believe such incentives can benefit the Saskatchewan potash industry as it strives to pioneer new developments that enhance worker safety and environmental protections, as well as efficiency and productivity.”

The Saskatchewan potash sector accounts for approximately 30 per cent of world production and directly employs approximately 5,000 people. Full-year potash sales for 2019 reached 12.3 million tonnes—the second highest on record—with sales expected to reach a record of nearly 14 million tonnes in 2020. ▲

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Moving potash to market



Ken Seitz,
Nutrien EVP and CEO of Potash.

Q&A WITH KEN SEITZ, EVP AND CEO OF POTASH AT NUTRIEN

Find out more about Nutrien's Ken Seitz, executive vice-president and CEO, Potash, who heads up the world's largest potash producer with over 20 million tonnes of potash capacity at its six potash mines in Saskatchewan, Canada.

You've been leading Nutrien's Potash business for just over one year now. What has been the highlight?

Seitz: Joining Nutrien brought together two of my passions into one dream role: mining and agriculture. I

grew up on a farm near Regina, so understanding farmers and their challenges is in my blood.

The absolute highlight for me is the amazing people. We have an extraordinary team in Potash and across Nutrien, and their pride shows in their work. It's energizing to work with employees who rally behind Nutrien's purpose every day - to grow our world from the ground up. What a noble and exciting purpose to be a part of, focused on feeding the world safely and sustainably.

How has Nutrien responded to the COVID-19 crisis?

Seitz: One of our core values at Nutrien is safety, and throughout the COVID-19 pandemic, we remained steadfast in our commitment to safety and protecting the health and well-being of our employees, their families, and our communities. It's a responsibility we're extremely proud of. We also proudly continued operating as an essential service, so growers around the world will have the crop nutrients and solutions they need to feed people - now and into the future.



One of Ken Seitz's highlights in his first year at Nutrien has been working with the amazing people.

Our potash mines have been able to run safely and effectively from the early stages of the pandemic through to today. Our safety and procurement teams led the way by quickly tailoring our pandemic response plan for COVID-19 protocols and ensuring we had the appropriate PPE and safety supplies to respond to the virus so we could remain focused on serving our customers safely.

Our commitment to the community hasn't waned either. We continue to give back to the communities where we live and operate with a focus on keeping food programs running without disruption. In Saskatchewan, our contributions total more than \$550,000 out of the \$1 million of COVID funding earmarked by the organization. In addition to funds, we donated much-needed N95 masks to the Saskatchewan Health Authority. We have also encouraged our employees to safely get out into the community and help where we can. We increased our time commitment for volunteering to five days per employee in this time of need. I am deeply proud of the way our employees have responded, with so many powerful stories of helping out where there are needs.

Some of our community investments included supporting the Food Banks of Saskatchewan Feeding Saskatchewan Together campaign, the Greater Saskatoon Catholic Schools Nutrition Program, and the Saskatoon Tribal Council & White Buffalo Youth Lodge Food for the Community program.

We've been fortunate that for the most part, COVID-19 has not had a significant impact on our potash business. The supply chain of rail and truck to move our potash to market was not significantly impacted and we were able to deliver our potash to our offshore customers around the world and to our customers in North America in time for their spring plant-

ing needs, and one of our best fall fertilizer application seasons.

What does the future of potash look like for you?

Seitz: As the world's largest soft rock operator, Nutrien Potash hasn't shied away from our opportunities and challenges. There's no substitute for potash, so there continues to be great opportunity here.

The growing world population needs more food and Nutrien is honoured to serve the farmer - from ground to grower - to meet the demand. We're fortunate Nutrien is at the epicentre of this important conversation - and we have to be, as a critical part of the Saskatchewan and Canadian economy.

Nutrien continues to deliver solid performance and operational results.

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Seitz volunteering with the Friendship Inn in 2019. Nutrien gives back to the communities where they live and operate and encourages employee volunteerism.

For Nutrien to deliver on its strategy, we need a diverse, talented team. There's no question that teams with greater diversity - be it experience, backgrounds, gender, or cultures - make better decisions with greater outcomes because there are fewer biases. But there are also great human benefits to prioritizing diversity and inclusion. I've seen firsthand in my travels and work around the world that the pursuit of happiness is the same for everyone: peace, tranquility, security. And we can get there by being mindful and treating everyone with the same respect and dignity every day in our interactions with one another. ▲

Global potash demand continues to be strong, and it's encouraging to see that through a great and early harvest season, North American farmers are seeing higher crop prices and taking the opportunity to lay down more affordable crop nutrients, including potash.

Nutrien has its sights set on leading the way to become the safest, most reliable and lowest-cost potash producer network. Our Next Generation Potash program is leveraging the strengths of our sites, ETC (engineering, tech and capital) and IT teams to transform our network of six potash

mines to achieve improved safety, increased productivity, reduced expenses, and improved dependability and flexibility. Through this collaborative approach, the program focuses on five digital destinations: autonomous mining operations; advanced process control; integrated planning and dynamic scheduling; connected workforce; and predictive maintenance.



Nutrien's Cory mine in one of six mines in its potash network in Saskatchewan.

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Since our founding in 1912, National Steel Car Limited (NSC) has continuously designed and manufactured freight cars to meet the ever changing requirements and standards of the railroad industry and over two decades ago NSC began working to develop the ideal car for moving potash.

Like every NSC railcar built in Hamilton, ON each order brings about new ideas allowing us to constantly refine our approach and continuously improve the end product. Our 4045 and 4300 cf covered hopper cars are no exception. They boast the shortest car lengths, lowest light weights and highest carrying capacity in the industry.

NSC continues to carry the weight of the potash industry with over 13,000 cars in service.



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Mining companies rely on suppliers to solve their problems and be able to quickly turn around custom manufactured goods to support their continued production. This is precisely what is expected of Croatia Industries, which they deliver with on-staff engineers, trained craftsmen, and over 40 years of experience.

Croatia Industries is located in Saskatoon and serves the resource extraction and industrial sectors of Western Canada, which includes mining, power generation, manufacturing, forestry, and oil and gas. They cater to the unique machinery needs of their

customers and offer the specialized equipment and trained staff necessary to service those needs. They offer a full-service facility, able to not only manufacture, but to also evaluate, recommend, and implement solutions with value.

During previous expansions, Croatia Industries added the capability to execute large machining projects through the acquisition of a six-axis CNC horizontal boring mill with a 20-ton capacity, as well as a four-axis CNC lathe with capacity to machine workpieces 63 inches in diameter and 30 foot length up to 15 tons.

Despite the recent declines in mining, Croatia Industries has opted to continue to invest in its operations and technology. Recent capital investments include the installation of new machine tools such as a CNC horizontal boring mill and a CNC lathe, which were completed in 2020. These new machines were strategically selected to enhance their production processes, which ultimately allows them to pass along decreased costs and delivery times to their customers.

While continuing to further their technical offerings, Croatia Industries has added the capability to digitally

scan a component using its handheld metrology grade 3D scanner. They can now ascertain complex geometry and precise dimensional information faster than ever before. This scanning service is also offered for inspection and corrosion/erosion monitoring purposes for critical equipment. In addition to their technical services, they offer millwright and welding services to meet their customers mechanical inspection, repair, and assembly needs.

Croatia Industries operate under a quality management system certified to ISO 9001:2015. They are a member of ISNetworld and their health and safety program is certified through the Certificate of Recognition (COR) program which ensures national occupational health and safety standards are met.

Croatia Industries has established its



Newly installed Gurutzpe CNC Lathe.

position in the marketplace through unparalleled quality and exceptional customer service. These values run deep into the very core of the company. This bodes well to continue a tradition of supplying quality crafts-

manship in response to the real necessities of their customers - productivity, safety, reliability, precision, and confidence.

For additional information, please visit www.croatiaindustries.com. ▲

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Leading at the FOREFRONT

DIGITAL TRANSFORMATION, CYBER SECURITY, AND AUTOMATION

As all industrial sectors undergo digital transformation, March Consulting Associates Inc. (March) is always looking at quantitative methods to minimize risk and maximize return on investment (ROI) for our clients who are planning to implement digital solutions for greenfield, as well as brownfield projects. From automating mining operations, intelligent 3D models used to model both greenfield and brownfield projects and simulating real-world scenarios, there are a number of ways these solutions can digitally transform the potash industry. Automation itself is a broad topic within digital transformation with all existing mining operations looking at adding autonomy to their operations to improve safety, reduce operational costs, and increase efficiencies.

As is the case with any new technology, there are several things to consider when looking at automating any operation.

1. Creative competition – As automation demands grow, numerous small- to mid-size manufacturers are starting to offer programmable logic controllers (PLCs) that are fully featured low-cost controllers that can compete directly with mainline PLCs. This may present a great opportunity for achieving automation while staying within budget constraints that a mining operation might be working under. March engineers have knowledge of these options and continue to investigate new applicable options for the potash industry.
2. Cybersecurity – Every conversation related to digital transformation generally leads to network and cyber security. Unlike last-generation control systems, PLCs and DCSs are now integrally connected over Ethernet not just to other control devices, but also to external environments so they can be remotely supported. Therefore, any network design needs careful consider-

ation to mitigate the risk of cyberattacks. Further, applications such as cloud computing and data exchange with external systems impose a challenge and a potential cybersecurity threat to crucial mining operations. Our experts in the area of controls can provide designs for connecting through firewalls to external networks while still maintaining the security which is always top of mind for any mining operation.

3. Disruptive technologies such as AI, machine learning, and augmented reality – As a part of digital transformation, all mining operations are also evaluating technologies such as artificial intelligence and machine learning and its application to real-world scenarios. Given the pandemic, augmented reality is another technology that may be very applicable for the future as travel is restricted. March has engineers with expertise in this area who can help to evaluate practical applications that can truly bring value to mining operations.

In summary, the area of automation continues to grow and provides great opportunities for all mining operations. In addition to the considerations above, the key challenge will be the interaction of autonomous equipment with equipment that may need to be non-autonomous and manually-operated to ensure safe and efficient operations. Data extraction and communication becomes critical for a successful implementation.

March Consulting Associates Inc. is a multi-discipline engineering company providing engineering, procurement, project and construction management services to numerous resource-based industrial and commercial enterprises. With offices in Saskatoon and Regina, we have been serving these enterprises for over 21 years and proudly call Saskatchewan home. ▲

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Integrity | Adaptability | Safety | Quality



Jansen digital strategy shapes our future

Most recently, travel limitations have accelerated the deployment of wearable point-of-view cameras that allow off-site subject matter experts to support and guide on-site workers without the risk, cost, and inconvenience of physical travel.



The S3d and synchro tools help us input data and have a 3D model on our portal. The data loaded into the model ranges from physical data, schedule data, cost data, and operational data.

Digital technology is everywhere.

It is estimated that there are now 4.6 billion Internet users globally, 5.1 billion mobile phone users, two billion online shoppers, and 3.7 billion social media users. Every 60 seconds there are 200 million emails sent, 4.2 million Google searches made, and 60,000 Instagram images uploaded.

The data created by all this almost unimaginable – a staggering 44 zettabytes.

This is doing amazing things for businesses as they harness the power of technology. But a new system or piece of software alone will not guarantee success. That is why a team from Jansen have been busy preparing a digital strategy to shape the future of the business.

The team's goal has been to put together a strategy that will help Jansen thrive in the future. But this isn't

just technology for technology's sake. All digital initiatives will deliver measurable value through cost reduction, throughput, recovery, utilization, and then immeasurable value through improvements to HSE and workforce culture.

Breaking down geographic barriers

It starts with what the team calls integrated project delivery, which allows for a high level of collaboration even in a decentralized team.

The S3d and synchro tools help us input data and have a 3D model on our portal. The data loaded into the model ranges from physical data, schedule data, cost data, and operational data. Enriching the engineering data, or shifting it from 3D to 4D to 5D and beyond, creates an almost infinite range of opportunities, including the ability to simulate construction.

BHP

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Part of the benefit of a greenfield operation is that the team has the opportunity to really challenge the status quo and build their vision from scratch.



The project has adopted the philosophy that data is entered only once, controlled at the source, and then consumable for further enrichment. In other words, as soon as data is published, it becomes visible at other locations and available to anyone who needs it: anytime, anywhere, and on any device.

This has benefited our suppliers. We have been able to integrate the engineering details with contracts and procurement, and then share this detail with suppliers. This means they get the most accurate information. There's no email, no misplaced documentation, no lag, the data is entered once and used many times.

Disrupting construction for the better

Construction comes next, and even though this may sound like a purely physical pursuit, a data-centric approach can significantly improve productivity.

Typically, a complex construction project will have a number of pain points: document centricity, a lack of integration, as well as manually intensive, sequential, and hierarchal processes. The strategy aims to alleviate these by building an easily accessible library of quality documentation that is the single source of the truth for those involved in the project.

Typically, a complex construction project will have a number of pain points: document centricity, a lack of integration, as well as manually intensive, sequential, and hierarchal processes.

The Integrated Construction Centre is where a whole heap of interconnected data is brought together for people in the field, from engineering, cost and schedule information, check sheets, punch lists, permits, work package data, incident management, as well as training and induction packages. It can even be used to book a seat on the bus or a room in the camp.

“This is not an assembly of discrete applications, this is a complete and integrated system that removes the need for overheads and administration, gets people into the field faster, and makes them more productive once they are there,” said Mike Elliott, project director for Jansen and former head of engineering & digital strategy for the project. “A lot of the value that is gained is through connectivity. Construction work pack updates are pushed to mobile devices, services can be ordered from in the field, permits are linked to personnel training records, check sheets are linked to progress, area access is linked to your training and orientation.... and I can go on and on.”

According to Brian Grosskleg from the technology team, this sounds like a simple concept, but has traditionally been hard to implement.

“When we have the ability to effectively retrieve technical details on demand throughout our operations it

provides value to BHP's staff and bottom line through efficient, informed, and risk-mitigated decision making. This is a top priority for any project, and even more important when you consider the size of Jansen," he said.

Building on solid foundations

Part of the benefit of a greenfield operation is that the team has the opportunity to really challenge the status quo and build their vision from scratch.

So what does the future look like?

The team will look to learn from other BHP operations around the world in implementing integrated operations, digital asset management, and a digital value chain.

The team is busy maturing non-traditional technology, including virtual and augmented reality capabilities, machine learning, reality capture techniques, and remote worker options. Most recently, travel limitations have accelerated the deployment of wearable point-of-view cameras that allow off-site subject matter experts to support and guide on-site workers without the risk, cost, and inconvenience of physical travel.

Automation is another theme. The team have a technology roadmap to fully automate borers with partner, Sandvik.

The borer has the technology to become fully autonomous, including a guidance system and a ground-penetrating radar coupled with automated bolting. The value is in removing people from potential harm, whilst significantly increasing utilization as mining never really stops.

People come first

While technology is often seen as the key in the future, Mike Elliott has a different message.

"The technology available to us is amazing, but without the people to make it work, it is pointless. There has been a lot of hard work in building this strategy and a lot of training and dedication from our people to think differently and embrace a new mindset," says Elliott. "As this continues, I know we will deliver great outcomes across productivity, safety, and people engagement at Jansen. I

look forward to seeing us bring this to life, together."

Grosskleg agrees. "Rome wasn't built in a day, and it was not the chariots or the chisel that built it, but the people, using those tools," he says. "This parallel can be made in digital technology, all the gadgets on earth can't help you if the user base isn't comfortable using them." ▲

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IMI's Alternative Energy Systems Innovation Challenge

ADVANCING SOLUTIONS FOR SASKATCHEWAN'S POTASH PRODUCERS



The AES Innovation Challenge

The International Minerals Innovation Institute's (IMI's) Alternative Energy Systems Innovation Challenge is a new initiative of the IMI. This challenge presents innovators with a unique opportunity to advance their technology solution for the minerals sector by working with Saskatchewan's leading minerals companies, including potash producers K+S Potash Canada GP, The Mosaic Company, and Nutrien Ltd., as well as potash developer BHP Canada. IMI has allocated up to \$500,000 Canadian dollars to support selected project proposals. In association with its industry members, the IMI will decide how many solutions may be selected for this Innovation Challenge and whether the total funding will be distributed to one, two, or a combination of innovators.

The Innovation Challenge is designed to advance the successful proponent(s) proposed solutions to be field-trial ready within two years, and to help meet the technology development and adoption needs of the minerals industry with respect to energy use and greenhouse gas emissions. This Innovation Challenge presents a strong opportunity for innovators to leverage additional funding from other sources and outside investment, while working more closely with prospective minerals producers to demonstrate their technology in a customer's facility.

How the challenge works

The Innovation Challenge is designed to meet an operational, environmental, and value-added high priority of the minerals sector by identifying and preparing field trial-ready solutions. By participating in the challenge, innovators and potash producers could potentially achieve effective results, faster and cheaper, while building new supply chain alternatives for reducing energy use and greenhouse gas emissions.

The challenge is designed to ensure a focus on delivering

field trial-ready solutions in a way that reduces the time, costs, and risks associated with pulling new solutions out of the supply chain and into use in operations.

This program aims to reach several advanced technology companies. By participating in the program, these technology companies are expected to accelerate commercialization and increase the sales of their technology. Through direct access to customers and collaborators, technology companies could advance and deploy their solution, be supported with best practices for scaling up technology, and leverage funding by having the value and relevance of their innovation demonstrated.

Timelines

IMI's AES Innovation Challenge was launched in October and applications were due November 20th, 2020. A technical review team made up of industry and business development professionals will score the applications and invite short-listed proponents to present early in 2021. Up to five technologies will be selected to participate in an "innovation sprint" over the remainder of 2021, during which their technologies will be supported to move down the path to commercialization, allowing the industry to select a winner by year's end. The winning technology and company will then have access to a mine and/or mill to demonstrate that the technology could be deployed at scale and meet operating requirements.

