Plant

SEPTEMBER/OCTOBER 2021

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INSIDE

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GUEST EDITORIAL
BY MARYAM FARAG

Industry 4.0

An opportunity for Canadian manufacturers to thrive.

Manufacturing is a cornerstone of our modern economy. According to the Government of Canada, it accounts for approximately $174 billion CDN of Canada's gross domestic product (GDP), and represents over 10 per cent of the country's total GDP.

What's more, manufacturers export over $354 billion each year, representing 68 per cent of all of Canada's merchandise exports, according to the Government of Canada.

All of this adds up to 1.7 million full-time jobs across the country. As the sector has modernized, manufacturers have become increasingly innovative and high-tech, relying on a highly-skilled and knowledgeable workforce, on digitization and technology.

However, today when we talk about manufacturing, we never miss an opportunity to mention how Industry 4.0 is having an international impact, in terms of connectivity across continents, and the way it's transforming global economies.

But what exactly is Industry 4.0? Let's go back in time and look at what this term means and where it came from.

The first industrial revolution took place between the late 1700s and early 1800s. During this time, manufacturing evolved from focusing on manual labour performed by people and aided by work animals, to a more optimized form of labour performed by people through the use of water and steam-powered engines and other types of machine tools.

In the early 20th century, the world entered a second industrial revolution with the introduction of steel and use of electricity in factories. The introduction of electricity enabled manufacturers to increase efficiency, and it helped in making machinery more mobile.

Starting in the late 1950s, a third industrial revolution slowly began to emerge, as manufacturers began incorporating more electronic technology in their factories, and eventually computers.

Finally, a fourth industrial revolution has emerged in the past few decades, known as Industry 4.0. To put it simply, Industry 4.0 takes the emphasis on digital technology from recent decades to a whole new level with the help of interconnectivity through the Internet of Things, and access to real-time data.

More companies worldwide are putting Industry 4.0 at the heart of their strategy. These companies are combining advanced connectivity, data analytics, cloud computing, sensors, intelligent algorithm and more to transform their businesses and create value for themselves and their customers.

Canadian companies have an advantage in making the most of what truly underpins Industry 4.0; skilled workers.

One of the biggest challenges that companies face in bringing Industry 4.0 to life is building a digital culture and finding workers with the necessary skills. Canada has an abundance of highly educated workers; software engineers, computer scientists, data scientists, who can lift companies' use of digital tech to improve their business and unlock untapped value.

Since the next industrial revolution is already here, if Canadian companies move with speed, intent and investment, they can be at the forefront.

In this issue of PLANT, Richard Kunst and Mariela Castaño give us insight on what the future of manufacturing holds in a question and answer article from Plant Talk's latest episode, Factory of the Future, focusing on various trends, technologies, and automation.

Also, Canadian Manufacturing Editor, Sadi Muktadir, highlights the different approaches of how manufacturers are addressing the decrease in personnel using automation at 2021's Advanced Manufacturing Roundtable.

Industry 4.0 empowers business owners to better control and understand every aspect of their operation, and allows them to leverage instant data to boost productivity, improve processes, and drive growth.

Canada's manufacturing industry has huge potential for Canada's economic future through adopting Industry 4.0 technologies.

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Plant
CANADA'S MANUFACTURING MAGAZINE
SEPTEMBER/OCTOBER 2021 • Volume 80, Number 5

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SUBSCRIPTION RATES
Canada – $76.00 per year
USA – $201.00 (CAD) per year
International – $227.00 (CAD) per year
Single copy – Canada $12.00

Add applicable taxes to all rates. Combined, expanded or premium issues, which count as two subscription issues.

ISSN: 1929-6606 (Print), **1929-6614** (Online).

PUBLICATIONS MAIL AGREEMENTT NO. 40065710

Return undeliverable Canadian addresses to:
PLANT Circulation Department,
111 Gordon Baker Rd. Suite 400,
Toronto, ON M2H 3R1

PRINTED IN CANADA

Funded by the Government of Canada | Canada

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NEWS

AUTOMOTIVE

STELLANTIS WINDSOR ASSEMBLY PLANT WINS AWARD

The Stellantis Windsor Assembly Plant (WAP) won the 2021 Canada Region Energy Project of the Year from the Association of Energy Engineers (AEE). The winning project reduced energy usage in the plant's paint shop by 20,250 gigajoules or eight per cent annually of the topcoat process.

