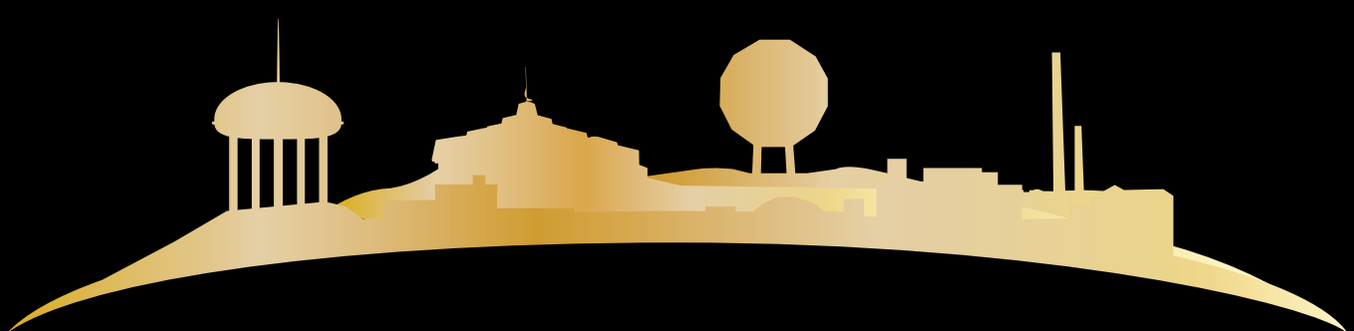

2020 SUDBURY

Vision for the Future

No need to apologize. **We're a mining town.**

By Hugh Kruzel

Future success will come from cleaner, safer technologies

Sudbury doesn't like to think of itself as a mining town. It brings up images of deserted wastelands. Sudbury has spent half a century fighting this impression.

But the raison d'être of Sudbury fundamentally remains mining. Think mining in a much broader sense than just Glencore and Vale, stacks, headframes, ore trucks and slag.

Oh, there is no denying significant employment and value in other sectors – government, education, health care, manufacturing and construction – across the Sudbury economy, but subtract mining, and...well, do the math.

Dick DeStefano, retired executive director of the SAMSSA (Sudbury Mining Supply and Services Association) is optimistic the city will be a mining town for at least 100 years.

"We have only scratched the outer rim and more is coming." He is talking about the new "depth" projects, and the fact only low hanging fruit has been mined; the first 5,000 feet or so. What lies at the bottom of the Basin (at 18,000 feet) will require a new skill set and advanced tools to make it accessible.

"With a series of multiple tunnels leading to an endless supply of minerals and metals, we will be active and vibrant for the next 100 years... nickel, copper, platinum, palladium, gold, and other metals. If you add the 350 mining supply and service companies and the three educational institutions plus the nine mining related research centres as an integrated mining technology cluster you have all the ingredients for success."

Much of this success will come from the adoption of new technologies, continuous process improvement, and analysis using enhanced algorithms, machine learning and AI.

So, let's go deep, says Sheila Robinson of Jannatec.

"Jannatec delivers innovative and customizable technology to improve safety, productivity and connectivity. We are developing physiological monitoring of the workers for ultra-deep mining, which is a very hot, humid environment. These sensors allow an alert to be sent to the worker when they are at risk of going into heat stress. This can prevent injuries, such as falls and help with productivity. By tying in the sensor systems to wearable technology we can protect our most valuable assets, the ultra-deep mining worker."

Jannatec is a long-standing resident at the hub of mining innovation that is NORCAT, located on Maley Dr. Formerly known as the Northern Centre for Advanced Technology, NORCAT is a not-for-profit technology and innovation centre that provides health and safety training for the mining industry, occupational health and safety services, and product development assistance to small, medium and large industrial enterprises.

Stephen Gravel, manager, Centre for Smart Mining, Cambrian College, has this insight, "Mining has long been considered laggards in tech adoption. Now it seems the industry is moving at the same pace as some of the more quickly adapting sectors such as Medtech and Fintech.

"If the ecosystem is nimble and responds to the now fast moving landscape, the future will be very bright. That's why our organization has decided to go all in on smart technology to make sure our firms don't fall behind."

The Centre for Smart Mining's "goal is to de-risk and de-mystify technology for the mining sector through fee-for-service access to expert researchers and advanced equipment and through funded applied research projects," says Gravel.

"As an industry-driven centre, we focus on transformative technologies we encounter with our company partners.