"Developing and adopting low-carbon and resilient technology is a key component of any meaningful plan to address the challenges represented by climate change," says Al Shpyth, IMI's executive director. "Innovation challenges have proven to connect technology development with technology adoption. IMI's Alternative Energy Systems Innovation Challenge will help to advance technologies that support emissions reductions and lower industry's fuel and electricity costs while maintaining the province's energy resiliency." ▲

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Salt and potash rock mechanics

THE IMPORTANT CONCEPT OF THE THREE-LEGGED STOOL



Rock mechanics involve developing an understanding of how rock responds to changes in equilibrium and then applying that understanding to addressing scenarios that range from localized ground-control issues to mine-wide issues related to accessibility and stability. A rock-mechanics program amasses information from three interdependent elements to develop effective solutions that work within the confines of the local geology. The elements that comprise the three “legs” of the rock-mechanics stool are mine measurements and field observation; laboratory testing; and numerical modeling.

In the mine

We can informally determine the mine behaviour by observing what is good behaviour or bad behaviour, but some indications of change or instability are subtle and may not be visually apparent. Mine measurements provide data to quantify the mine behaviour by evaluating trends in the recorded data. These data, when taken throughout the mine on a regular basis, enhance worker safety by identifying areas where ground-control problems are developing. A recorded behaviour against which numerical models can be validated is also provided by this data.

In the laboratory

Tests are the fundamental method for measuring rock behaviour under simple and well-controlled conditions. Tests provide data to interpolate and extrapolate the expected rock behaviour under various conditions; however, bad data are often worse than no data. Salt and potash are difficult to fail under moderate confining stresses; consequently, unconfined compressive strength (UCS) tests do not adequately represent strength, and poorly designed creep tests may not properly characterize long-term deformation. Good data improve our understanding of the fundamental rock behaviour, and interpretation of the data helps us to develop site-specific behaviour models for numerical modeling.

On the computer

Numerical modeling has become a prominent tool to forecast and interpret mine behaviour. An effective modeling approach should be grounded in reality, and arbitrarily changing modeling parameters under the guise of “engineering judgement” can grossly mischaracterize mine behaviour, especially in potash. This approach has resulted in the adage of “garbage in, garbage out”, which has led some to believe that modeling is worthless, when in reality, the modeling approach was poorly implemented. An approach based on accurate field and laboratory data can be used to forecast the mine behaviour in real-world terms, such as the susceptibility for roof falls, load-bearing pillar capacity, and long-term response of the mined excavation. The results can also be used to interpret the mine behaviour by comparing the measured and predicted behaviours. Good agreement suggests that the mine is behaving as expected. The extent or severity at which the actual behaviour deviates from the expected behaviour can indicate the potential impacts on the global stability of the mine.

This three-legged approach strives to reduce the inherent risk in mining by developing a better understanding of mine behaviour. Each leg is equally important, and heavily relying on a single component can lead to illogical ends, such as an overly conservative design or unsafe conditions. This consideration is especially important in salt and potash mines, where the mine behaviour is unlike that of many other commodities. Over the past 50-plus years, RESPEC has tested, modeled, and observed salt and potash behaviour from nearly every actively mined evaporite deposit in the world. Our approach has successfully guided decisions regarding mine design optimizations and provided a comprehensive assessment of the utility of existing workings and long-term stability, as well as suitable management of the resource. ▲



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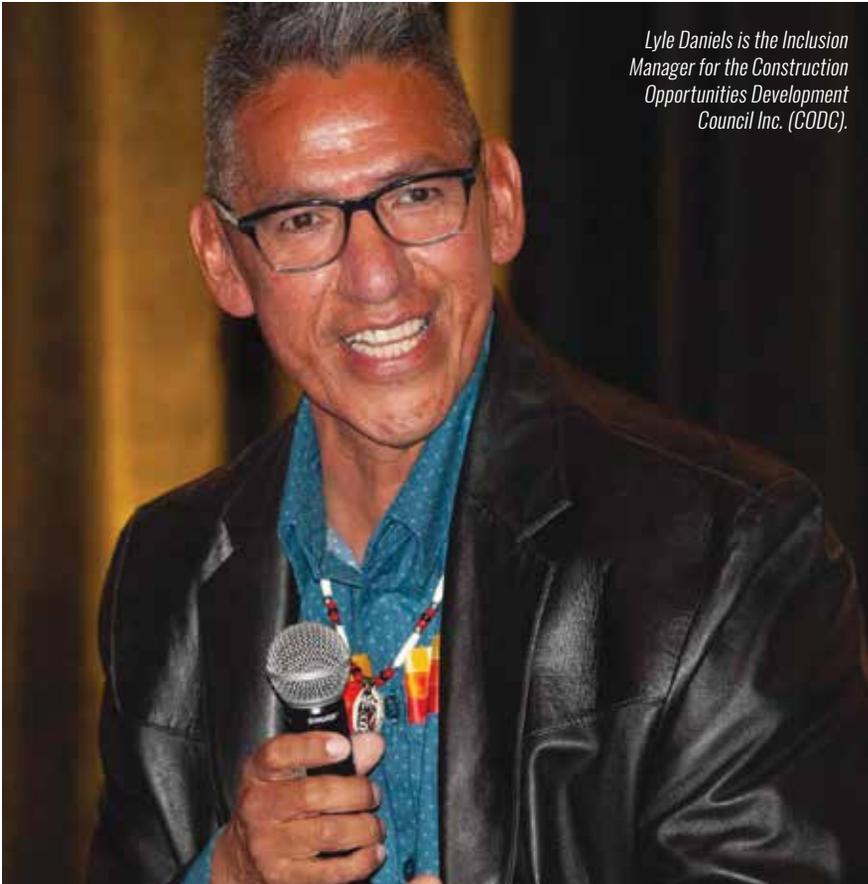
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THE CODC: Investing in Saskatchewan's workforce to service the potash industry



Lyle Daniels is the Inclusion Manager for the Construction Opportunities Development Council Inc. (CODC).

The first step makes it tough for many to join the construction industry. This is why we need to reach out further and establish a common place for these groups to develop a plan for their future in construction.

many to join the construction industry. This is why we need to reach out further and establish a common place for these groups to develop a plan for their future in construction. It's more than starting at a construction site. Many new people in the trades need to start with a researched career plan, which helps them to understand how they can become a journey person through the apprenticeship system. A solid career plan also helps the individual to understand the expectations of a career in the skilled trades, so they are well prepared for the life and opportunities of a construction worker.

The CODC's Build Together program partners with a variety of industry stakeholders to develop and deliver such career plans. We are not just offering a job; we are offering lifetime career opportunities for the people of Saskatchewan. ▲

With the ongoing partnership with the Saskatchewan Building Trades Council and the Construction Opportunities Development Council Inc. (CODC), they have worked to establish a new focus on recruiting under-represented peoples in the province.

The construction industry has an aging workforce and will lose almost a quarter of it to retirement over the next decade. Forecasts also indicate that in the medium to long term, the

industry will continue to grow. This means that the industry will need to recruit and train new workers from non-traditional populations. These groups of people include women, Indigenous people, new Canadians, and all youth in the province. All of these groups have unique needs and, with the right focus, can be the next generation of tradespeople supporting themselves, their families, and our province.

The first step makes it tough for



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Tron works in an environment that has safety as a first priority, ensuring safety and quality standards are met and fostering continual improvement throughout the company. Tron has earned industry accepted certifications such as COR, ISO9001:2015, ASME and CWB.

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CANDO: Keeping potash on track

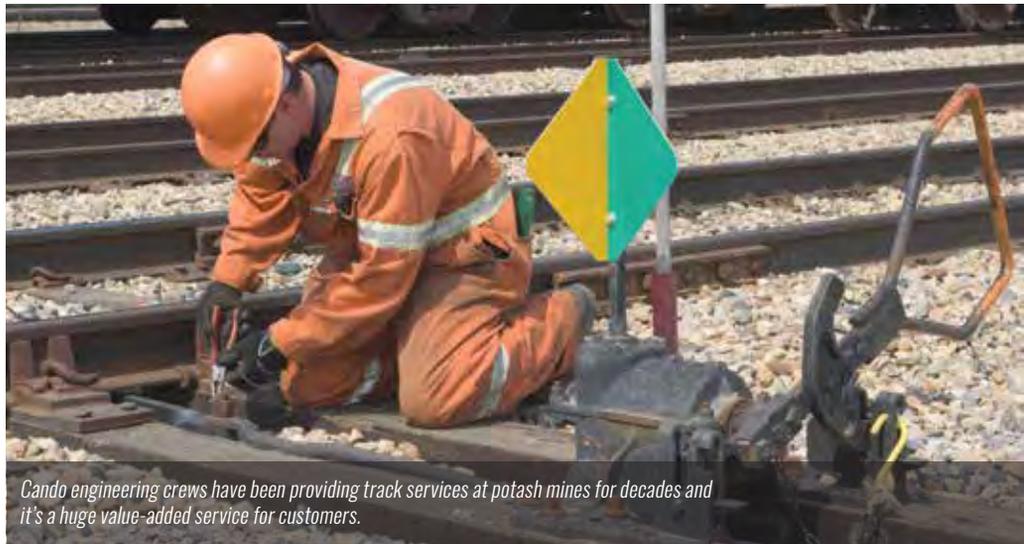
Cando Rail Services helps move 19 million tons of potash a year, handling approximately 90 per cent of all potash produced in Canada. Cando provides services ranging from unit train operations, to railcar switching, to air brake testing, and more. Cando helps its customers and the Class 1 railways come up with solutions to complex challenges that allow them to move massive volumes of potash more efficiently by rail.

Another important part of the service Cando provides potash producers with comes from the company's track expertise. Cando engineering crews have been providing track services at potash mines for decades and it's a huge value-added service for customers.

"We have the track expertise and equipment to provide things like track inspections, tie and rail change outs, and snow removal on site so the customer can focus on what they do best – producing potash," says Dave Peters, manager of engineering for Western Canada.

Embedded track maintenance

To ensure customers can meet their logistics deadlines, Cando works with existing potash producers providing on-site embedded track maintenance crews to monitor and repair tracks during operations. Embedded crew personnel are trained and qualified



Cando engineering crews have been providing track services at potash mines for decades and it's a huge value-added service for customers.

with Canadian Rail Operating Rules, General Mine Safety Awareness, and TIGS. Cando can assess customer requirements based on their operations and provide the necessary crew and equipment to maintain, repair, and advise on track requirements.

Cando also provides an experienced track inspector to do annual inspections. From those recommendations, Cando will prepare a five-year recommended maintenance plan with budgetary numbers so customers can plan appropriately for future needs. Cando can also provide a CN-approved certified Red Seal welder for switch component welding and grinding maintenance. A regular welding and grinding maintenance program can extend the life of turnout components by years and reduce

frog and switch point changeouts.

With eyes in the field and an experienced estimating team in office, Cando offers a full spectrum of rail services. Ongoing maintenance can alleviate costly repairs and is a safeguard against potential track failure. With one of the best in-house safety programs and with top ratings in North America, customers' track requirements are covered by a team with over 45 years of combined experience.

"We're a phone call away from whatever the customer needs," says Peters. "We can do extra inspections, help with a derail or perform a quick maintenance job to make sure their tracks are in good shape and within operating standards. If they have any track issues, we're there." ▲

EMBEDDED TRACK MAINTENANCE

A key aspect to Cando's service is long-term track maintenance contracts where Cando crews are on the ground providing track maintenance experience on a daily, weekly, or monthly basis for the customer. The client can customize their daily, weekly or monthly plan to include whatever track requirements suit their needs. Light and medium maintenance services include:

• Track inspection • Track upgrades (including design/build)

- Thermite welding and destressing • Rail joint build up • Switch grinding
- Tie and rail change out • Surfacing and alignment
- Adjusting switches and complete turnout replacements/installations
- Crossing replacements and repairs
- Track remediation services such as replacement of failed sub-ballast
- Snow and ice removal • Derailment assistance and repairs
- Evaluating track assets and catering a multi-year maintenance plan to suit



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Supporting the potash industry from (below) the ground up



MINE SUPPLY COMPANY REINTRODUCES JENNMAR TO THE WESTERN CANADIAN MARKET

The underground mining and construction sectors have always depended on ground support. Highly stressed or squeezing ground, rock burst conditions, brittle fracture - these conditions pose many challenges for mining operations dedicated to keeping their employees safe. Thankfully, innovations in ground support technology have accommodated more extensive excavation and larger equipment, and meant greater productivity overall, all while increasing safety, flexibility, and mine life in the process.

Recent advances in ground support have included new and improved rock and cable bolt elements, increased use of encapsulated rock bolts, improved one-pass bolt installation systems, better understanding of corrosion and corrosion protec-

tion, and the development of new types of mesh and spray-on liners. Testing systems, modeling advances, deeper understanding of rock-fall conditions, and implementation of quality assurance procedures in ground control management programs have helped to ensure continual improvement in this area.

Safety. Service. Innovation.

These principles are the guiding force behind JENNMAR, a global, family-owned company that has been dedicated to leading the way in ground control technology and manufacturing for more than 40 years. In May of 2020, President Tony Calandra announced JENNMAR was returning to the Canadian market, with a Sudbury-based production facility set to begin operations by March 2021.

In August, JENNMAR announced it had selected Mine Supply Company of Saskatchewan as their distributor for Western Canada

“Having had a previous relationship with Mine Supply, we have a well-established understanding of our collective goals,” said David Hurd, managing director, JENNMAR Canada. “With our support, and their location and reputation, we know their team will serve the needs of Western Canada’s mining sector extremely well.”

Mine Supply is looking forward to sharing JENNMAR’s expanded portfolio of ground support options, as the company’s catalogue has grown to include several significant, connected product lines since it left the Canadian market in 2014.

**JENNMAR's industry affiliates
- Quality, compliance,
efficiency, availability
and safety**

JENNMAR's strength has always lied in the company's ability to offer multi-phase solutions for client projects, all while committed to ensuring supply chain confidence. Half of JENNMAR's 20 strategically-located production facilities are dedicated to ground control product. From engineering to resin manufacturing, rolled-steel and drill-steel manufacturing, custom steel fabrication, precision wear parts, tools and bits, chemical roof support and sealing products, staffing solutions, transportation and more, the company ensures clients have support at every stage of their projects.

One of Mine Supply's favourite additions to the JENNMAR catalogue includes XCAL TOOLS, a company that has been manufacturing precision wear parts, tools and bits made from tungsten carbide and steels (including underground roof bits, conicals, radial tools, and more) for over two decades. These quality products are produced in four facilities in West Virginia, Ohio, Virginia, and Kentucky, where they produce more than 50 grades of cemented carbide and also have the capacity to develop tougher grades to meet industry demands. J-LOK continues to produce state-of-the-art resin designed to complement JENNMAR products.

Marc Collette, Mine Supply Company's manager of sales & business development, stresses the unique advantages of an integrated manufacturer with so many North American-based facilities.

"JENNMAR's investment in regional manufacturing minimizes both supply and logistical risks overall, and ensures faster delivery at a lower freight cost. And their quality control

is unparalleled," says Collette, adding that Mine Supply has expanded its warehouse footprint to house-finished, manufactured ground support inventory in order to meet the needs of clients.

As with all of its products, the Mine Supply Company team remains connected with end-users at site, working with clients to develop solutions

for site-specific issues. With more than a century of combined operations, sales and procurement experience, the team knows the value of premium products.

To find out more about this Saskatchewan company and its premium product lines, connect with the team at sales@minesupplyco.com, or call 306-653-1056. ▲



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0.50 mm Potash Screening, Chile - (9) 5-deck Stack Sizers.

Derrick screens raise potash and phosphate recovery, reduce cost



In late 2020, three five-deck high-capacity Stack Sizer® screens fitted with 850-micron Polyweb® screen panels will be installed in Australia for sulfate of potash recovery. This will be the first installation of Stack Sizers for this application in Australia. These high-capacity, small footprint screens will produce significantly higher yields than the previous equipment used in the application, allowing recovery operations to focus on capturing as much product as possible with minimal additional work. Derrick's unique Polyweb urethane screen panels on the Stack Sizer reduce near-size blinding to maintain optimum efficiency, while offering unmatched panel life. Working together with global potash producers to improve mill recovery and efficiency, Derrick continues to develop proprietary high-capacity, high-efficiency, robust and reliable screening solutions for the potash industry.

The Derrick Stack Sizer replaces conventional high-amplitude horizontal banana-type screens before the screening surface. Compared with the low-screening efficiency of conventional screens, the Stack Sizer offers lower circulating loads, low structural maintenance costs, and reduced brine spray on the screen deck to liberate fines, thereby raising productivity and process efficiency.

In early 2020, Derrick introduced its latest screening innovation, the SuperStack® to the world and it soon caught the attention of the potash industry. With its eight vibrating screen decks operating in parallel, combined with a 30 to 35 per cent increase in effective screening width compared with Derrick's 5-Deck Stack Sizer, this novel machine exceeds the Stack Sizer's capacity by two-and-a-half to three times.

SuperStack enters South Africa

In 2018, Derrick-Africa recommended 10 5-Deck Stack Sizers to a major phosphate producer to upgrade their plant, but were not considered purely on price. In early 2019, Derrick re-attempted to enter the phosphate market by offering SuperStack screens instead of Stack Sizers. Once again, the offer was rejected due to uncertainty of the new technology. In January 2020, however, Derrick re-visited the producer in Cape Town and offered them four SuperStacks instead of 10 5-Deck Stack Sizers. They showed that the SuperStacks would result in significantly reduced infrastructure. Through a cost-benefit analysis, Derrick's offer won the \$2.3 million tender, allowing the first SuperStack installation to proceed in Africa.

Michelle Lawrence, COO, Kropz says, "The four SuperStacks offer an elegant and cost-optimized solution to increasing throughput of the milling circuit and top-size presentation to the flotation circuit. We look forward to recommissioning the plant

and working together with Derrick to maximize overall efficiencies.”