WAP builds the Chrysler Pacifica, Chrysler Pacifica Hybrid, Chrysler Grand Caravan and Chrysler Voyager, with a new vehicle coming off the production line every 48 seconds. Out of the approximately 27 hours to finish a vehicle, eight to 10 hours of that are spent in the paint shop.

The booths have 18 air hoses that pump in fresh air and 20 exhaust fans help create an equilibrium to maintain a steady temperature of 62 degrees Fahrenheit and required downdraft. Three paint booths are each divided into eight zones. In the "observation zone," the team optimized the downdraft airflow from the air hoses by reducing the rate of fresh air in that zone, while maintaining the required airflow and temperature in the other zones. They were able to do this without compromising the plant's paint application quality and performance.

HEXAGON PURUS & BALLARD LAUNCH CLASS 6 FUEL CELL ELECTRIC TRUCK

Hexagon Purus and Ballard Power Systems announced a collaboration to produce Class 6 & 7 fuel cell electric trucks powered by Hexagon Purus' turnkey electric drivetrain, hydrogen storage system solutions, and Ballard's fuel cell module.

Ballard's eighth generation of the fuel cell module, the FCmove, provides a zero-emissions electric power source.

Hexagon Purus' lightweight type 4 H2 storage systems, high energy density ProPack battery storage, and electrified accessory systems deliver long range zero-emissions power for electrified commercial vehicles.

VW CANADA OFFERS FREE CHARGING FOR ID.4 OWNERS

Volkswagen Canada will provide free unlimited charging for three years from the date of purchase for new owners of 2021 VW ID.4, on Electrify Canada charging network.

Topcoat observation zone in the Windsor Assembly Plant paint booth.

Photo:© Stellantis (top) / VW (bottom)

Electrify Canada recently announced that it will expand its charging infrastructure in Canada from 27 stations with 108 chargers to over 100 stations with over 500 chargers across Canada by the end of 2025.

The VW ID.4, using Electrify Canada's fast charging, can charge from five per cent to 80 per cent in about 38 minutes. Electrify Canada chargers are available in 150 kilowatts (kW) and 350kW.

GENERAL MOTORS AND TELUS PARTNER ON 5G AUTOMOTIVE NETWORK

GM Canada and Telus are working together to connect GM's next-generation vehicles to Telus' 5G network. This represents the first time GM has selected a domestic communications company to provide connected-vehicle services for Canadian customers.

The first GM vehicles with built-in connectivity to Telus' 4G-LTE and 5G network are expected to be introduced with the 2025 model year.

Through GM's fifth generation rollout, current 4G LTE-equipped model year 2019 and newer vehicles will be able to migrate to the new Telus network. As a result, current Chevrolet, Buick, GMC, and Cadillac owners in Canada will experience faster connectivity speeds and some of the same performance benefits of future 5G-equipped vehicles.

23%

of firms increased production in August compared to July, compared with 11 per cent who reported declines.

REPORTS

OPERATING CONDITIONS IMPROVE SHARPLY AMID STRONGER DEMAND CONDITIONS: REPORT

According to IHS Markit, Canadian manufacturers recorded another robust expansion in manufacturing conditions with the PMI at a four-month high in August.

Quicker upticks in output, new orders, exports and purchases

VW ID.4 at a charging station.

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underpinned growth and in turn supported optimism. Delivery delays were again, however, a common theme in the latest survey period, with lead times lengthening markedly. As a result, firms sought to protect against future shortages by building pre-production inventories but consequently faced steep cost pressures. Input price inflation strengthened to a fresh new series high, but selling prices rose at a fractionally softer pace.

Production volumes at Canadian manufacturers rose at a sharp and accelerated pace. Around 23 per cent of firms increased production in August compared to July, compared with 11 per cent who reported declines.

Similarly, higher sales to both international and domestic markets resulted in a marked uptick in new orders. Firms mentioned a general improvement in customer demand. Higher sales to U.S. and European markets also drove the increase, according to panellists.