Current areas of interest at the centre are industrial Internet of Things (IoT), underground communications networks (LTE and 5G), electric battery fleets, big data capture and analysis, alternative mine waste remediation and underground wearables.

One of the junior members of the mining ecosystem, Brady Vallbacka (a project manager), says new methods and fresh and evolving assumptions are important.

"Technology in mining will have to play the role in increasing the safety of employees. Automation and robotics will provide mining with innovative opportunities to remove dangers faced by everyday workers underground," says Vallbacka.

"By investing in underground tech, the mining industry will create a more efficient environment to extract, refine and

deliver commodities while letting everyone return home safe."

This safety component is a cross-company mantra, but it also has a considerable bottom line effect.

Alain-Joseph Boulay comes from the more academic perspective, but his views align. "Artificial intelligence has already made some impact in specific areas in many different industries, including improved safety, better monitoring of mission critical systems, reduction in energy use and improved process control.

"These benefits are also seen in the mining industry in Sudbury with addition of autonomous mining vehicles and improvements in other automated systems such as ventilation and cooling systems. Importantly, many of the leaders in AI technology are Canadian, including researchers in Toronto, Montreal and Edmonton.

"There is a growing battle for AI supremacy among such countries as China, the EU, USA and Canada – commercialization of AI technologies in the Canadian mining industry will help us to win on a global level. From this perspective, Canadian mines, such as those in Sudbury may have a better chance to maintain the lead with regard to AI technologies in mining."

The industry is evolving so quickly in terms of artificial intelligence, automation and the internet of things that walking through an underground mine in 2030 will see a significantly change in the working and operational environment, says Paul Bradette, director of business development for SAMSSA.

"The pace at which suppliers are transforming the mining industry keeps our cluster top-of-mind throughout world. It is impressive how our member companies are able to make use of all available technology to reduce the environmental footprint, improve safety within the industry while facilitating an increase in productivity at a lower cost.

"The mining industry is embracing digital technology solutions, and this momentum will continue to gain traction with the growing need for mining companies to reduce costs, improve safety and become more productive."

Shannon Katary

"SAMSSA has hosted some of the largest mining companies in the world as they look to this cluster to unlock value within their operations. As an organization, our responsibility is to support our members and ensure the innovations get the attention of both regional and international mining companies."

We're losing our Stack

Vale is retiring the Superstack this year. The tallest chimney in the Western hemisphere, will be placed into care and maintenance mode in the second quarter of 2020. With no immediate plans for the shell to be demolished, it could remain a part of the Sudbury skyline for a little while longer. The 380-metre chimney has loomed over Sudbury since 1970 when it was built to disperse sulphur gases and other byproducts of the smelting process away from the city.

Epiroc develops and produces innovative drill rigs, rock excavation and construction equipment, The company was founded in Stockholm, and has a shop in Lively.

Ola Kinnander, from Epiroc's headquarters in Sweden, contributes the following, "Epiroc strongly believes in the electrification of mining equipment, especially for underground mines where the benefits are especially significant.

"The trend of electrifying the mining industry has just begun but we are convinced that it will be more and more common and eventually the new normal. Why? Because the technology is finally here and insight into the benefits is now spreading fast.

"The benefits include higher productivity and cost efficiency for the mining companies, less noise and emissions for the machine operators who truly get a better work environment, and of course also a better environment for society at large because of reduced emissions," adds Kinnander.

"All mine operations stand to benefit from electrification but especially underground mines since they today must spend a significant amount of money on ventilating out the diesel fumes; much of that cost and hassle would be removed with battery-driven machines."

Shannon Katary, director of marketing and communications for Maestro Digital Mine, an innovator in mine ventilation and automation, points out there really is no one-size-fits-all technology for this very diverse industry that includes more than just hard rock, underground, quarries, but even agricultural mineral and even hydrocarbons.

"Transforming the mining industry into the Digital Era (Industry 4.0) comes down to integrating digital technologies that provides real-time, critical data so that decisions and progress can be made in real-time.

"The mining industry is embracing digital technology solutions, and this momentum will continue to gain traction with the growing need for mining companies to reduce costs, improve safety and become more productive.

"The real increase in productivity levels comes from innovative digital thinkers/companies working with operating mines, who together, identify and integrate the right digital solution for the right situation and environment (for surface or underground mining). The application of cross-sectoral digital technologies into mines highlights a shift in what solutions can go underground to address the challenges of mining at depth.

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