The SuperStack’s demonstrated safety and maintenance, environmental, and societal benefits include:

Safety and Maintenance

- Totally enclosed, lubricated-for-life vibratory motors
- Lightweight, easy-to-install screen panels
- Front-to-back screen panel tensioning reduces changing time to less than one minute per panel
- Exceptionally low maintenance requirements

Environmental

- Low, 10 HP power consumption
- Sacrificial, replaceable anodes help prevent corrosion on the live frames in the harsh potash environment
- Stainless-steel support structure and porcelain-coated screen frame construction for long-term durability
- Reduced infrastructure

Societal

- Maximum efficiency in recovery and improved grade to ultimately increase crop yields

Screening Dead Sea potash



SuperStack in phosphate recovery

Phosphate recovery applications have opened new opportunities for both the SuperStack and Stack Sizer screens in South Africa and Florida in the U.S. In Florida, five Stack Sizers have replaced Derrick Multifeed screens for a long-term (30+ years) Derrick customer. This firm concluded that the time was right to upgrade their operation to the latest proven Derrick technology.

The future of SuperStack in potash/phosphate industry

Through successful installations, the SuperStack is demonstrating efficiency and cost savings in the recovery of potash and phosphate. Successful installations are expected to rise as its reputation expands, making it an important element in serving the ever-expanding need for these vital agricultural products throughout the world.

For more information, contact:

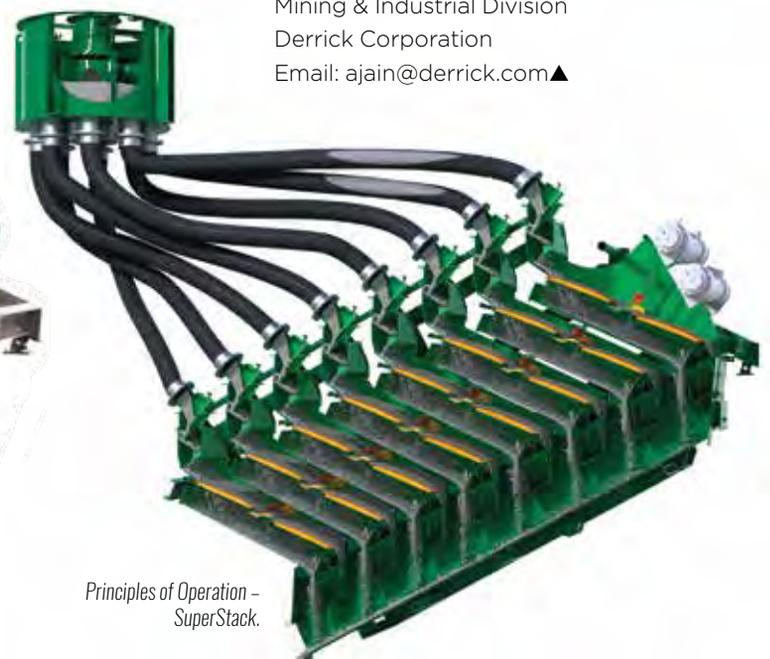
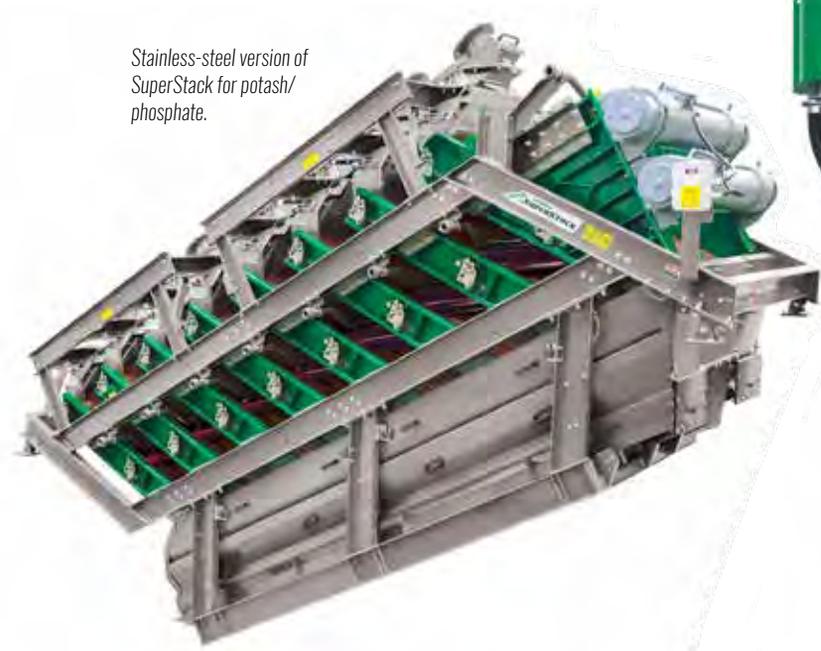
Amit Jain

Mining & Industrial Division

Derrick Corporation

Email: ajain@derrick.com▲

Stainless-steel version of SuperStack for potash/phosphate.



Principles of Operation – SuperStack.

SIMSA had a plan, so how did we do?



When the initial planning for the Saskatchewan Industrial and Mining Suppliers Association (SIMSA) was being done in 2012 through 2013, several goals were set. So, how did we do?

Following consultations with a number of Saskatchewan suppliers to the mining and resource industries, a group of local supplier-company persons incorporated SIMSA in March 2013. The association was initiated by a board of eight, and when SIMSA's logo was created, the eight green dots in it are representative of the eight original directors. It should be noted that the Saskatchewan Ministry of Trade and Export Development played a key role in SIMSA's formative process and its early operations.

At that time, Saskatchewan's mining sector was on the end of a major capital spending initiative by several mining companies. The thought was that Saskatchewan suppliers had not captured enough of the spend, as they wrote in SIMSA's planning documents, "Clearly there is an opportunity to increase Saskatchewan's participation in supplying goods and services in the resource industry." They went on to say that, "To this point, the extensive Saskatchewan supplier base serving these industries has not been well represented."

In a unique environment of cooperation, a sector review was completed and SIMSA was conceptualised. They wrote, "Industry understands the importance of working together

to assist in promoting Saskatchewan capabilities and has an interest in working collaboratively to capture more work within Saskatchewan borders. This desire to work together and to promote local capabilities has resulted in the formation of the Saskatchewan Industrial and Mining Suppliers Association (SIMSA)."

SIMSA's primary focus was to be on increasing the Saskatchewan-based market share in Saskatchewan projects and representing the interests of the members in order to influence government and industry. The key criteria for membership were that a company had to have a permanent physical office and at least three employees in the province.



Saskatchewan's Minister of Energy and Resources Bronwyn Eyre addresses SIMSA members.

Explore the Possibilities

Expert mining solutions from SIMSA



Since 2013, members of the Saskatchewan Industrial and Mining Suppliers Association (SIMSA) have helped keep Canadian companies performing on the global stage, forming the backbone of the fast-growing Saskatchewan industrial economy along the way.

Now you can put that real-world experience to work for your operations.

With well over 200 members (and growing), our world-class problem solvers will meet your deadlines and budget and help you find ideas that work in the real world. From construction pros to engineering experts and more, we'll help you tackle your biggest challenges.

What can SIMSA members do for your business? Visit our website to explore our Saskatchewan Supplier Database and find out.

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In the beginning, the association's membership included 22 companies: the goal of 100 members was targeted for 2016, 200 members for 2018, and 300 members for 2023.

A target of hosting two to three events per year, with a combination of social, networking, and education, was set for 2016, and four events per year was foreseen at 2017.

In 10 years, SIMSA was to also be the go-to place for market information on projects/opportunities. The activities foreseen would, "Proactively promote Saskatchewan capabilities to producers, EPC/EPCM, and OEM companies within the geographic region of Saskatchewan." They also thought that, "Materials and tools will be developed to educate, engage, and raise awareness."

Plans for a website were made, which was to "...include an online searchable database, profiling members' goods and services capabilities."

They foresaw that SIMSA, "...will partner with other organizations on issues and activities of common interest while representing the Sas-

In the beginning, the association's membership included 22 companies: the goal of 100 members was targeted for 2016, 200 members for 2018, and 300 members for 2023.

katchewan priorities that have not been currently captured by existing supplier-based organizations. The intent of SIMSA is to partner and leverage activities with existing associations (both resources-based and general business) where common interests exist while profiling Saskatchewan supply solutions."

Today:

- SIMSA hosts at least 12 educational and procurement-related events per year, which is well ahead of the target of four. These events are largely in partnership with Saskatchewan's major mining and energy companies, plus their EPCMs, and have been the catalyst for the association's growth.
- SIMSA now has over 220 members and has actually grown through the COVID crisis. Comparatively, SIM-

SA's membership was 74 in September of 2016 and almost tripled within the subsequent three years, while another construction-related association saw more than a 40 per cent decline in membership. The target of 300 members by 2023 is still on track.

- The Saskatchewan Supplier Database has been built and is a sortable shortlisting tool of SIMSA member abilities and products. This item was paid for and designed in collaboration with BHP, the Government of Canada, the Government of Saskatchewan, Husky Energy, Mosaic, Nutrien, SaskEnergy, SaskPower, and TC Energy. The database generated \$97 million in sales for SIMSA members over the past year.
- SIMSA provides daily markets and services updates by email, as well as a monthly newsletter.
- SIMSA regularly meets with government and other associations in a cooperative effort to build a better Saskatchewan.

The initial vision for SIMSA's activities and how it was to function were captured and always kept in mind; and by following them, the membership grew as forecasted. The current pandemic required SIMSA to shift from an in-person to a virtual delivery mode, and provide some training on it, but the spirit in which things are done and the focus on Saskatchewan's supply chain has and will not change. ▲



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Sensor-based sorting for potash operations

BY REBECCA GOTTO AND LUCINDA WOOD, SASKATCHEWAN RESEARCH COUNCIL



SRC's Industrial CT Scanner. PHOTO PROVIDED BY SRC.

Sensor-based sorting is becoming increasingly prevalent for mining operations as a method to remove waste or to upgrade ore prior to downstream hydrometallurgical processing. Sensor-based ore sorting has the potential to upgrade feed prior to milling and hydrometallurgical processes, thereby reducing plant footprints, tailings storage facilities, and energy consumption. However, potash projects and operations need to know if this technology is appropriate, and what its optimal parameters are.

The problem

Of all the ore sorting technologies available, X-ray transmission (XRT) sorters are one of the most common choices. That is because XRT sorters pass high-intensity X-rays

through particles, not just their surfaces, to generate images of varying greyscale that indicate mineralogical differences within the particle and then mechanically separate them.

A popular test currently used to evaluate the amenability of the ore to X-ray sorting is to simply pass the particles through an industrial sorter and obtain grey-scale images based on default imaging parameters. This test provides information on the presence of mineralogical differences, but it does not provide an understanding of the actual mineralogical composition of the ore. It also does not necessarily pick up all the differences owing to its default imaging parameters, especially for lesser known commodities or complex ores.

The solution

A new test performed by the Saskatchewan Research Council (SRC) that combines high-resolution X-ray micro Computer Tomography (CT) with QEMScan has the ability to gather not only information about the amenability of ore to XRT sorting, but to obtain valuable information about mineralogy and optimum sensing parameters that can streamline metallurgical test work programs. To complete the test, SRC's team conducts 3D CT scanning on potash samples to obtain volumetric information of individual mineral phases. QEMScan is then used to calibrate the greyscale values of the 3D volume, which reflects different atomic numbers of minerals in the potash sample.

This test also provides information relating to grain size and associated X-ray attenuation coefficients, desired mineral presence, and information relating to associated minerals and clays used to later assist with developing sorting algorithms. This ensures that industry can get a quick and accurate understanding of whether sorting is the right technology for their needs and have the optimum parameters to proceed with their metallurgical test work. This also results in streamlined metallurgical test work as the range of parameters to be tested have already been optimized beforehand.

Industrial CT systems offer great versatility and many advantages in analyzing large or dense materials, such as mineral containing potash,

Industrial CT systems offer great versatility and many advantages in analyzing large or dense materials, such as mineral containing potash, with high X-ray attenuation...

with high X-ray attenuation, while providing significantly higher spatial and contrast resolution than common scanning techniques. In addition, whole cores can be analyzed without the need for crushing them, which greatly assists with ores from exploration programs. QEMScan can provide valuable mineralogical information of associated (and mineralogically) similar minerals to better understand the upgrading potential of an X-ray sorter.

The advantages

Combining the CT and QEMScan can address many limitations of the current way to determine whether XRT sorting technology is appropriate for particular ores. Mineralogy information from QEMScan can identify incidences of mineral encapsulation, problematic clays and detrimental minerals, as well as calibrate the greyscale values of CT data. The 3D CT imaging carried out on cores provides spatial information of the ore, mineral grades and grain size distribution without crushing them. These together can form a unique dataset that helps to characterize the formation and optimize the extraction process for potash and other minerals that no other test is able to do.

The most important advantage, perhaps, is that it is a non-destructive test. It also requires no special sample preparation, is flexible in sample geometry and size, can be scanned at extremely low resolution, and the scanning time is also considerably low compared to similar tests.

The applications

There are many cases where this new test would be highly valuable

to industry, including core digitization for core logging and profiling; measuring spatial information such as grade, grain size distribution, surface contact areas between minerals; helping to optimize processing parameters where ore sorting is a po-

tential unit operation; and monitoring dynamic processes such as solution mining and geomechanical tests.

For more information, please visit www.src.sk.ca. ▲



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INTEGRATED PROJECT DELIVERY – **The devil you don't know**



Bruce Harrison, Mckercher LLP.

BY BRUCE HARRISON, MCKERCHER LLP LAWYER AND PARTNER,
WITH ASSISTANCE FROM TYLER GRAY, STUDENT-AT-LAW

In 2018, the Canadian Construction Documents Committee (CCDC) released CCDC 30, a new standard form contract for integrated project delivery (IPD) construction. The IPD project model seeks to overcome weaknesses in traditional project structures that isolate design and construction from one another by promoting collaboration between project owners, designers, and contractors from project conception through the design stage and during construction. The stated goal of the IPD model is greater project efficiency by promoting collaborative and timely troubleshooting of potential project problems through the implementation of a shared risk/reward system.

The main difference from a contract perspective is that the core project parties (owner, consultant, general contractor, and major suppliers) each sign on to a central project agreement. The design, scope of work, price, and performance schedule are administered and controlled through this one single agreement.

There are two key provisions in CCDC 30 that act in tandem to support this increased collaboration. The first is the establishment of a risk/reward pool from project profits. The primary parties to the contract place an agreed percentage of potential profits in a common pool that pays out at key milestone dates and project completion. If the project is on-time and on-budget, each signee receives their allocated profit from within the pool. Efficient performance presents an opportunity to multiply profits, while poor performance reduces potential earnings for all parties proportionate to their role in the project. The structural goal of the risk/reward pool is to tie individual profits to project success.

The shared profits pool is also a significant risk apportionment mechanism under CCDC 30. Parties will want to determine how much individual profit is allocated to the risk pool within the IPD contract. Varying proportions of profit allocation may shift the burden of risk from one party to another. For example, where 100 per cent of profits are shared, risk is apportioned equally among all parties. However, if less than 100 per cent of profits are allocated to the risk/reward pool, "shared risk" may land more heavily on one party's shoulders. When combined with waiver and lia-

bility provisions within CCDC 30, the risk/reward pool requires parties to consider how much risk they are willing to bear in the performance of their obligations.

The second provision in CCDC 30 that differs substantially from traditional contracts is found in the waiver and liability provisions which significantly reduce opportunities for parties to bring claims against one another in court. Here, the shared risk/reward structure results in the waiving of claims that would result from project delays or cost overruns as those are risks born by all contract parties. This significant alteration to the liability structure within IPD projects seeks to promote early communication of project challenges or errors between parties without fear that such communication will give rise to liability. Rather than parties protecting positions in fear of potential litigation, they can work together to collaboratively problem-solve and mitigate risk to the overall project outcome more quickly and effectively.

The alteration of risk apportionment in CCDC 30 from traditional contracts is a key consideration for parties looking to use the IPD model. Effective collaboration will require early involvement of all parties to the contract and a strong commitment to project-first thinking. This is a paradigm shift, so experience in collaborative approaches is certainly an asset for those looking to use IPD models. While there are some exceptions to the general waiver of liability, claims arising from project delay and cost overruns under CCDC 30 do not give rise to individual liability. In order to effectively apportion risk, parties making use of an IPD model will want to consider which parties will be obligated to sign onto the IPD contract. This will likely include the relative importance of the subcontractor supplier and the willingness of a participant to accept the risk of other's performance.

CCDC 30 offers a new perspective on traditional project delivery where parties share risk and reward related to the performance – efficient or inefficient – of all participating parties. With substantive changes to waiver and liability provisions, and significant potential deviation from traditional risk apportionment, parties considering the use of an IPD model should bear in mind past experience using this model and the importance of a strong, collaborative team. ▲



Resourceful

McKercher LLP has a specialized team of lawyers and professional staff dedicated to providing advice to Saskatchewan's natural & renewable resource sectors. Our Resources Advisory Team provides value-added business and legal services including specialized mining agreements, acquisitions & dispositions, financing, regulatory & environmental issues, First Nations & government relations, and litigation.

With offices in both major cities in the province, we are strategically positioned to take advantage of all that Saskatchewan has to offer. We are proud of all that we have accomplished and consistently work towards serving our clients with innovation and integrity. With roots tracing back to 1926, we know our province and the intricacies of thriving in the business landscape of the prairies.



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“Fill the Mill”

HOW EFFECTIVE ANALYTICS WILL DRIVE PRODUCTIVITY AND REDUCE COSTS

BY JEFF ARMSTRONG, DIRECTOR OF STRATEGIC INDUSTRIES, JUMP ANALYTICS



In an industry that is demanding, competitive, and always evolving, mining companies need to maximize their production efficiency. To meet this objective, mine operators need to rely on the unbiased truths of accurate data to support and drive their decision making.