Higher output requirements and rising backlogs resulted in additions to headcounts in August, bringing the current period of job creation to 14 months. The rate of increase moderated slightly from July but remained higher than the long-run series average. Some firms found it difficult to source skilled replacements for voluntary leavers, however.

Supply chains were once again under intense pressure in August. Global material shortages and port congestions added to lead times which lengthened to the second-greatest extent in the series history. In a bid to protect against future supply shocks, firms added to their pre-production inventories, and at the second-quickest rate on record.

89%

CEOs who helm Canada's biggest and most-influential companies are bullish about their local economy's growth prospects for the next three years.

THE WORLD'S MOST-OPTIMISTIC CEOS ARE IN CANADA: KPMG'S GLOBAL CEO OUTLOOK

According to KPMG's latest Global CEO Outlook report, despite the Delta variant of the COVID-19 virus slowing down the return to normal, "Canadian CEOs hold the world's most confident outlook for domestic economic growth."

The report finds that nine in 10 (89 per cent) CEOs who helm Canada's biggest and most-influential companies are bullish about their local economy's growth prospects for the next three years, surpassing pre-pandemic levels by a full 10 points and the highest among global peers surveyed in 11 major countries, including China, Germany, the U.K. and the U.S. Only Australian CEOs share the same level of optimism as Canadians, at 88 per cent.

While bullish on Canada, their three-year outlook for the global economy has not yet returned to pre-pandemic levels (55 per cent vs. 72 per cent in January 2020). When it comes to the growth prospects for their own companies, Canadian CEOs are overwhelmingly confident, at 86 per cent, unchanged from this time last year.

Nearly 40 per cent of Canadian CEOs forecast between 2.5 per cent to 4.99 per cent per annum earnings growth for the next three years, while nearly half (48 per cent) of global chieftains are expecting less than 2.5 per cent per annum earnings growth.

Canadian CEOs see technological disruption as more of an opportunity than a threat (91 per cent vs. 76 per cent globally), and say they are actively disrupting their industry rather than waiting to be disrupted (86 per cent vs. 72 per cent globally).

Over four in five Canadian CEOs (83 per cent) said they "need to be quicker to shift investment to digital opportunities and divest businesses that face digital obsolescence," compared to 78 per cent globally.

For nearly a third (31 per cent) of Canadian executives, achieving growth means their No. 1 priority is digitizing and connecting their enterprise (vs. 26 per cent globally) and 68 per cent are investing more of their capital in buying new technology (vs. 60 per cent globally).

TECH SOLUTIONS

LATIUM TECHNOLOGIES AND EDDY SOLUTIONS TO ENABLE LEAK PROTECTION TO AON CLIENTS

Eddy Solutions announced a partnership with Latium Technologies to provide IoT enabled data driven solutions to Aon's clients.

The partnership includes Eddy's leak mitigation technology to construction projects of all types, including commercial and high-rise buildings, where water damage risk poses a considerable problem for contractors, builders, building owners and their insurance carriers.

Eddy's system applies an IoT approach to track the presence of water using smart sensors and shutoffs, integrated into the JSI platform, equipping contractors and owners with water usage information and the immediate notification of the detection of issues.

KONTROL TECHNOLOGIES EXPANDS BIOCLOUD TECH

KontrolTechnologies Corp. is expanding its BioCloud technology to new customers in Australia, France, Belgium, Turkey and Germany.

Kontrol BioCloud has released its new software update, focused on an improved graphical user interface, enhancements to data logging, data exporting and more.

PRODUCTION

THE FIRST PRODUCTION OF SAF SUSTAINABLE AVIATION FUEL DEVELOPED IN CANADA

The SAF+ Consortium announced one of the first productions of sustainable aviation fuel Power to Liquids (PtL) in North America.

This production took place in its pilot factory, located at the ParaChem industrial site, east of Montreal. SAF+ aims to bring to market, by 2025-2026, synthetic kerosene, whose carbon footprint is reduced by 80 per cent compared to fossil kerosene. The PtL sector consists of producing a synthetic liquid fuel by capturing and combining CO2 from industrial sources to green hydrogen produced in Quebec.