The advanced applications of technology are allowing the industry to look at ways to drive automation and efficient processes when it comes to data collection, data streaming, and data analytics. However, many mining companies face challenges in pulling together data from the vari-

ous systems used to run their mine sites. They often spend too much time performing manual data pulls and manual data reconciliations, leading to untimely and inaccurate reporting. This, in turn can lead to inefficiencies and worse, safety issues.

In order to optimize productivity and mitigate risks, companies must be able to access clean, accurate data from each area of their operations, consolidate and align views of that data, and present those views in timely, automated, and accurate reports. This adjustment allows companies to be proactive with their data rather than reactive.

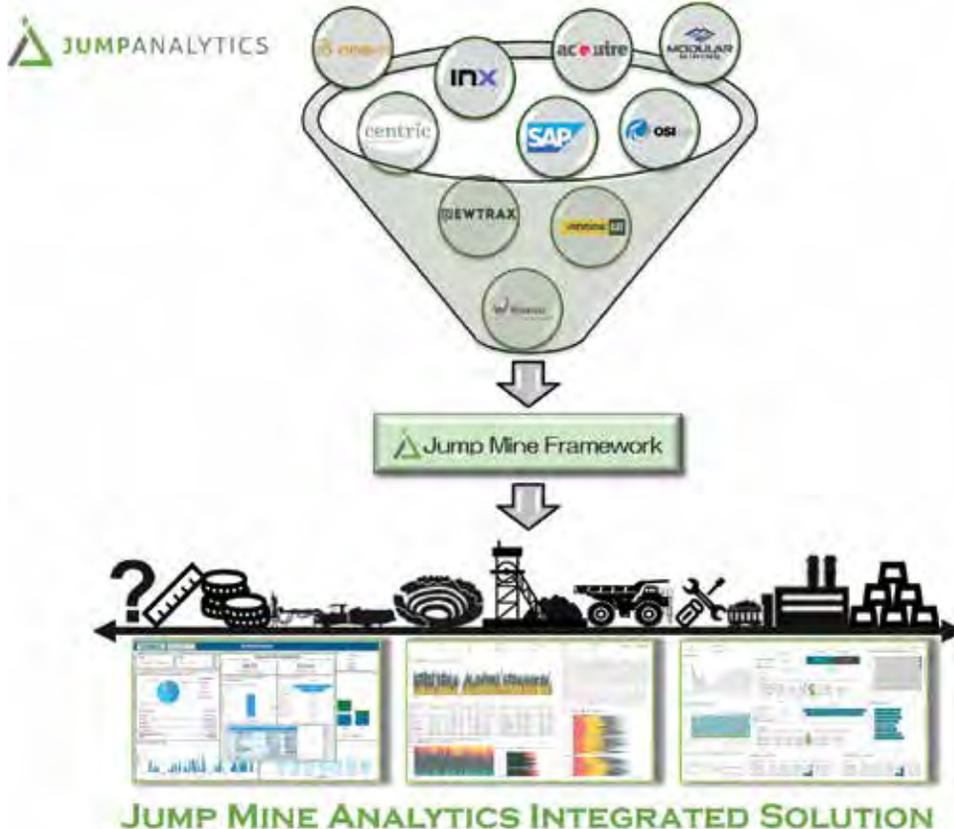
Let's look at just one scenario faced by mining companies.

Putting analytics to work

In the world of mining, safety is priority number one. Period.

Next on the scale of importance, hitting your operational targets is what drives the business forward. Setting your targets, yes that's the easy part, but knowing with certainty what affects your chances of hitting or exceeding your target can be challenging, given the unlimited variables interrelated to the target at hand. "Fill the mill" they say! Ok, let's go!

Let's assume the scenario of material movement. You added 10 per cent more capacity to the fleet, and they have been 100 per cent available for the past two weeks, but there's barely been an increase in material



moved. Okay, looking at the data for these haul trucks, it seems to show that the effective use of the fleet has gone down.

Having this data readily available will allow you to adjust, make the changes necessary, course correct, and reach the overall objective of filling the mill. Simply adding to the fleet wasn't the answer. Improving effective use? Bingo! A data analytics solution like Jump Mine Analytics Framework will help bring this information to the forefront.

But wait, further upstream, the "fill the mill" initiative has stalled. Stockpiles are empty, the equipment effectiveness is even worse than yours was. Had their initiative been shared, had their historical numbers been known and used in combination with material movement data, an action plan could have been developed with historical data from the two links in the chain. Used for analysis, fill the mill would be a success with less chance of unforeseen bottlenecks.

What every organization needs is a tool that brings this and other data out of their respective hiding places and relates them in a governed, master data environment, where all can be used and understood at all levels. Jump Mine Analytics Framework provides this level of support. Eliminate the "telephone game", lost-in-translation numbers that change when passed from one hand to another.

The Jump solution offers a design and process to consolidate data from key mine systems into one place, allowing for final month-end adjustments to be melded with daily actuals, and for financial forecasts to be used with physicals to fine-tune the economical feasibility in the weekly mine plans. Cumbersome spreadsheets and notepads, which

have always been a single point of failure, riddled with user error, are replaced with data entry systems that integrate seamlessly with the framework, removing the risk that roaming spreadsheets pose.

Jump Mine Analytics Framework is the launching pad to the advanced analytics and the predictive analytics

that make hitting your targets with accuracy the thing of consistency. Let us do the data mining so you can focus on the mining that matters to you.

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The advertisement features a central logo consisting of a stylized 'N' with a crosshair inside. Surrounding the logo are several images of industrial machinery, including large storage tanks, a conveyor system, a large metal component, a mobile processing unit, and a complex mechanical assembly. The background is a gradient of blue and grey.

Saving the past



A stone circle found during a Heritage Resources Impact Assessment (shovel in centre of circle).



A CanNorth archaeologist conducting a Heritage Resources Impact Assessment.

There are rich and diverse heritage resources just below our feet. Heritage resources are non-renewable, and each resource is unique and important. Lost or disturbed heritage resources are a loss for everyone. As defined by The Heritage Property Act of Saskatchewan, heritage resources include archaeological or paleontological objects and sites, built heritage and structures of architectural or historical value, and any site or property where it is reasonable to suspect that heritage resources may be found. The Act protects heritage

resources on both private and provincial Crown land and is administered by Saskatchewan's Ministry of Parks, Culture and Sport's (PCS) Heritage Conservation Branch (HCB).

It is important to know the process for compliance with provincial heritage legislation when planning or managing a new development. A first step is to determine if the development is located on heritage-sensitive land by using the PCS developer's online screening tool. If the development is located on heritage-sensitive land, the project will need to be submitted to the HCB for further review. If the HCB decides that the development has moderate-to-high potential to disturb heritage resources, the HCB may require that a Heritage Resources Impact Assessment be completed before any construction starts.

The importance of preserving and protecting heritage has been acknowledged in the United Nations Declaration on the Rights of Indigenous People, as well as by provincial heritage groups such as Heritage Saskatchewan and the Saskatchewan Archaeological Society. Not follow-

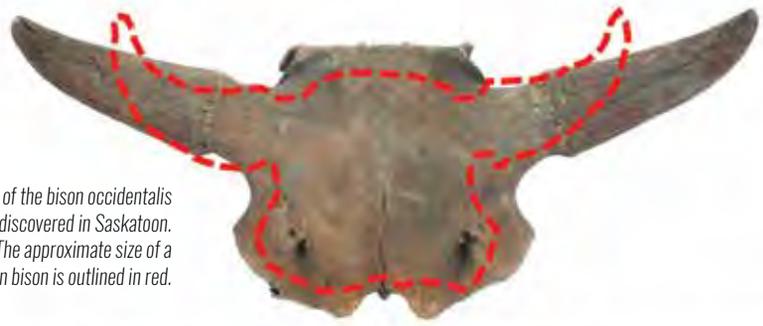
ing the proper steps to protect heritage resources may result in regulatory or legal non-compliance, which could lead to serious consequences. Further negative consequences of non-compliance with heritage legislation may include project delays, lowered investor and public confidence, potential community backlash, and damage to personal and corporate reputation. Protecting heritage can have a positive impact by connecting people to the past and by providing a sense of belonging, understanding, and wellbeing. In addition to being a legislative requirement, the management and protection of heritage resources helps us to better understand who we are and how we got here.

Canada North Environmental Services' (CanNorth) heritage division has been helping developers and project managers navigate provincial legislation since 2011. CanNorth's archaeologists are qualified and have a proven track record of successfully completing Heritage Resources Impact Assessments throughout Saskatchewan, Alberta, and Manitoba. CanNorth is based out of Saskatoon and is 100 per

cent First Nations owned by the Lac La Ronge Indian Band and is a Certified Aboriginal Business through the Canadian Council for Aboriginal Business. As such, CanNorth is mindful of the stakes when conducting Heritage Resources Impact Assessments for developments in Saskatchewan and maximizes Indigenous community involvement, including integrating traditional knowledge, engaging local people, and creating employment and education opportunities.

CanNorth has been involved in many interesting heritage projects. CanNorth archaeologists were called in to investigate after a back-hoe operator uncovered several large bison skulls during an infrastructure project in Saskatoon. Upon examination, CanNorth archaeologists determined that the skulls belonged to *Bison occidentalis*, a species of extinct bison that roamed around the Saskatoon area between 5,000 and 10,000 years

One of the bison occidentalis skulls discovered in Saskatoon. Note: The approximate size of a modern bison is outlined in red.



Canada North Environmental Services

ago; the skulls were much larger than our contemporary bison. CanNorth archaeologists were able to collect important data during the Heritage Resources Impact Assessment, satisfying the HCB's compliance requirements for the project. The bison skulls were further analyzed in CanNorth's laboratory and sent to the Royal Saskatchewan Museum's T.Rex Discovery Centre in Eastend, Saskatchewan, where they are available for research and study. CanNorth's involvement

and consultation in this project helped the client achieve compliance with The Heritage Property Act and complete the development ahead of schedule and under budget. The process also resulted in the collection of valuable scientific data that could help us better understand our ancient environment.

Please do not hesitate to contact CanNorth to discuss any heritage questions or future projects. ▲



CanNorth

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- Habitat Restoration and Compensation Planning
- Mapping Services
- Heritage Resources Impact Assessments
- Specialty Socio-Economic Services



Specializing in the mining industry

Fletcher transport vehicles to help provide safer and more efficient work environment



The Mine Scout is a two-seated, supervision vehicle intended to transport mine staff who are frequently between underground and surface operations.

In 2018, according to the Mine Safety and Health Administration (MSHA) statistics, nearly half of all U.S. mining fatalities were due to accidents involving powered haulage, including mobile equipment and anything else under power that hauls people or materials. Because underground mines require constant transport and handling of necessary materials to keep operations running efficiently, the need for improved transport is evident. Manual labour required for material handling can increase the risk of injury and lost time, creating a less safe and less productive work environment.

To address these needs in the mining sector, J.H. Fletcher & Co., in conjunction with UV Botswana, has released a line of equipment for the United States. This product line, labeled under the MV U40D model name, focuses on utility vehicles designed for material handling needs in low-profile underground applications. The universal front end of the MV U40D is designed to accommodate a variety of back end options, allowing optimal versatility in the work environment.

Included in the MV U40D product line are the below vehicles, designed to

accommodate material handling and transport needs:

- General Transporter, designed to transport workers under a FOPS approved canopy and material(s) into underground operations.
- Scissor Lift, capable of lifting 1,500 kgs. This model has the capability to add a one-ton crane for lifting heavy materials onto the scissor lift platform.
- Multi-Purpose Cassette Carrier, designed to accommodate a variety of cassettes that can be loaded, transported, and unloaded as needed underground. This machine allows the interchanging of cassettes, performed by a single operator, using a hydraulic roll on/roll off function.
- Lube and Fuel Carrier, capable of carrying various fuel and oil combinations.
- Bulk Emulsion Carrier, designed to carry three tons of emulsion for charging up of faces.
- Bulk Bowser Utility vehicle, capable of carrying 2,000 litres of diesel or water, with hydraulic-powered pumps for dispensing fluid to the underground fleet.

- Tire Handler, designed to service operations with tire sizes between 12.00 x 20 to 26.5 x 25 tires. Using the grab assembly, this model can remove the used tire from the equipment and replace with new.

Both the Mine Scout and Rock Ranger models are designed to complement the MV U40D product line. The Mine Scout is a two-seated, supervision vehicle intended to transport mine staff who are frequently between underground and surface operations. The Rock Ranger transports up to five workers in an open-style cab, along with the capability to haul maintenance supplies such as tool boxes and spare parts.

The MV U40D product line reduces time and labour required to transport materials into underground mines. J.H. Fletcher & Co., in conjunction with UV Botswana, has established this product range to combat the risk of injury during manual labour and keep operations running smoothly. These vehicles create a safer environment for personnel by heavily reducing the amount of manual labour necessary. The MV U40D product line can create a more efficient material-handling process for underground environments. ▲

ANSWERING MINING'S TOUGHEST QUESTIONS



Fletcher values what their customers say. Since 1937, Fletcher has been answering some of underground mining's toughest questions. At Fletcher we provide an atmosphere for an open dialogue with customers to ensure their operations are reaching maximum efficiency. Is your operation facing obstacles that mass produced equipment isn't addressing?



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Potash mining is a challenging business and success is built on strong relationships. You need partners who will work with you to maximize your uptime and minimize your operating costs; repairing and rebuilding your equipment and replacing it when it's worn out; and designing, building and supporting specialized units when you need them. You depend on these proven partners to ensure that you receive the best total-cost-of-ownership value for your equipment dollar.

Brandt is the one-stop potash mining equipment and services partner that delivers a broad range of premium OEM and custom equipment, backed up by best-in-class product support; always going above and beyond to keep you productive and profitable.

You can always trust the Brandt team to do it right, no matter how big the challenge, because we're deeply invested in mining; offering a unique mix of products and services, delivered through our extensive network

of full-service branches from coast to coast to coast across Canada.

Our support for the Canadian potash mining industry is three-fold.

Surface mining

As the exclusive Canadian dealer for the complete line of products from John Deere and Kleemann, Brandt is proud to deliver best-in-class equipment for surface mining operations. With a complete range of excavators, wheel loaders, dozers, graders, crushers, screening plants, and conveyors, Brandt delivers the tools you need to get the job done. We know that uptime is critical to your success, so we offer complete industrial repair and parts support for mining-class equipment and processing plant machinery (including gearboxes, pumps, centrifuges, conveyors, and more), along with custom structural-steel fabrication. And, with 56 full-service branch locations across Canada, the parts you need and the specialists to install them are always close at hand.

Underground mining

Brandt has a long track record of producing premium custom solutions for the most challenging underground mining environments, built on the most extensive design, engineering, and custom manufacturing capacity in the industry. From Brandt-built mobile and stationary underground equipment to John Deere compact construction equipment, to a complete range of state-of-the-art survey tools, we deliver the best-in-class products that are right for your business. And, when service or repairs are needed, we deliver complete support services for everything we sell and are fully equipped for repairs to shaft/hoist assets, including hoist drums, skips, and more.

Mining technology

To succeed in mining, staying ahead of the technology curve is a must, so Brandt provides everything from integrated machine control and fleet and resource management solutions

You can always trust the Brandt team to do it right, no matter how big the challenge, because we're deeply invested in mining; offering a unique mix of products and services.

to the latest drone technology for stockpile measurement, tailings inspection, and general site surveys. Brandt Positioning Technology delivers comprehensive, state-of-the-art technology solutions like JDLink™, Topcon, iVolve, and FleetWise™ from 56 locations across the country to help you manage your mining operation more effectively than ever before for maximum productivity and profitability.

Our Technology Integration Services team is the only one of its kind in the industry. These industry-certified technology integration, support and installation specialists work side-by-side with you to integrate and leverage a full range of positioning and mass-data gathering and analysis tools; delivering maximum profitability for your mining operation.

When all is said and done, our ultimate focus at Brandt is always your success. We are on the job 24/7/365, working to help you effectively manage operating cost variability by delivering the ultimate in operator uptime support with top-quality products, parts, service, and on-the-ground resources so you can confidently focus on getting the job done. ▲

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Delivering a successful project



Belterra's involvement in the K3-K1 overland conveyor project began back in summer 2019 with a preliminary meeting to discuss Belterra's potential involvement.

Despite the challenges of this project in conjunction with the COVID-19 pandemic, the project was completed in five months: two weeks ahead of schedule and on budget.

2020 has been a year unlike any other.

In a year where COVID-19 wreaked havoc on the overall economy, we were fortunate at Belterra to be involved in some special projects in the potash industry. None more impressive than the K3-K1 overland conveyor project.

Belterra's involvement in the overland project began back in summer 2019 with a preliminary meeting to discuss Belterra's potential involvement. As Belterra had the experience from the previous overland conveyor, we knew what to expect, and we were prepared for any obstacles that could present themselves.

Once Belterra was selected as the preferred vendor, the real work began. Lead by Steve Hornsby and our world-class Belterra steel cable division, we went to work planning the project over the next six months. The client's expectation was that the successful bidder remains relatively self-sufficient and also facilitate subcontractors, rental equipment, and coordinate execution of their work around other contractors while adhering to all on-site safety and other project requirements.

Hornsby and his team created a plan that oversaw the planning, mobilization, execution, and closing of the project.

Members of our service and support team were assigned to the project based on their areas of expertise and the project plan was broken into the key phases based over a 10-month schedule (including in-shop planning, on-site work, and project closing). The project team worked closely with the client to make sure no detail was overlooked. This allowed the customer to coordinate all work and make key decisions such as:

- Size of belt reels.
- Location and timing of work to be completed by all other contractors.
- Coordination of safety, quality, and construction documentation.

The scope of work was to install 74,200 feet of 54-inch-wide ST2500 steel cord conveyor belt, requiring 30 splices be executed in the field. Suffice it to say, a project like this doesn't come around often and would be a major undertaking since K3-K1 would be one of the longest continual conveyors in North America.