LEADERSHIP

THE WESTJET GROUP APPOINTS INTERIM PRESIDENT AND CEO

The WestJet Group announced that Harry Taylor will assume the interim role of President and Chief Executive Officer with a transition period taking place between late November and mid-December 2021.

Taylor joined WestJet in 2015 as executive vice-president and chief financial officer. During this time, he led the airline's inaugural U.S. bond issue, negotiated the purchase of the Boeing 787 Dreamliner and Boeing MAX aircraft, and was instrumental in the sale of WestJet to Onex. Through the pandemic, Taylor led the Finance team in managing WestJet's liquidity to ensure sustainability with little to no revenue coming in.

Western Manufacturing Technology Show live and in-person

The Western Manufacturing Technology Show (WMTS) recently took place in Edmonton, AB, featuring the latest manufacturing technologies, products, processes, and topics from leading OEMs and suppliers showcasing their solutions.

BY MARYAM FARAG

For over 30 years, manufacturers in Western Canada have attended WMTS looking for new ideas, solutions and suppliers to help them gain a competitive edge.

This year, the show returned to being in-person, providing the audience an opportunity to tap into trends, forge new relationships, and evaluate dozens of technologies, including machine tools and tooling, work holding, metalworking, welding, and advanced manufacturing solutions from additive manufacturing to automation, robotics and Industry 4.0.

Geared toward the needs of manufacturers in Alberta and surrounding regions; professionals serving industries, ranging from oil and gas to petrochemicals, construction, mining, and agriculture; benefited from meeting face-to-face with WMTS exhibitors. They included DMG MORI, Elliott Matsuura Canada, Thomas Skinner, Westway Machinery, among others.

Technologies presented by exhibitors included machine tools, tooling and work holding, metalworking and welding, advanced manufacturing, including additive manufacturing and Industry 4.0, automation and robotics, and design engineering.

Three industry keynote speakers addressed the manufacturing and business climates in Western Canada.

On day one, Chris McLeod, Vice-President, Digital Marketing and Communications, Edmonton Global, spoke about *Radical Transformation and Diversification of the Edmonton Metropolitan Region Economy*.

(From left) Billy Rideout, Stefano Chiovelli, Tonya Wolfe, and Ira Laughy.

McLeod discussed the role of Edmonton Global in transforming and growing the economy of the Edmonton Metropolitan Region. He discussed why now is the time to pivot to the emerging opportunities for manufacturing in hydrogen, agri-food, logistics and life sciences.

"The Edmonton Metropolitan Region can compete to win in a world where competition for investment is fierce, but only if we are proactive, aggressive, hyper-targeted, and come together as a community to present a unified story to global investors," said McLeod. "Driving opportunity here is the work being done in technology, innovation, AI, and its applications to the manufacturing sector."

Day two saw a panel discussion, moderated by Billy Rideout, President, Exergy Solutions Inc., about how *Advanced Manufacturing is Transforming the Energy Sector*. Panelists included Tonya Wolfe, Manager, Centre for Innovation in Manufacturing, Red Deer College; Ira Laughy, President, Rapid 3D; and Stefano Chiovelli, Research and Development, Syncrude. They spoke about how Canada's manufacturing sector can help create better parts for reduced wear, improved reliability and increased efficiency aimed at boosting productivity and competitiveness as a nation. The discussion also highlighted the active collaboration in the strategy to build a skilled workforce and advanced manufacturing capabilities across academia, industry, and service providers.

"Canada has a unique opportunity leveraging expertise in oil and gas, energy and mining to play a key role in the clean energy transition," said Rideout. "The goal is to provide solutions for immediate benefit to the province while transitioning to a net-zero footprint for this vital industry."

On the final day, Billy Rideout, spoke about how *Additive Manufacturing Saves Lives and Creates a New Energy Future*. He explained how the team collaborated with over a dozen companies to design, test, build and donate Canada's first approved production of emergency ventilators in response to the pandemic.