Belterra mobilized to site, staged all the equipment, pulled on 30 rolls of ST2500 x 2,500-foot belt, and com-

Members of our service and support team were assigned to the project based on their areas of expertise and the project plan was broken into the key phases based over a 10-month schedule (including in-shop planning, on-site work, and project closing).

pleted 30 splices. Despite the challenges of this project in conjunction with the COVID-19 pandemic, the project was completed in five months; two weeks ahead of schedule and on budget.

The reasons for a successful project:

- Belterra's experience and leadership on previous large-scale projects.
- Belterra's familiarity with the site and the scope of this particular project.
- Belterra's number of qualified and experienced belt technicians that we could dedicate to the project.
- Belterra's planning and attention to detail on this project.

On completion of the project, all of the customer's expectations had been met or exceeded, with the additional

benefit of being able to move product on the conveyor ahead of schedule.

"Thank you for the superb work you and your team have performed on our project. As you have stated, the work went very smoothly almost without issue and that was due in large part to the preparation, planning, and flawless execution provided by your team," says Murray Daku, project manager for Wood. We are all very pleased that you have performed the work safely and still been able to complete earlier than the original schedule, even in light of all the COVID-19 challenges that were thrown at us. Thank you again to you and your team for the great work!"

Belterra has proven itself to be a valuable partner, advisor, and product expert to the potash industry for decades. From large overland projects to everyday conveyor maintenance, at Belterra, we keep you moving. ▲








We have partnered with premium suppliers to bring you the latest products, innovations, and expertise. Whether you need belting, components, advice, or immediate service solutions, we're here to help you whenever you call.

When it comes to Potash mining, the high-demand environment leaves no room for error. At Belterra, we have spent years researching and understanding your needs and we appreciate the tough conditions you operate under. Our responsive, 24/7 service is here to keep you operational at all times. With Belterra you can count on:

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- More material through-put
- Reduced downtime or unplanned outages
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- More efficient use of your facility staff time

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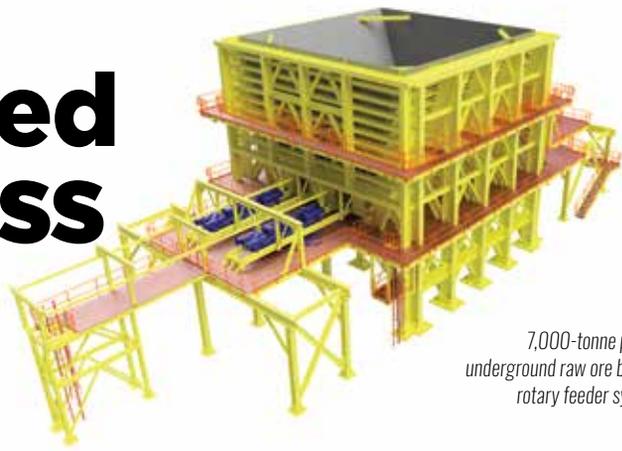
MAXIMIZE CUSTOMER VALUE WITH CMI

As customers are trying to increase productivity and profits to maximize shareholder value by reducing costs, a common theme that has been emerging over the last few years is to get more with less. A customer needs to get more productivity out of their manpower to reduce fixed costs and to get more productivity from their equipment through better selection, easier maintenance, and increased reliability. If this strategy is not implemented properly, the result could easily be less with less as employees become burnt out or inefficient by not focusing on their strengths.

CMI is uniquely positioned to maximize customer value and get more with less.

CMI has been in business for over 30 years and our team has over 150 years of experience directly in or supporting operation and maintenance needs for both underground and surface mining operations. CMI's focus is to provide solutions that maximize our customers' overall profitability, and we do this through a combination of tailored OEM equipment and distribution of various mining equipment and products.

CMI provides tailored OEM equipment that meets 100 per cent of our customers' needs. This typically involves maximizing equipment reliability (functionality and performance) while minimizing costs through standardization of equipment spare parts and training. By providing equipment as a system versus a component, CMI assumes the overall responsibility to ensure the system meets the needs of the customer. The customer manages one interface with CMI while we manage the hundreds and possibly thousands of interfaces between each component. Service and warranty are easier as customers only need to worry about one vendor: CMI. We are currently working on a project where this strategy offered significant reduction in customer workload. CMI was already fabricating the structure for multiple conveyor systems and were already managing the schedule for multiple packages to be delivered to site packaged and labeled properly to support optimum construction. CMI then provided an option to manage the rest of the supply allowing the customer to manage the additional scope as part of the original package. This eliminating the need for over 120 additional purchase orders, approximately six new contracts, six weekly schedule updates, six bi-weekly proj-



7,000-tonne potash underground raw ore bin and rotary feeder system.

ect review meetings, and not to mention the expediting and technical requirements of each component. By bundling this additional supply with CMI, the customer saved all this additional work and could get more with less.

CMI has 30 years of vendor relationships to leverage on which allows this bundling strategy to be provided at a reasonable cost. We also leverage a collaborative approach with local vendors that our customers are familiar and comfortable with. This is a critical strategy to meeting the site requirement as the local vendors have the knowledge when site information was not maintained 100 per cent accurate. CMI and other local vendors provide value as the glue to help bridge these gaps for the operations.

Maximizing equipment reliability while minimizing costs is another major focus to get more with less. CMI's technical expertise allows us to understand the equipment requirements and connect this with technological advancements within the industry. We provide equipment that meets the standardization strategies and options for the newer technology or increased reliability to maximize value. This allows our customers to make informed decisions by understanding the cost of standardizing on existing or upgrading to new and improved options. Our relationships and knowledge allow our customers to get more out of equipment with less costs.

The last key area where CMI can support our customers is through our service groups. HD Engineering & Design and CMI Tech Services provide our customers with opportunities to ramp up manpower for specific tasks or projects without increasing their overall fixed manpower costs. We have supported projects like non-routine maintenance overhauls, site troubleshooting support and repair, project management and drafting services, maintenance planning, and development of equipment hierarchy structures in the EAM systems and developed maintenance PM strategies. This allows customers to utilize their resources where they are most efficient and leverage their detailed company knowledge to generate the most value to get more with less.

Therefore, if you are getting asked to, or you need to get more with less, give CMI a call to look at unique strategies to maximize your success. ▲



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BY IGOR MAKARENKO



The vertical configuration of indirect heat exchangers means it can cool potash in pre-loading storage areas.
PHOTO COURTESY OF SOLEX THERMAL SCIENCE.

Innovative potash cooling practices are giving producers the tools they need to remain competitive amid low commodity prices.

A steady decline in potash prices from highs of near \$500 US per tonne in 2011 to sub-\$200 today means plant operators are on the hunt for improved efficiencies within their existing processes. In part, this has highlighted historic challenges with existing direct cooling solutions that typically come with high operating costs and are less flexible in adapting to varying processing conditions.

Vertical plate technology that cools potash indirectly has emerged as a Goldilocks solution that puts temperature control back into operators'

hands while also reducing energy costs and improving storage management practices.

Potash must be cooled to a specific temperature range before it can be safely packaged and transported. In most cases, the potash will come into the cooling stage at a temperature of 100°C or higher and should exit the cooling stage with a target output in range of 50° to 60°C to be safely handled and avoid caking.

Yet when throughputs exceed existing processing conditions, direct cooling solutions such as fluid beds and rotary drums cannot cool the product to temperatures needed to meet these conditions. As a result, the potash must be moved to large

on-site storage facilities where it is left to "stack-cool" anywhere from three to four days. When that product finally cools, it is then conveyed to loadout where it is packed into trucks or railcars.

The challenge with stack-cooling bulk storage is it complicates plant logistics - for example, demurrage and warehouse management - not to mention increases the likelihood of caking and forces the product to sit rather than being sold. In addition, potash is a great insulator, meaning even after sitting for extended periods of time, it can still be dangerously hot in spots and therefore potentially hazardous to operators and truck drivers at loadouts.

Vertical plate technology is flexible and robust enough that it can accept more product while still meeting cooling requirements. A tall, tower design allows the product to slowly pass through stainless-steel heat exchanger plates that are cooled by water or other liquid mediums. The plates absorb the heat and the product cools as - encouraged by gravity - it slowly and uniformly moves downward, controlled by a discharge device.

The design allows true counter-current flow of the water inside the plates, which achieves greater thermal efficiency, and as a result, more effective

cooling. In addition, the plate design offers more surface area to cool the product than beds or drums, and in a more compact space. The typical required footprint for a vertical heat exchanger is two metres by two metres.

Combined, these factors allow plant operators to not only handle higher throughputs while still guaranteeing a safe and even-temperature product that won't subsequently cake during further transport, but it also gives them a conveniently located cooling stage directly at loadout. That, in turn, frees up space within the main facili-

ties, mitigates the need for housing product in flat storage, and puts the safest possible product to handle into truck drivers' hands.

Because the potash is cooled by conduction as opposed to convection (air cooling), indirect cooling technology also foregoes the need for high-energy consumption air chillers and large fans. Rotary drums and fluid beds come with large-scale fans for pushing and pulling air and wet scrubbers or baghouses to clean the air to meet emissions requirements.

These pieces of equipment come with high energy costs and require significant space. In a typical 3,600 tpd potash plant, the operating power requirements of a typical fluid bed is 1,040 kW – compared with just 100 kW with indirect cooling technology.

To learn more about indirectly cooling potash, visit solexthermal.com.

Igor Makarenko is global director, fertilizer at Solex Thermal Science, a Calgary-headquartered company specializing in bulk solids thermal exchange. ▲



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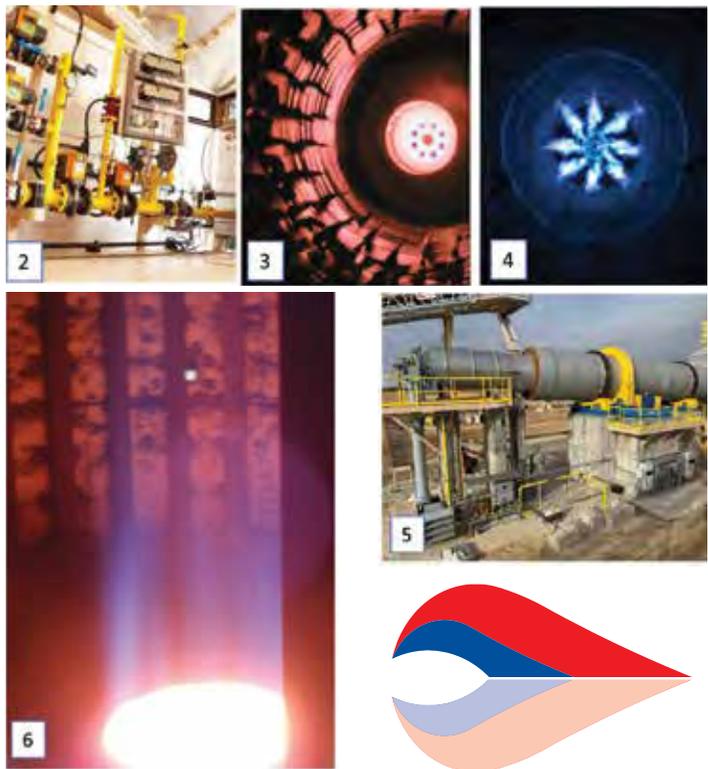
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Radiometric process control for the potash industry



Berthold's radiometric measurement systems for the potash industry are built to work as non-contacting and non-invasive, and thus, they are immune to the conditions prevailing in the factories.

Do you need precise and reliable data on your potassium concentration? We will explain how Berthold Technologies can help you with their sophisticated potassium analyzer solutions. Sensitive, accurate, and robust even in harsh environments.

The conditions in the factories of the potash industry are known to be rough and extreme, especially when permanently mounted measuring devices are continuously exposed to these conditions. Not only can dust and dirt impair or damage measuring instruments, but also the highly alkaline and abrasive suspensions can drastically reduce the operating time of sensitive gauges or even exclude entire measuring techniques.

Therefore, robust, and yet highly accurate online measurement systems are required, which deliver reliable

and repeatable results. Berthold's radiometric measurement systems for the potash industry meet all those expectations since the instruments are built to work as non-contacting and non-invasive, and thus, they are immune to the conditions prevailing in the factories. Moreover, maintenance and costly downtime can be practically avoided. Berthold provides the DuoSeries LB 474 and LB 472 measuring solutions for potassium concentration (LB 474), product density (LB 474) and bulk flow determination (LB 472).

Potassium concentration measurement

The measurement of the potassium concentration is one of the most difficult and challenging measurements in the mining industry. In nature, the

element potassium is both stable in the form of the potassium isotopes K-39 and K-41, and radioactive, represented by the radioisotope K-40. Stable potassium and K-40 are in a fixed ratio to each other, and K-40 makes up only about 0.01 per cent of the total potassium. Due to this low proportion, an extremely sensitive and long-term stable measuring system is required. In addition to this, the system must be able to suppress naturally occurring background radiation to achieve an optimum signal-to-noise ratio. With the LB 474 potassium analyser, Berthold fulfils all those requirements. The potassium analyser makes use of this constant ratio of K-40 and the stable potassium isotopes. By detecting the gamma radiation of K-40, the total concentration of potassium, and thus K_2O equivalent or KCl, can be determined.

Depending on the process conditions and the mechanical arrangement, the potassium analyser can be equipped with three different types of detectors. Furthermore, adapted to the prevailing conditions on-site, the detector can be installed inside a tube which is immersed into a tank or vessel, or it can be mounted at a tank's outer wall. Under specific circumstances the detector can also be installed at a conveyor belt.

Density and bulk flow measurements

In contrast to the determination of the potassium concentration, for the

Depending on the process conditions and the mechanical arrangement, the potassium analyser can be equipped with three different types of detectors.

measurement of product density and bulk flow, an additional gamma radiation source (Cs-137 or Co-60) is required. The gamma radiation sources are produced to customer specifications by Berthold's own source production facility and in accordance with the highest safety guidelines. Both source and detector are installed non-contacting and non-intrusive at the relevant pipeline, vessel, or conveyor belt. The gamma radiation is attenuated by the process media to be investigated when penetrating the pipeline, vessel, or belt. This weakening of the radiation is detected by the detector. The higher the product density or the load, the less radiation reaches the detector. In this way, density, con-

centration, solid content, mass flow, and bulk flow can be determined reliably and without contact - independent of pressure, temperature, viscosity, conductivity, or vibrations.

Transmitter

The measurement systems LB 474 and LB 472 each consist of a scintillation detector and a separate transmitter. This transmitter can be located in a distant (up to 1,000 metres) and easily accessible control room. The modern transmitter has a 3.5-inch touch panel, a dual-core CPU, and various operating options. Extended functions for self-diagnosis and monitoring also ensure maximum functional safety.

For further information, please visit this link:
www.berthold.com/potash-industry.

About Berthold Technologies

As a world technology leader in the field of radiometric measuring systems, Berthold products convince with outstanding measuring performance and reliability. The main fields of application are, for example, in chemical and polymers (etc. fertilizer industry), steel and power plants, mining and mineral processing, waste and recycling, refineries, paper, glass, and in the food industry (example, sugar beets). In addition, microwave measuring systems for the determination of moisture and concentration belong to our extensive portfolio. The production of high-quality measuring systems for industry and research began more than 70 years ago in Bad Wildbad in the Black Forest in Germany. ▲

PROCESS CONTROL FOR THE POTASH INDUSTRY

Potassium analyzer, density & bulk flow measurement

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The Berthold logo consists of the word "BERTHOLD" in a bold, blue, sans-serif font, with a stylized blue arc above the letters "B" and "H".

Processing fines prompts advances in compaction technology



Fertilizer industry producers mine ore both underground and on the earth's surface, and chemists and process engineers utilize numerous processes to yield product for distribution on farm land. One example involves the creation of K_2SO_4 (SOP) through the Leblanc process, more specifically, the Mannheim process. This process creates premium potassium fertilizer required for healthy plant growth and plant metabolism. It promotes optimized crop yield and higher-quality produce. Farmers typically use SOP for high-value fruit farming with chloride-sensitive crops such as grapes, beans, berries, and legumes. SOP, known for its abrasiveness, is typically extremely fine particle size distribution (PSD), following the completion

of the Mannheim process. Therefore, how do farmers transport and spread such a fine product onto their fields? Farm fertilizer applications require product with high granular integrity, uniform size and shape, no dust, yet highly solubility in water. Agglomeration processes, such as roll compaction, densifies highly fine powder into granular particles that can be stored, shipped to and distributed by farmers throughout the world, including billions of acres.

Sulfates require high pressure per linear inch to compact product uniformly and with low friability. Compacting fine abrasive material presents challenges, solved by rugged reliable machines, like Ludman Industries Roll Compactors. Ludman develops and invests in leading industry technology to provide the best roll compaction equipment for fertilizer producers.

Examples of investments made to improve system yield and achieve quality product include:

- Hi-PAK Ludman Corrugated Rolls
 - Fine PSD products call for larger nip zone in roll compaction equipment. Slowing roll speed achieves larger nip zone, but conversely affects throughput.

Ludman's corrugations capture more product and mitigate adverse roll speed factors. This approach maintains higher production volumes, while creating dense product.

- Synchronous roll technology to increase system yield and lower cost of ownership
 - Deep Groove technology employs consistent corrugation patterns that, likewise lead to consistent product. Maintaining geometric product shape in congruence with total roll control involves synchronizing roll operation. While simple in concept, in practice, rolls constantly work in opposition to the other, as torque forces vary on each roll. Ludman Roll Positioning technology allows for complete control by forcing the rolls to work together. Output with this method shows consistent shapes, consistent thickness, and uniformly dense product.
- Advanced alloy technology
 - As mentioned, SOP abrasiveness requires rugged heavy duty metals, yet reliable performance to compact ideal product. Balancing roll hardness and



Ludman Industries Model 4440 Roll Compactor translates waste fines into salable granular product.