"There are many advantages to additive manufacturing as a critical part of the shift to Industry 4.0. Quicker prototypes, regionalization and digitization of supply chain, mass customization, and unique geometries are the common applications for AM technology," said Rideout. "Exergy has been collaborating with the energy industry on research and development that is transformational to this sector of our economy. The team has found ways to combine additive manufacturing with an agile methodology to accelerate the testing and piloting of clean technology."

The keynotes took place in the SME Zone, where industry experts and audience met to share business and career advice, and to expand their networks.

Annex Business Media was a part of the event, as media sponsor and exhibitor, representing its manufacturing group brands: *PLANT magazine*, *Machinery and Equipment MRO*, *Canadian Manufacturing*, *Design Engineering*, and *Manufacturing Automation.*

Event partners and industry supporters included The Canadian Machine Tool Distributors' Association; The Canadian Tooling & Machining Association; Canadian Manufacturers and Exporters, Canada Makes; and CWB Group.

Maryam Farag *is the Associate Editor of Machinery and Equipment MRO magazine, Food and Beverage magazine, and Plant Magazine, Annex Business Media. Reach her at mfarag@annexbusinessmedia.com*

Photo: Maryam Farag.

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Automation: Solving the talent shortage or exacerbating it?

Manufacturers are looking to add personnel in order to address the talent shortage, however, 2021's Advanced Manufacturing Roundtable showed a different approach of how manufacturers were addressing the decrease in personnel. **BY SADI MUKTADIR**

The numbers don't lie. According to a 2021 study by *The Manufacturing Institute* and *Deloitte*, 77 per cent of manufacturers say they will have ongoing difficulties in attracting and retaining workers in 2021 and beyond. This is on top of a separate study by *ManpowerGroup* showing that the manufacturing sector in Canada is looking to increase hiring by at least 50 per cent in the Q4.

This response to a recovering pandemic economy doesn't come without some other suggested solutions. While there are many manufacturers looking to add personnel and address the talent shortage, 2021's Advanced Manufacturing Roundtable painted a different picture to how manufacturers were addressing the decrease in personnel.

"Being required to function with a smaller number of people has shown manufacturers that they actually can, and once they figured out a way to do it with IIoT investments, they discovered the benefits of reduced staff requirements," said Peter Coffee, VP for Strategic Research, Salesforce.

The roundtable's discussion was focused around how advanced technologies and IIoT investments have helped manufacturers respond to talent shortages plaguing the industry.

Canadian Manufacturing's own 2021 survey found that 28 per cent of manufacturers reported that they were able to use their technology upgrades to reduce staff requirements. This was the third leading benefit of their upgrade, up significantly from recent years. Even more significant, was that 36 per cent of manufacturers currently applying IIoT-connected solutions reported experiencing the benefit of reduced staff requirements.

Increased profit margins, quality control, reduced downtime and increased throughput are all some of the benefits seen from reduced staff requirements; something manufacturers are beginning to explore.

"Reduced staff is a big part of any sort of technology investment, especially with regards to IIoT connectivity. The whole point is that you're investing

to give your staff the ability to do more with less," said Peng-Sang Cau, VP, ATS Automation.

Though automation technologies and Industry 4.0 tools are helping manufacturers do more with less, manufacturing executives and researchers recognize that it's not enough to address the shortage.

"People are investing in technology because of the labour shortage but the labour shortage is still a huge issue that hasn't gone away," said JP Giroux, President, Excellence in Manufacturing Consortium (EMC).

Dennis Dussin, President, Alps Welding Ltd. expanded on this.

"During COVID-19 lockdowns, every business has had to get more done with fewer people, but the labour shortage has gotten worse. I think it's much worse after COVID-19 than it ever was before the pandemic. We were always trying to get by without enough skilled labour, and with the pandemic that's gotten worse. We're looking for ways to get more done with fewer skilled people and technology's a big part of that."

Steve Bassaw, Product Manager, SYSPRO illustrated how strained the labour market is in his work with clients.

"We have clients who want to expand their plant, they have the money, and the resources but the only thing they don't have is the labour. Even worse, they're ready to build a second plant and the only constraint is that they can't find the labour. This is a story we've been hearing for years now, long before the pandemic."