Ludman develops and invests in leading industry technology to provide the best roll compaction equipment for fertilizer producers.

brittleness is key to answering this problem. Ludman's high-chrome, spun-cast shells with forgiving cores complement time-tested, industry-leading roll compactors. Advanced roll technology provides reliable and longer-lasting roll faces that withstand high pressure and continuous operation.

Total process solutions for roll compaction paired with innovative machine technologies bolsters potash producers looking to achieve greater yield and consistently superior product. ▲



Ludman develops and invests in leading industry technology to provide the best roll compaction equipment for fertilizer producers.

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Model 4440



Roll Diameter	Roll Face	Throughput
44 inches	40 inches	150 tons

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JA Tech Inc.

JA Tech Inc. was formed in 2003 to satisfy customer requirements relating to the testing and commissioning of high-voltage electrical systems. As a provider of field, technical, and engineering services and products for equipment and apparatus which form an electrical power system, our mining customers have come to know and trust our capabilities on their sites.

JA Tech is a Certified Aboriginal Business through the Canadian Council for Aboriginal Business and is a member of the First Nations Power Authority.

Engineering services and substation automation

From feasibility all the way through to commissioning and start-up, we have the ability to support any electrical project through its complete life cycle. JA Tech offers engineering and design services covering all aspects of an electrical system, including high-voltage greenfield and brownfield electrical design, power system studies, protection relay upgrades, and everything in between. Leveraging the latest technologies such as IEC 61850, we are proud to offer unique, custom-tailored solutions for our customers, and take special design consideration for safety, constructability, maintainability, and reliability of

the final product. For substation automation, we use IEC 61850 design and implementation, along with multi-vendor IED configuration and GOOSE messaging. We specialize in RTAC configuration and HMI design with support for DNP3, Modbus/RTU, Modbus/TCP, Ethernet/IP and SEL protocols.

E-house and control room design builds

When you require a modular, industrial solution for your MCCs, switchgear, transformers, VFDs or protection systems, we can provide complete turnkey CSA buildings from our shop in Saskatoon. We can install equipment supplied by others or provide a complete package, tested and ready to ship. All of our engineering changes are done in house to help speed up delivery schedules for our clients and reduce costs. As we continue to grow, so do our capabilities.

PD testing

Knowing and understanding the condition of your assets is vital to controlling the risks presented to your business. As part of our predictive maintenance offering, JA Tech performs both online and offline partial discharge testing. We have also completed permanent RFCT installations

JA Tech offers engineering and design services covering all aspects of an electrical system, including high-voltage greenfield and brownfield electrical design, power system studies, protection relay upgrades, and everything in between.

on medium-voltage cable shields for customers so their cables may be monitored at regular intervals. This is especially important on aged cables and feeders that cannot easily be isolated for offline testing. We have worked closely with companies like EA Technologies to ensure a quality installation that is functional on a variety of different switchgear brands.

Mitsubishi drives and Elsteel MCC's

JA Tech and ArrowSpeed Controls have teamed up to support the Saskatchewan potash industry to supply, install, and commission Mitsubishi drives. Arrowspeed Controls is one of the largest VFD integrators in Canada with inventory up to 800 HP. JA Tech will provide local, factory-trained technicians to support all of your VFD projects. We also offer an Elsteel MCC, which is a custom CSA/UL MCC design for all industries and applications.

High-voltage cable installation and jointing

JA Tech performs specialized installations of high-voltage cables in addition to terminations and testing. We have been involved in several 230kV and 138kV cable termination analysis and replacements, as well as full installation, termination, and testing of new high-voltage cables. Our in-house representatives are certified in PFISTERER® brand high-voltage terminations, including the EST style and Connex up to size 6S. As we own all the specialized tools to perform this work, there is no need for us to subcontract any equipment. This allows us more flexibility with the client to ensure they are getting the quality and safety standards they require. Our cable jointers are experienced in many different brands of medium- and high-voltage cable preparation techniques. References are available, contact our office for more details. ▲

Technical Field Services
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JA Tech is a provider of construction and technical service for all equipment and apparatus that form an electrical power system. We provide some of the most skilled labour and up-to-date equipment in the mining, industrial and utility sectors. Through Integrity, Quality and Commitment we achieve the best for our customers.

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NRT is busy planting seeds and harvesting new opportunities in the ever-changing economic landscape.

Growing versatility

NRT SOWS SEEDS OF PROGRESS

Northern Resource Trucking (NRT) is no stranger to economic upheaval. The company was primarily developed with the purpose of servicing the growing uranium industry in northern Saskatchewan, but the close ties NRT has with this single resource sector has been both a blessing and a curse. With global uranium prices reaching record lows in recent years, mine closures, shut downs, and layoffs were inevitable. In the past five years, NRT has been forced to look beyond its biggest customer and to diversify its fleet. So, when 2020 came along, and with it the COVID-19 crisis, NRT was well placed to make the most of a bad situation. In fact, while other companies struggle to make ends meet, NRT is busy planting seeds and harvesting new opportunities in the ever-changing economic landscape.

If 2020 has taught us anything, it's that businesses need to be flexible. Since its inception, NRT has made a name for itself for its unique business model; the company is a partnership with Saskatchewan First Nations and was the first of its kind in Canada. Not only has this business model set NRT apart from its competitors, but its partnership keeps

business in northern communities, creates jobs for those who want to stay in the north, and provides investment opportunities that keep money in those communities. Now, this same business model is drawing attention from companies in Manitoba and Ontario, and NRT is growing its operations across the country.

Northern Resource Trucking has expanded steadily in the past 34 years. Now it serves Cameco and Orano, SSR Mining's Seabee gold mine with their ice road, Federated Coop for fuel and propane, and New Gold in Ontario, among others. NRT has also combined forces with the First Nations Mining Economic Development (FNMED) Inc. to create Piwapisk Hauling Limited Partnership in Manitoba, and with Big Grassy River First Nation to create Big Grassy Logistics in northwestern Ontario, where NRT's unique business model is being mirrored in partnerships with First Nations in Manitoba and Ontario that are well positioned to take on the needs of burgeoning resource development east of the Saskatchewan border.

One of the things that NRT has had to do in order to take

If 2020 has taught us anything, it's that businesses need to be flexible. Since it's inception, NRT has made a name for itself for its unique business model; the company is a partnership with Saskatchewan First Nations and was the first of its kind in Canada.

on new projects and attract new customers is to diversify its services. The uranium mines in northern Saskatchewan require some very specialized equipment and training, and NRT has discovered that the unique skillset of its drivers is quite versatile in other markets. Northern Resource Trucking has a fleet of 100 trucks and 235 trailers, including dry vans, refrigerated vans, flat decks, drop decks, fuel trailers, pneumatic bulkers, coded chemical trailers, pressure vessels, fiberglass tanker trailers (for bleach-type products), molten sulphur and equipment trailers with jeeps and boosters. This, combined with the experience of the company's drivers with rough roads, poor road conditions, and specialized over-dimensional work, means no job is too complicated.

Northern Resource Trucking is so invested in growing versatility that it has opened a new Winnipeg branch, which is developing business in Manitoba and northwestern Ontario. Where five years ago the uranium industry made up 95 per cent of Northern Resource Trucking's revenue, today it is down to 59 per cent as NRT continues to expand and diversify. NRT looks forward to growing with other businesses looking to provide supplies and equipment to resource development projects in the north and across Canada. NRT's one-of-a-kind experience and expertise in northern transportation and First Nations partnerships will provide an edge over the competition. It might be winter, but NRT is still sowing seeds, growing versatility, and harvesting opportunities across Canada. ▲

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Properly identifying root causes assures successful material and dust containment



Potash application before.



Conveyor belt support and sealing.

Fugitive dust is a continuous problem for the material handling industry. Any time there is material movement, dust can be generated. Side effects of this issue include the negative impacts on operational health, safety, and efficiency. These must be resolved to avoid constant clean-up tasks, loss of product, equipment damage, and health and environmental concerns.

Recently, Richwood was invited to help mitigate persistent dust generation issues for a potash client in Canada. Though there were several sources of dust in this application, the assignment was to seal and contain a busy load zone. The approach, recommendations, and results are presented here.

Identifying root causes for the escaping material was the first step. Though it would be simple to prescribe canoe liners, skirting, and skirt clamps and call it a day, this would be an over-simplified view of transfer areas. A thorough survey to evaluate the system operating conditions and requirements was conducted. Factors noted include: conveyor belt width, belt operating speed, type of material conveyed, the conveyor profile, tons per hour, the design of the transfer chute, type of belting and types of splices, as well as other details that effect the performance of the conveyor.

Successful dust containment is built from the bottom up and this application was no different. During the inspection it was noted that there were a few inefficiencies that needed to be corrected to help contain more material and dust particles. These issues were most evident when cleaning, when the amount of dust generated would be considerable enough to make for very low visibility, further underscoring the necessity to resolve this problem.

A complete Material Containment System was recommended that was designed and built from the underside of the belt up. It included impact systems with a true radius conveyor belt support profile. Best practice design standards for bulk handling belt conveyors begin with a full trough transition entering the load zone. This places the belt in full contact with belt support components at all times, establishing the consistent foundation for the sealing system. Any reliable system requires a straight, stable bedrock of support. This basic requirement is often overlooked and is critical to successful system results.

Next, material containment that includes a multi-layer sealing system to effectively contain both heavy bulk material and fines was recommended and engineered for the location. This multi-layer design approach uses internal wear liners to seal bulk material inside skirtboards while protecting against abrasive wear with the flexible outer skirting media dedicated exclusively to the containment of fine dust.

The installation of all components was assisted by the Richwood technical support team.

The results, especially the cleaner and safer work area for staff, have been a great benefit to the client. Additionally, any conveyor maintenance or inspections needed in the area are much easier to perform. Before the material containment system installation, there was a huge amount of dust escaping the skirted area of the conveyor, creating large product losses and cleanup costs. Since the Material Containment System installation was completed, the remaining dust that collects in the area filters down from the processing floor above. Though overhead conditions above the tunnel still release dust, cleanup from material escaping from the conveyor has been drastically reduced. The cost savings realized here will continue to provide a consistent return on investment in safety, work hours, and components.

Conveyor transfers have their own unique characteristics that must be accurately identified and incorporated into the system design process. Best results for effective dust control are realized through a total system design for each individual application.

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Building better together



One of Graham's major strengths is building capacity within Indigenous groups through the transfer of construction practices and business development methods, so they can meaningfully participate in the project.

GRAHAM'S INDIGENOUS PARTNERSHIPS

Over the last 25 years, Graham has prioritized and developed strong sustainable business relationships with Indigenous communities that are as-

sociated with their projects and businesses. These relationships reflect Graham's own values and respect the heritage and culture of Indigenous

communities. Graham has established these relationships through joint ventures and strategic alliances with Indigenous communities and their associated businesses in a way that fosters shared values and ideals. By planning and building for long-term success, Graham strives to create an environment that generates positive effects through training, employment, and the development of a sustainable economic capacity in the communities.

Together with their Indigenous network, Graham has developed many successful, revenue-generating limited and joint-venture partnerships. Graham recognizes the importance of building relationships with Indigenous communities, not only for the pre-construction and construction phases, but also from a long-term development perspective. With the understanding that building successful



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One of Graham's major strengths is building capacity within Indigenous groups through the transfer of construction practices and business development methods, so they can meaningfully participate in the project.

partnerships is an enduring, dedicated commitment that requires proactive effort, mutual respect, trust and time. Graham continually strives to build and maintain long-term partnerships that bring Indigenous communities lasting success.

Within Saskatchewan, Graham has two principle partnerships:

Points Athabasca Contracting LP

Established in 1998 with Athabasca Basin Development Limited Partnership, this joint venture has successfully completed numerous projects in the northern Saskatchewan resource sector and remains one of the largest employers in the region.

Great Plains Contracting LP

In partnership with File Hills Qu'Appelle Tribal Council, this alliance has successfully completed many projects in southern Saskatchewan. Since 2011, this partnership has supported career growth and skill development through the hiring, training, and mentoring of Indigenous people on its projects.

One of Graham's major strengths is building capacity within Indigenous groups through the transfer of construction practices and business development methods, so they can meaningfully participate in the project. With increased capacity and knowledge, community members are able to take a principal role in the growth of their community through local opportunities. This is done through Graham's industry-certified Builder's Framework employee training program, covering preconstruction, construction project management and technical construction techniques to

support the education of their Indigenous partners and through ongoing support of organizations including Saskatchewan Indigenous Institute of Technologies, the Canadian Council for Aboriginal Business, and the Indian Resource Council. These part-

nerships assist Indigenous people in gaining the necessary skills, training, and work experience to obtain and maintain long-term employment.

Graham takes pride in being visibly strong supporters of Indigenous communities across Canada. Through trust, transparency, respect, and commitment, these partnerships are changing the future. Together, Graham and their Indigenous partners are building better. ▲

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Trust, expertise, and innovation define Inproheat's dynamic presence in the potash industry



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At Inproheat Industries Ltd., three generations of company history have led to a diverse portfolio of notable projects in Canada and around the world.

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We take a listen, understand, and act approach to client communication. When trust is built on a foundation of open dialogue, unwavering transparency, shared ideas, and collective goals, it will lead to success.

The mining industry evolves quickly

- through 60 years in business, we have experienced it first-hand - which means that solutions need to come swiftly and from an informed place. This is our expertise. We identify the needs of our clients and match them closely with our regular observations of current industry trends. This strategy delivers quality solutions with the greatest impact at the most competitive investment.

Innovation is a two-fold process in each project. First, we aim to provide solutions that will offer unparalleled quality and efficiency upon project launch. From there, we will seek out

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system design improvements for future integration that will continually exceed expectations. In short, we transform forward-thinking ideas into industry-leading solutions.

The impact of our trust, expertise, and innovation philosophy is most visible in our proprietary technology, Submerged Combustion. An Inproheat cornerstone for over 45 years, SubCom® boasts shorter payback periods on capital expenditures, up to 15 per cent less fuel consumption with proportionally lower greenhouse gas emissions, less maintenance, and high reliability, especially when compared to competing heating technologies.

The appeal and efficiency of SubCom® is reinforced through its history of success.

In 2011, the Potash Corporation of Saskatchewan (PCS) approached Inproheat to modernize a novel 1990 SubCom® application that was instru-

mental in PCS earning a 1991 CGA Award for innovative use of natural gas. With four additional burners, all-new modular fuel trains with automated controls, and a new process control and burner safety management system, the revamped application was installed for the 2011-2012 winter mining season, lending increased heating capacity, technological advancements, and better control over the heating process to the entire operation.

In 2016, Compass Minerals - already using SubCom® technology for a 30 MM Btu/h process water heating system - commissioned Inproheat for an additional unit as part of an expanded system of Sulphate of Potash (SOP) and Magnesium Chloride production from brine taken from the Great Salt Lake in Utah. The new system required twice the capacity through two parallel SubCom tanks, four low emissions burners of 15 MM Btu/h ca-

capacity each, along with heat recovery units for high thermal efficiency. To provide an operator-friendly environment and facilitate the transition, Inproheat integrated previous components and design specifications. The project was delivered in 2016.

These are just two examples. We would welcome the chance to learn about your project goals for 2021 and beyond.

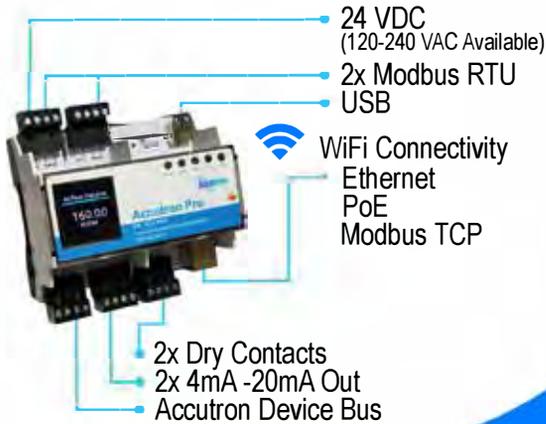
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For more information:
Steve Panz
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spanz@inproheat.com

Alec Logan
CEO - Inproheat Industries Ltd.
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Cavex® 2 hydrocyclone increases volumetric capacity up to 30 per cent



ALMOST 25 YEARS AFTER THE ORIGINAL CAVEX® HYDROCYCLONE REVOLUTIONIZED CLASSIFICATION, CAVEX® 2 WILL INTRODUCE A STEP-CHANGE IN PERFORMANCE AND SUSTAINABILITY, WITH WATER AND ENERGY SAVINGS

Cavex® 2 hydrocyclones allow operators to increase capacity up to 30 per cent without altering its footprint.

The launch of Cavex® 2 marks a new generation of hydrocyclones. Like the original Cavex® hydrocyclones did more than two decades ago, Cavex® 2 introduces new geometric features which offer performance unmatched by any cyclone in operation today.

“Our Cavex 1 design set an industry benchmark over two decades ago with its unique 360° laminar spiral inlet geometry, which significantly reduced turbulence. This design was so successful and desired by the market that it was widely replicated by competitors,” states Debra Switzer, global product manager for hydrocyclones at Weir Minerals. “Following years of research, development and trials, we have improved upon this design with the creation of LIG+ inlet and chamber design. This unique design produces a more stabilized flow pattern, further reduces turbulences and friction throughout the hydrocyclone, and provides up to 30 per cent additional capacity.”

The advanced LIG+™ design (patent pending) enables the Cavex® 2 hydrocyclones to classify up to 30 per cent more feed slurry, while occupying the same footprint as competitor hydrocyclones. Ultimately, operators can now achieve more throughput with fewer operating hydrocyclones, reducing the upfront CAPEX.

The new design has taken into consideration the shape and angle of the hydrocyclone to ensure particles report to the correct stream. This reduces recirculation and misclassification, taking separation efficiency to the next level.

“Cavex 2 allows our customers to do more. A more sustainable circuit, with lower energy and water requirements, and expand the capacity of their existing circuits, without increasing the footprint of the cyclones or clusters. It’s the kind of generational engineering leap that will change the way circuits are designed for decades to come,” says Switzer.

Engineered for future mine, Cavex® 2 takes advantage of Weir Minerals’ Synertrex® IIoT technology, which enhances the overall performance of the hydrocyclone. Armed with this technology, operators are automatically alerted to roping or blockage conditions ahead of time, ensuring the hydrocyclone runs under the most optimal operating conditions.

“To minimize the amount of bypass that is produced in any hydrocyclone, it is favourable for it to operate in the semi-roping condition. This is often difficult to do continuously because any upset in the hydrocy-

clone’s feed conditions could move it into the roping condition, but with Synertrex this balancing act can be closely managed,” adds Switzer.

Cavex® 2 hydrocyclones can be customized to suit almost any application, with a variety of spigots, vortex finders, and liners. Liners are available in a range of material options, including Weir Minerals’ proprietary R55® rubber compound or Linatex® premium rubber, both of which have proven to outlast competitors elastomers in similar applications. Liners can be replaced via a “snap-in” system which requires zero adhesive, while smaller models (400CVD and below) are available with moulded fibreglass housings.

“Every stage of the Cavex 2’s design has been guided by the needs of our customers. As a consequence, it has been tested in multiple mining applications throughout the globe. These tests revealed outstanding results of up to 30 per cent additional capacity,” says Switzer. “Decreasing ore grades and increasing need to reduce both water and energy usage have created the need for a low-maintenance, highly efficient hydrocyclone which can be readily



Above: Cavex® 2 hydrocyclone installed at a site in Russia.
Left: Cavex® 2 hydrocyclones installed at a mine site in South Africa.

retrofitted into existing circuits to increase throughput and maximize returns. I can't wait for our customers to see what this new range is capable of."

Cavex® 2 hydrocyclones are now available to increase capacity of mines across the globe. For more information, visit www.cavex2.weir.

About Cavex® hydrocyclones

Introduced to the world in 1998, the Cavex® hydrocyclone design delivers maximum efficiency, maximum hydraulic capacity, and long wear life. The laminar spiral inlet geometry design provides a natural flow path into

the Cavex® hydrocyclone. Its unique shape has no sharp edges or square corners and allows the feed stream to blend smoothly with rotating slurry inside the chamber. The result is greatly reduced turbulence throughout the entire hydrocyclone, creating even wear, long life, and efficient classification. Today, Cavex® hydrocyclones can be found on mines across the world.

About The Weir Group PLC

Founded in 1871, The Weir Group PLC is a premium mining technology business whose purpose is to make customers' operations more sustain-

able and efficient. The group is ideally positioned to benefit from structural trends that support long-term demand for its technology, including the need for more essential metals to support economic development and carbon transition. Weir's highly engineered technology enables these critical resources to be produced using less energy, water and waste, reducing customers' total cost of ownership. The group has 13,000 employees in over 50 countries and has been listed on the London Stock Exchange since 1946.

For more information, visit www.global.weir.▲

Driving innovation in Saskatchewan potash

Saskatchewan's potash industry has for many decades been a stable and important element in our region's economy. Since 1965, Bit Service has been a strong supporter of this growth, as a locally owned and operated organization providing key elements to each operating mine's underground needs.

From humble beginnings, Bit Service provided service and boring machine bit sharpening, expanding capabilities shortly after with bit manufacturing, repair and cutting assembly fabrication services. Not long after, the high-quality products of long-established mining manufacturers Cincinnati Mine Machinery Co. and The Bowdil Company were brought onboard, aiding Bit Service to grow alongside the needs of the industry.



Cincinnati Conveyor Chain.

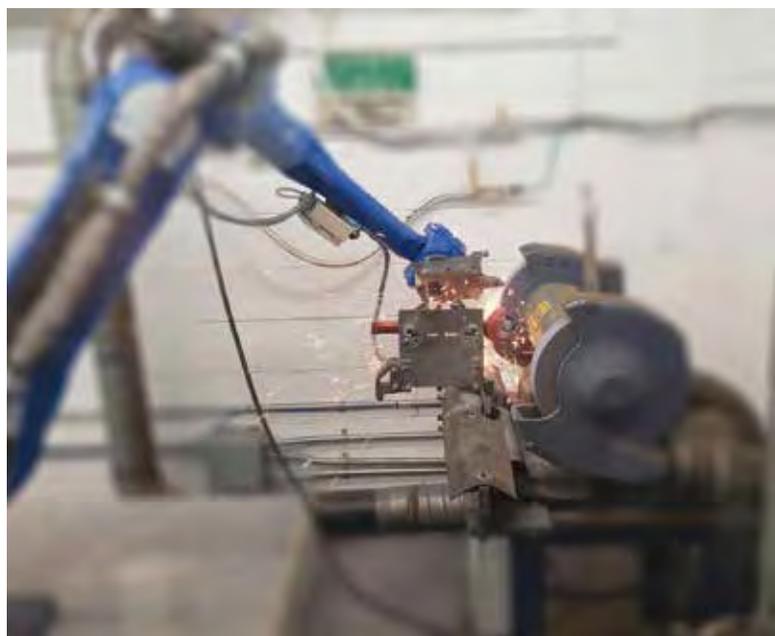
The **BOWDIL** Company



Bowdil Trim Chain.

The experienced and knowledgeable personnel at Bit Service work with mine staff and management to help eliminate problems they face with mine consumables and to maximize production. From the design stage, aided with 3-D modelling software, through production and warehousing they continually fulfill customer needs. Constantly striving to innovate and improve on the products they service and provide, Bit Service has seen 55 years of strong partnerships in Saskatchewan potash.

The two- and four-rotor boring machines have long been the primary mining machines in the conventional Saskatchewan potash mining market. Instrumental in the cutting and production of the ore are the radial bits on the front of the machine and Bit Service saw a need for an upgraded and purpose-built product in this area. Over the course of decades and hundreds of prototypes, employing several different carbide grades and profiles, as well as dozens of braze formulas and procedures, a line of bits specific to the needs of Saskatchewan potash mining were refined and put into production. Technological innovations and robotics in the production methods have pushed the capabilities to new levels, and to this date, they are the most prominent and well-received bits in use in our province's potash industry.



Robotic work cell in our production facility.

Building on the value provided to their mining customers, early in 2020 Bit Service finalized an agreement to be the exclusive distributor of Kennametal's underground mining products for our Saskatchewan potash clients. Through the partnership with Bit Service, Kennametal is committed to providing superior products to the mining end user customers. In addition to providing a way to market, Kennametal looks forward to the opportunity to collaborate with Bit Service in order to support their lo-



cal manufacturing and design expertise. This relationship allows for ongoing product development and innovation of new mining tools, as well as continuing to support the local productivity and economy of the Saskatoon and Esterhazy regions.

Recently, through a partnership with ULMA Conveyor Components, Bit Service has been working diligently to introduce a revolutionary, high-quality conveyor roller system to the Saskatchewan potash industry. Starting with highly engineered and thoughtfully designed rollers and idlers, with some of the industry's most advanced R&D and testing laboratory facilities, through to the industry-first digitally monitored roller system, ULMA Conveyor Components is a world leader in the field. The uncompromising design and manufacturing quality of ULMA's products, along with technological innovations never before seen in these applications are the start of an exciting new chapter in potash mining.



ULMA Conveyor rollers at work in cold weather environment.

Customer service and satisfaction has always been the primary goal and their extensive warehouse stock is an illustration of this. Due to constantly changing customer needs resulting from machine alterations and geological differences, Bit Service works closely with mines to stock what they need in quantities to maintain maximum productivity. These partnerships are strong and Bit Service looks forward to continuing them for many decades to come. ▲



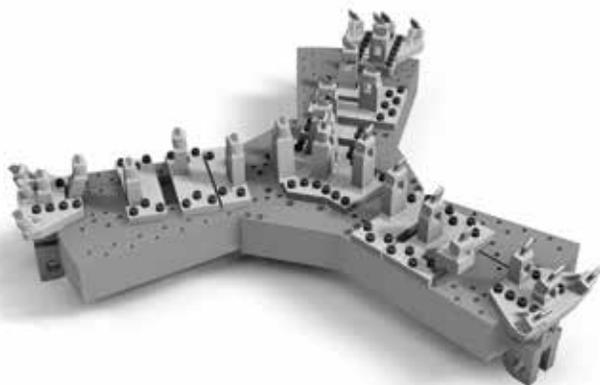
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Air booster rebuilds

NEW LIFE FOR YOUR BOOSTER ON TODAY'S TIGHT BUDGETS

BY SAM DICK, P.ENG., ENGINEERING COORDINATOR, COMAIRCO

If the air stops, the mine stops. So as an air compressor ages, the risks of extended outages and lost production increase dramatically. Even still, with budgets tightening across the mining industry, it can be difficult to find the capital for a new compressor. Comairco's new booster refurbishment service may be the most economical way to breathe new life into your old air booster packages.

Electric-driven compressed air booster packages can be found next to any air-powered drill requiring an elevated compressed air pressure (typically 250-350 psig). The booster takes compressed air from the mine's standard supply and boosts the pressure as high as 400 psig. These compressors are typically mounted on a towable wheelbase with all the accessories, controls, and fire suppression, so it can be easily moved around with the drills as required.

Below: Compressor rebuilds have been an important part of Comairco's business since day one, and they now offer a refurbishment service for your entire air booster package. Seen here is machinery before it was sent to Comairco.



Comairco's refurbishment service can bring new life to your aging air booster packages for much less than the cost of a new booster.

Going beyond the air end, Comairco inspects every component in the booster package for repair or replacement. Machinery after Comairco refurbished it.

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COMPRESSED AIR SPECIALISTS



WHEN THE MINING INDUSTRY NEEDS COMPRESSED AIR,
THEY TRUST **COMAIRCO** TO MEET THEIR EXPECTATION.



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The harsh conditions of a mine can wear on even the most rugged equipment, and these air booster packages are no exception. Coolers can become caked with oil and dust, elevated operating temperatures can lead to varnish formation in the air end, and harsh atmospheres can cause internal corrosion. Over time these conditions will hamper the performance of the compressor and eventually lead to a risk of catastrophic failure.

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 rebuilds have been an important part of Comairco's business since day one, and they now offer a refurbishment service for your entire air booster package.

The air end is the heart of the air booster package, and the unique high-

pressure rotary screw design (often by Sullair) demands special expertise for a rebuild or major repair. Comairco only allows their most experienced and well-trained technicians to rebuild these air ends, and only uses high-quality OEM parts. This ensures "like new" performance and durability for every air end and allows Comairco to stand behind their work with a two-year warranty.

The air end rebuild by Comairco includes replacement of all bearings, seals, gaskets and O-rings with new OEM parts. This complete rebuild service also includes sealing strip repairs, remanufacturing of bearing bores and air gaps, precision grinding of rotor faces and air gap collars, machining of housings, gear fit repairs, repair of broken or cracked shafts, repair of broken housings, and dynamic balancing of all rotating parts.

Going beyond the air end, Comairco inspects every component in the booster package for repair or replacement. The motor and electrical panels are refurbished; gauges, hoses, and valves are repaired or replaced. To protect your investment, the entire frame and sump tank are sandblasted and repainted, and new reflective safety decals are added. Before leaving the shop, Comairco tests the package for leak tightness and performance, and performs a full visual inspection.

This is also a great opportunity to add customizations or upgrades to meet your changing needs. Comairco can add stainless-steel control panels, new air or electrical connections, instrumentation, safety devices, and much more.

Comairco's refurbishment service can bring new life to your aging air booster packages for much less than the cost of a new booster. Their investment in personnel and facilities ensure prompt repair time at competitive pricing.

Visit www.comairco.ca to contact one of their 23 North American locations. ▲



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Flyer Electric has been providing a wide range of industrial and commercial electrical services in Saskatchewan for over 35 years. We're known for our commitment to quality, dedication to safety and attention to every detail. Quite simply, we get the job done right - on time, and within budget. Whether it is a capital or maintenance project, new construction, expansion or somewhere in between, Flyer Electric has a proven track record of integrity and efficiency.

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A new course of action

THE DEVELOPMENT OF THICKENER TECHNOLOGY AND VIRTUAL SERVICES AT WESTPRO MACHINERY



Hydraulic thickener drive at the Westpro shop in Puslinch, Ontario.



120-foot high-capacity Thickener in Ontario, Canada.

Throughout our 35 years of experience in the mining, wastewater, and aggregate industries, Westpro Machinery has always been interested in research and development and how it may foster a positive impact moving forward. Going into 2021, we hope to change that interest into action. With that said, Westpro hopes to create waves with our world-renowned Hydraulic Thickener Drives, as well as the introduction of our Virtual Commissioning service.

At Westpro, we've always sought to create that positive impact within the industry, and with the help from our multi-disciplinary team of engineers, we have the capabilities to make this a reality. We believe it is vital that we do our part as your process technology partner, so this year at Westpro

we look to challenge efficiency with our Hydraulic Thickener drives and extend our team dynamic to our customers and their projects with our new virtual services.

Thickeners have been Westpro's bread and butter for quite some time, but internally, the success of our equipment is also a call to action. Over the years our equipment has developed a reputation for its robust construction and operational longevity, and during the early engineering stages of our hydraulic drives, we felt it appropriate to design a drive which takes our staple qualities to the next level. Our hydraulic drives seek to elevate the performance of the thickener through a number of technical advantages. Such advantages being our signature heavy-duty construction, a

hydraulic power unit equipped with safety instruments for low oil level and high temperature indication, dual filters for ease of maintenance, both automatic and manual operation modes, reverse capabilities, the finest torque monitoring instruments, and finally a high-quality planetary gearbox for excellent torque and thrust load. With these advantages, our expert team of multi-disciplinary engineers hope to provide a new definition of reliability and efficiency within the industry.

Leading our team of engineers is engineering coordinator Stephen Atkinson. When asked what has been the defining factor in the success of the custom engineered and designed drive, he had the following to say, "A big part of it comes from the team

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42-metre (138-foot) diameter-elevated high-capacity thickener at a potash plant in Saskatchewan.

environment we've got here at Westpro. It's really sparked a fire in us... it's made a big difference and has definitely helped get us to where we are today." Atkinson now leads his team as they complete virtual commissioning for projects across the globe, including a bolted thickener with our hydraulic drive technology in Alaska.

But what is Virtual Commissioning? Due to the COVID-19 pandemic, the industry's ability to commission internationally was uncertain. Between

travel restrictions and the health and safety of our employees, customers, and their families, it was evident that a change was needed. Since the start of the restrictions and public awareness, Westpro's expert team of process engineers have developed, exercised, and perfected a virtual commissioning service.

Westpro's virtual commissioning service offers a high-quality and cost-effective solution for your commission-

ing needs. Our dedicated engineering team is committed to supplying every step of the on-site commissioning process virtually and will also assist in everything from installation to the final sign-off and full Westpro warranty. At Westpro, we remain focused on customer satisfaction, and as always, providing a premium service that matches our equipment. Current virtual commissioning projects include a Rotary Dryer in Greenland and two Agglomerators in Argentina.

With the success of our Hydraulic Thickener Drives and our Virtual Commissioning service, we hope to maintain course on our 2021 goals. Additionally, research and development efforts are expanding even further this year with the introduction of new equipment, including a Grit Hydroclassifier and Pug Mill Mixer. We hope to continue this growth for all of 2021 and the many more years to come. ▲



Mitch Lamoureux, P.Eng., design engineer at Westpro Machinery.



JNE Welding celebrates 40 years of fabrication excellence

Crystallizer crossing the South Saskatchewan river.

November 2020 marks the 40th anniversary of a landmark on the Saskatchewan fabrication scene - JNE Welding. Founded on November 1, 1980 by Jim Nowakowski with a mobile welding rig, as well as integrity and ambition, JNE has grown to more than 140 people delivering thousands of tons of fabrications large and small to industry in Western Canada today.

After some field work in the late fall of 1980, Nowakowski started up a small shop at 1916 Saskatchewan Avenue in the north end of Saskatoon. He ended up adding five employees that first year, and by 1985 moved to the centre bay of 811, 56th Street East - a space still occupied by JNE 35 years later. Over the next few years, the business expanded to include the east and west bays, then additions of 960 square feet of shop space at the back and a temporary coverall space still in use today.

By 2006, JNE had 75 employees and was a growing company in Saskatchewan's potash industry and the Alberta oil sands - delivering pressure vessels, piping, ore bins, tank conveyors, ducting, transmission structures, and virtually any other fabrication that could be imagined. At the same time, JNE still delivered small projects and repair services, just like the first years on Saskatchewan Avenue. To take advantage of growing opportunities, the property at 3915 Thatcher Avenue was pur-





Crystalizer fabrication in the JNE shop.

In 2015, JNE partnered with Peter Ballantyne Developments LP and Des Nedhe Group to become 60 per cent Indigenous owned.

chased and a large new fabrication space with tall ceilings and heavy cranes was built on that location.

This new shop made a significant difference, allowing JNE to add almost 100 full-time positions to peak at more than 175 employees. In the 14 years since its completion, the “B shop” has established JNE as a custom heavy fabricator in western Canada – fabricating equipment that would have otherwise had to be supplied from outside of Saskatchewan.

In 2015, JNE partnered with Peter Ballantyne Developments LP and Des Nedhe Group to become 60 per cent Indigenous owned. The combined strength of this partner-

ship has provided direct financial and employment benefits to Saskatchewan’s northern communities and helps JNE’s customers deliver on their commitments to Canada’s Truth and Reconciliation Commission Calls to Action.

Today, JNE Welding continues to be guided by its core values, which are key to successfully delivering significant projects to potash producers. Their company values statement is “founded on integrity, we are bold, compassionate, collaborative, proud”.

An example of this was in 2013 when JNE was contracted to fabricate several large crystallizers for a new

potash facility. These large, complex vessels were fabricated with exotic materials to withstand the harsh process conditions of a potash mill. Then in 2016, JNE’s success with those units gave the producer confidence in trusted them with an additional unit on an expedited time frame. The size and material specifications made these challenging projects, but through collaboration with excellent partners, JNE successfully delivered on the customer’s requirements.

Over the past 40 years, JNE Welding has grown from just one welding rig to a reliable, capable high-quality fabricator serving Saskatchewan’s potash industry. They look forward to continuing to be a key part of that industry as it feeds the world for decades to come. ▲



COMBINED STRENGTH



JNE is a Limited Partnership in which the economic development corporations of English River First Nations and Peter Ballantyne First Nations have each acquired 30% ownership in the company with JNE's current owners retaining the remaining shares. JNE is known for strong project management practices and fabricating a variety of scopes of work. These scopes have included, but are not limited to, structural steel, chutes, ore bins, tanks, pipe spooling, pressure vessels, rotary dryers, and conveyance systems. We have developed fabrication and welding procedures for a vast array of alloys such as 316, 304H, 904L, 2205, Inconel, Monel and C276. We are registered on ISNetworld and are CWB, ASME, and ISO 9001:2015 certified.

JNE Welding Limited Partnership

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Littelfuse and Epitron help Newmont Mining improve operations and safety

MP8000 MOTOR PROTECTION RELAYS PROTECT NEWMONT CORPORATION'S WATER PUMPS

Installed in the motor control panels, the Littelfuse MP8000 relays shuts down pumps when they run dry, which prevents pump failure and costly replacement.

BY MARK POLLOCK

Newmont Corporation is one of the world's leading gold mining companies. Newmont's headquarters is located in Denver, Colorado, US and has gold mines in North America, South America, Africa, and Australia.

Newmont electrical engineering managers in Timmins, Ontario, were looking for a better solution for their mine water removal pumps, which are supposed to shut off when there is no water to cool them. The pumps have a shut-off switch activated by a float. In mine environments, mud can cause the float to stick, causing pump motors to fail by running dry, overheating, and burning up. The mine uses pump motors as large as 50 horse-

power, which are expensive to replace, as is the associated downtime from flooding.

To address high-cost pump failures, the electrical engineers asked Epitron Inc., a local electrical distributor and manufacturer of motor control panels, to find a solution.

Search for a solution

Without water flowing through a pump, the pump's current draw would be abnormally low because of the light load condition. They knew that undercurrent protection could detect a low water condition and because of this abnormally low current, an undercurrent protection device

would be able to detect a low water condition.

Epitron selected two potential suppliers of an undercurrent monitoring device.

The first supplier was a broad-based manufacturer of electrical and electronic power-distribution components. The second was Littelfuse, the manufacturer of the SE-105 ground-fault ground-check relay, which is widely used throughout the Canadian mining industry, as well as in Epitron's motor control panels.

The SE-105 is a combination ground-wire monitor and ground-fault relay designed for resistance-grounded



Newmont electrical engineering managers in Timmins, Ontario, were looking for a better solution for their mine water removal pumps, which are supposed to shut off when there is no water to cool them.

systems. The SE-105 monitors the integrity of the ground conductor to protect motors from hazardous voltages that result from ground faults on three-phase power systems.

The first supplier offered a conventional overload relay with undercurrent protection and little more. In contrast, Littelfuse provided in-person technical consultation to Epitron and Newmont. After learning about their specific needs, Littelfuse recommended the MP8000 Bluetooth Overload Relay. In addition to providing undercurrent protection, the relay provided several useful features for their application:

- Overload, voltage phase loss, voltage and current unbalance, and power monitoring
- Bluetooth wireless communication

- A smartphone- or tablet-based app that reads the relay status and remotely configures the MP8000
- Ethernet communication for remote monitoring and control from a PC
- Storage and readout of fault history

Outcome

Epitron chose the Littelfuse MP8000 relay, through which Epitron could offer Newmont cost savings, time savings, and greater worker safety.

Installed in the motor control panels, the Littelfuse MP8000 relays shuts down pumps when they run dry, which prevents pump failure and costly replacement.

Maintenance workers can also remotely access the MP8000 through an Ethernet connection to obtain in-

formation on a fault before visiting the pump location. This saves time because workers know what parts to bring.

On location, maintenance workers can communicate with the MP8000 using the Bluetooth smartphone app, avoiding the need to open the high-power motor control panel. This way, workers avoid unnecessary exposure to shock and arc-flash hazards, and avoid unnecessary circumstances where they need to put on PPE.

Epitron designed the MP8000 and SE-105 relays into their new motor control panels and is currently retrofitting the MP8000 into existing motor control panels throughout the mine.

“We could not be happier with the assistance we received from Littelfuse,” said Jethro Skwarok, general manager of Epitron. “They helped us understand how the MP8000 relay could solve Newmont’s costly pump failures. The MP8000, with its Bluetooth communication link and its app, enabled Newmont to reduce its operating costs and improve worker safety. The MP8000 gives us a competitive advantage over other motor control panel manufacturers.”

Littelfuse’s innovation and technical support helped reduce costs and improve safety—this in turn, struck gold. The MP8000 is universal to mining applications. Potash applications looking to improve their mine’s production and worker safety should get in touch with Littelfuse by going to Littelfuse.com/contact. ▲

Trust the experts IWL Steel Fabricators



With three fabrication facilities, ISW Steel Fabricators has a multitude of options to best facilitate project execution.



With professional engineers on staff working in conjunction with external engineering firms, we provide an integrated approach to project solutions.

IWL Steel Fabricators was originally established in the 1950s in Saskatoon, Saskatchewan.

We are proudly 100 per cent Aboriginal owned by the Clearwater River Dene Nation of LaLoche, Saskatchewan. The Clearwater River Dene Nation is the fourth generation of ownership at IWL and is committed to growing and expanding the company to meet its full potential. In return, profits are returned to ownership to be used at the band level to fund community needs, including housing, infrastructure, and social programs.

Through the core competencies of the Clearwater River Group of Companies, we are able to provide full service, cost-effective customer solutions for a wide array of projects, large or small. With three fabrication facilities, we have a multitude of options to best facilitate project execution.

IWL is certified to Canadian Welding Bureau CSA Standard 47.1 - Division 2. We employ Level 2 and Level 1 CWB welding inspectors, as well as CWB-certified welding supervisors. All welding personnel hold valid CWB tickets for various procedures and material alloys.

Our Quality Management System is third-party audited by Quasar via the Canadian Institute of Steel Construction. The cornerstones of the system include material traceability, dimensional verification, ITP implementation, project execution, and subcontractor management.

By being signatory to Mission: Zero we support the goal of a workplace with zero injuries. With a focus on safety first to prevent injury and elimination of unsafe work practices, we provide our employees with a safe work environment. In addition, we are ISNetworld certified as a subcontractor, consistently maintaining an "A" rating with our clients.

With professional engineers on staff working in conjunction with external engineering firms, we provide an integrated approach to project solutions. Our CAD/CAM department uses 3D modelling technology to provide detailed fabrication drawings for both shop and field use, as well as input data for our robotic fabrication equipment.

3D modelling provides a seamless transition from the design concept to the reality of fabrication. The direct interface of modelling software to automated fabrication ensures the additional benefit of increased productivity, integrated project management, scheduling accuracy, reduced field cost and maximum site efficiency.

By continuing to invest in new equipment and the latest technology, more efficient material processing is an ongoing goal. A recently purchased, fully automated five-axis processing machine is able to cut, bevel and cope pipe and tubing up to 12 inches in diameter. The accuracy and efficiency of this process will ensure decreased delivery times for processed material. In addition to pipe processing, the



new technology is able to bevel, weld prep, and countersink plates up to a maximum of two inches.

Material is traceable throughout the fabrication process. At time of drawing issue, all pieces are assigned a unique barcode. This barcode forms the basis of all documentation moving forward and scanning ensures accurate shipping documents and eliminates the possibility of delivery delays or missing components. Through cellphone technology, we are able to facilitate barcode scanning on site to further assist in material receiving, tracking, and site storage.

We can perform work as a supplier to a project owner or general contractor, or act as a general contractor and manage several subtrades.

We are a multi-dimensional fabricator with capabilities to do a wide range of steel fabrication projects:

- Structural steel, pipe supports, pipe skids, and modules
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- Material handling - conveyor galleries, belt conveyors, cross conveyors, mechanical soft drop system, and bucket elevator casings
- Splitter gates, grizzlies, material gates, motor bases, and pipe spools
- Platforms, stairs, handrail, and mezzanines
- ASME welding, sandblasting, painting, galvanizing, and installation services are available through our qualified sub-contractors

For more information, contact IWL Steel Fabricators at 1-306-242-4077, or visit us in person at 817-50th Street E., Saskatoon, Sask. ▲



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Standard Machine was started over 50 years ago in Saskatchewan as a small machine company primarily serving the potash market. Today, Standard Machine is a world-class leader in the design and manufacture of open gearing and

new gearboxes for the industrial market. As part of Timken Power Systems, our team applies our experience and know-how to improve the reliability and performance of machinery in diverse industrial markets worldwide.

Potash is one of the most demanding industries in the world, continuously developing for higher efficiencies to lower costs and to increase production. This has driven the development of newer technology, and Standard Machine has been at the forefront providing engineered solutions for many decades. Standard Machine's gear facility is located in Saskatoon and includes a group of leading-edge design engineers who are thoroughly dedicated to providing our customers with engineered upgrade gearbox solutions. These solutions prevent future repeat failures and will extend the life cycle of your gearboxes.

During the process of any industrial gearbox repair done at Standard Machine, our team of engineers, millwrights, machinists, planners, and customer service all look for opportunities to improve problematic designs and components. Our solutions can include improved heat-treating process-

es, improved grinding processes for higher-quality gear tooth geometry, higher-rated bearing selections, improved lubrication systems, upgraded seal designs, or many other specific design improvements.

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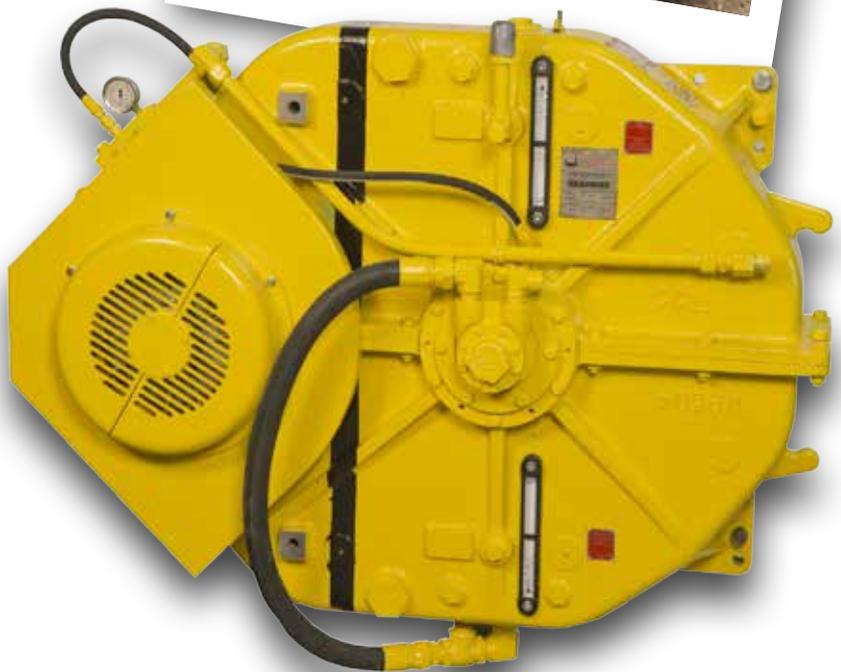
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With the company's close proximity to the salt mine in Windsor, Ont., Sellick Equipment was approached to provide both material handling and personnel transport solutions for the underground mine. Some of the early products developed were modifications to forklifts that used to charge holes drilled into the tunnel face with ammonia nitrate. The machine was referred to as an ANFO Rig. Another product built for the mine was the PC-120 Personnel Carrier, which was capable of carrying 12 workers and also doubled as an ambulance.

Sellick also found success in mines in Louisiana, Kentucky, Ohio, Nevada and Goderich, Ont.

In recent years, through its dealer, Cervus Equipment, Sellick Equipment has supplied many of the potash mines in Saskatchewan with a variety of both surface and underground material handling solutions. A very popular model is the SLP series low-profile forklift that is only 75 inches tall and has ROPS overhead guard protection for the operator. This, combined with four-wheel drive, LED lighting, fire suppression systems, and automatic transmissions, makes the SLP an ideal machine for supplying materials throughout the mine.

On surface, the larger S series model is popular with capacities ranging from 6,000 to 16,000 pounds. All models are available with four-wheel drive and come standard with ROPS operator overhead guards. ▲



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Service environments

Pocono Fabricators' Pre-Krete systems are designed to combat the detrimental effects of corrosion and abrasion at elevated temperatures (1000 F / 538 C). The combinations of both chemical and physical attack often lead to unanticipated failures in infrastructure and process equipment.

Experience

Pre-Krete remains a cost-effective answer to the corrosion/abrasion conditions of solution mining. In addition to protecting pipelines for potash, sands oil, sulfur, lithium, and geo-thermal applications, Pre-Krete safeguards process equipment, such as stacks and vessels, with uses in the power generation, pulp & paper, petro chemical, waste treatment, chemical process, and cement markets.

Product

Pre-Krete G-8 is a bauxite-based material. The material matrix is defined by incorporating products that provide corrosion and abrasion resistance, as well as innovations that control physical characteristics. Compressive strength, flexural strength, coefficient of thermal expansion, thermal stress index, thermal shock, k-factor, or thermal conductivity must be tendered in order to assure compatibility with substrates where Pre-Krete is employed.

In situ application

Existing subsurface pipe is lined. Excavated access points are located every 600 feet to 1,000 feet providing access to the pipeline. Utilizing high-pressure pumps, the Pre-Krete is moved through flexible hoses and pulled through the pipe while a rotary spray head centrifugally applies the Pre-Krete.

Spin casting application

In new pipe, Pre-Krete G-8 is applied via spin casting. Utilizing a lance, a ribbon of Pre-Krete is placed along the entire length of the pipe. The pipe is then spun and the Pre-Krete is centrifugally cast to the interior diameter of the pipe. This process requires special equipment and a skillset to assure that component distribution and densification of the Pre-Krete is consistent to assure maximum service life.

Installation

Excavation, placement, and backfilling of Pre-Krete-lined pipe are performed by highly skilled contractors. Standards have been developed for the transporting, handling, placement, and welding of the pipe. These details may differ and are specified on a project-by-project basis.

Future

Pocono Fabricators continues to supply Pre-Krete G-8 to potash producers for pipe ranging from three-inch to 54-inch diameter. Additional applications for Pre-Krete exist in the refinery process of potash. Pocono Fabricators is committed to this market and involved with improving existing products, as well as involved in R&D to consider new materials for this

service. As the world demand for agricultural-based food sources increases, yield per acre must as well. The demand for potash will keep pace with this trend.

Pocono Fabricators is a Division of Sauereisen, a third-generation company established in 1899. Sauereisen offers a complete line of protective linings and repair materials for new and rehabilitation applications. Visit them online at www.sauereisen.com.

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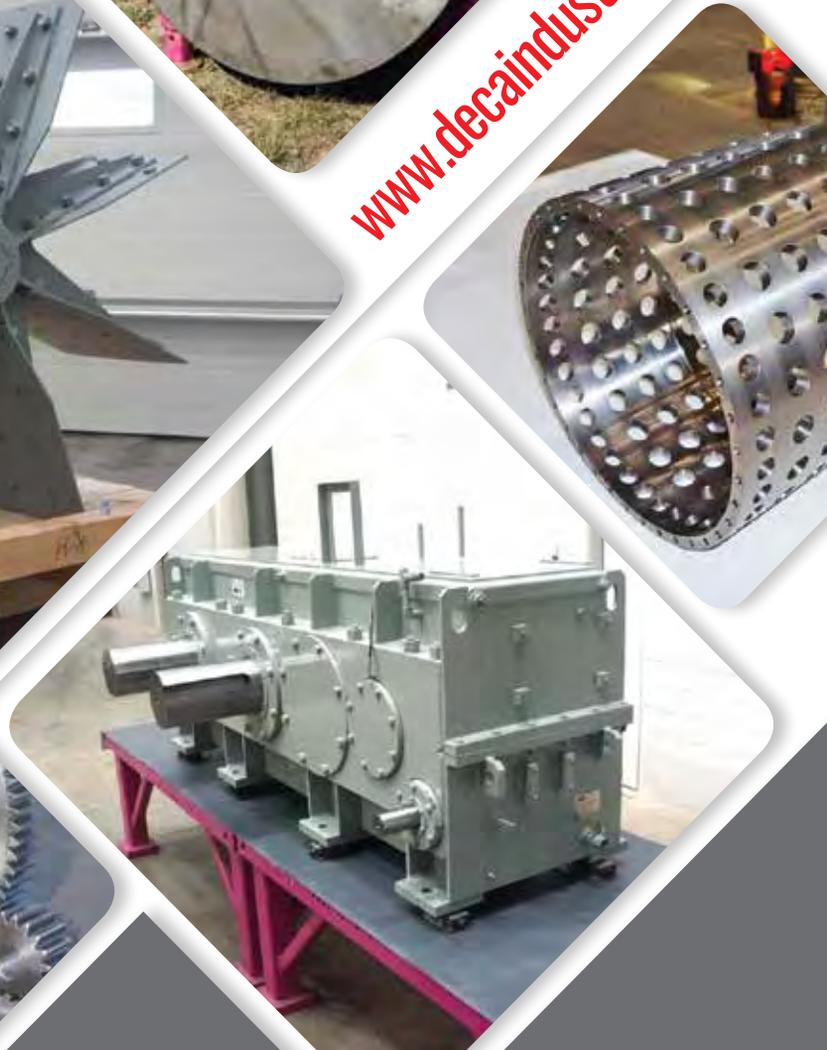


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