While technology may be a necessary and helpful investment, it's clear that other strategies are needed in order to address the talent shortage.

"There's a lack of skilled talent to address the new technologies being integrated. This is related to our own inability as a sector to attract the next generation of talent," said JP Giroux.

Scott McNeil-Smith, VP of Manufacturing Sector Performance, EMC added onto this.

"People are still the driver, regardless of the technologies being implemented. One of the big challenges, especially for smaller manufacturers is finding internal subject matter experts and consultants to help grow the company."

Manufacturing executives believe that with the increase in automation and advanced technologies helping manufacturers, so too does the need to rise to attract and retain talent.

"The customers I've been talking to are citing challenges in finding people. They can't hire fast enough so they're trying to leverage new technology because that's what Millennials and Gen Z are interested in. They're not interested in old-school manufacturing. And the companies that are more progressive with their technologies are able to attract and retain some of those young people," said Rory Macleod, Area VP of Sales, Salesforce.

Manufacturers understand that solving the talent shortage requires catering to that talent through those investments in new technologies.

"If anyone is going to solve this labour shortage it's not going to be anyone here on this call. It will be the next generation, and solving that shortage depends on our ability to get those young people with digital skills into the industry," said JP Giroux.

It won't take technology alone to solve the talent crisis.

Sadi Muktadir *is the Editor of* Canadian Manufacturing.

Canadian Manufacturing's own 2021 survey found that 28 per cent of manufacturers reported that they were able to use their technology upgrades to reduce staff requirements. This was the third leading benefit of their upgrade, up significantly from recent years.

Photo: © Blue Planet Studio / Adobe Stock

Why creativity is the key to improved employee performance in a post-pandemic world

Flexibility is the key to increasing employee performance and creativity, by allowing employees to choose where, when, and how they work.

BY SHAWN CASEMORE

This past week, my youngest son had his first skate in preparation for hockey season.

The pandemic and resulting health concerns have, unfortunately, led to fewer kids getting involved. As a result, he'll be playing up in the rep league this year, although typically, he would have played at the local league level.

With fewer kids involved, his hockey team is struggling to sustain itself.

The entire situation reminds me of the same challenge many manufacturers across Canada are facing today.

Many manufacturers are struggling to sustain themselves amidst a tight job market. With fewer employees interested in manufacturing, and an ever-increasing demand for employees with advanced skills, the situation for some is becoming dire.

What this means in the short term is that some manufacturers are facing lower productivity rates, whereas some are choosing to turn away business they simply can't deliver on.

Interestingly, however, other manufacturers aren't facing the same struggles for talent. Instead, their productivity levels are going through the roof.

Despite what you might believe, these aren't all big companies, and the talent they are seeking to attract ranges in skill level. Yet, they have employees lining up looking for work.

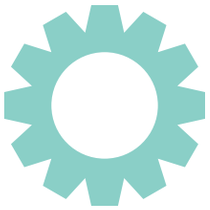
Best of all, the strategies they are using aren't new; they are simply

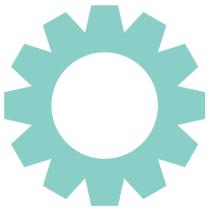
listening to and capitalizing on ideas their employees are sharing for what will make their workplace better.

One manufacturer I connected with recently in Alberta shared that they were attracting students to their company by introducing a "work what you can," shift for any student interested in working.

Another, in an entirely different industry in Ontario, shared they had focused heavily on building a "family atmosphere," that employees enjoy. They do this by openly soliciting and acting on feedback to improve their business direct from employees. The latter point is critical to the success of their efforts.

In preparing recently to facilitate a strategic retreat, I surveyed a company's employees, asking about what improvements or changes they would like to see in their company. A growing number of office employees commented that they would prefer a hybrid work week. They wanted to work from home for a couple of days, then spend the balance of their time in the office.





A recent study conducted by Gartner suggested that human resources can increase employee performance if they focus on providing employee-driven flexibility, allowing employees to choose where, when, and how they work. This flexibility will enable individuals to integrate personal and professional obligations, achieving a work-life harmonization.

Do these strategies work? Yes.

Will they cost the business more money? Likely.

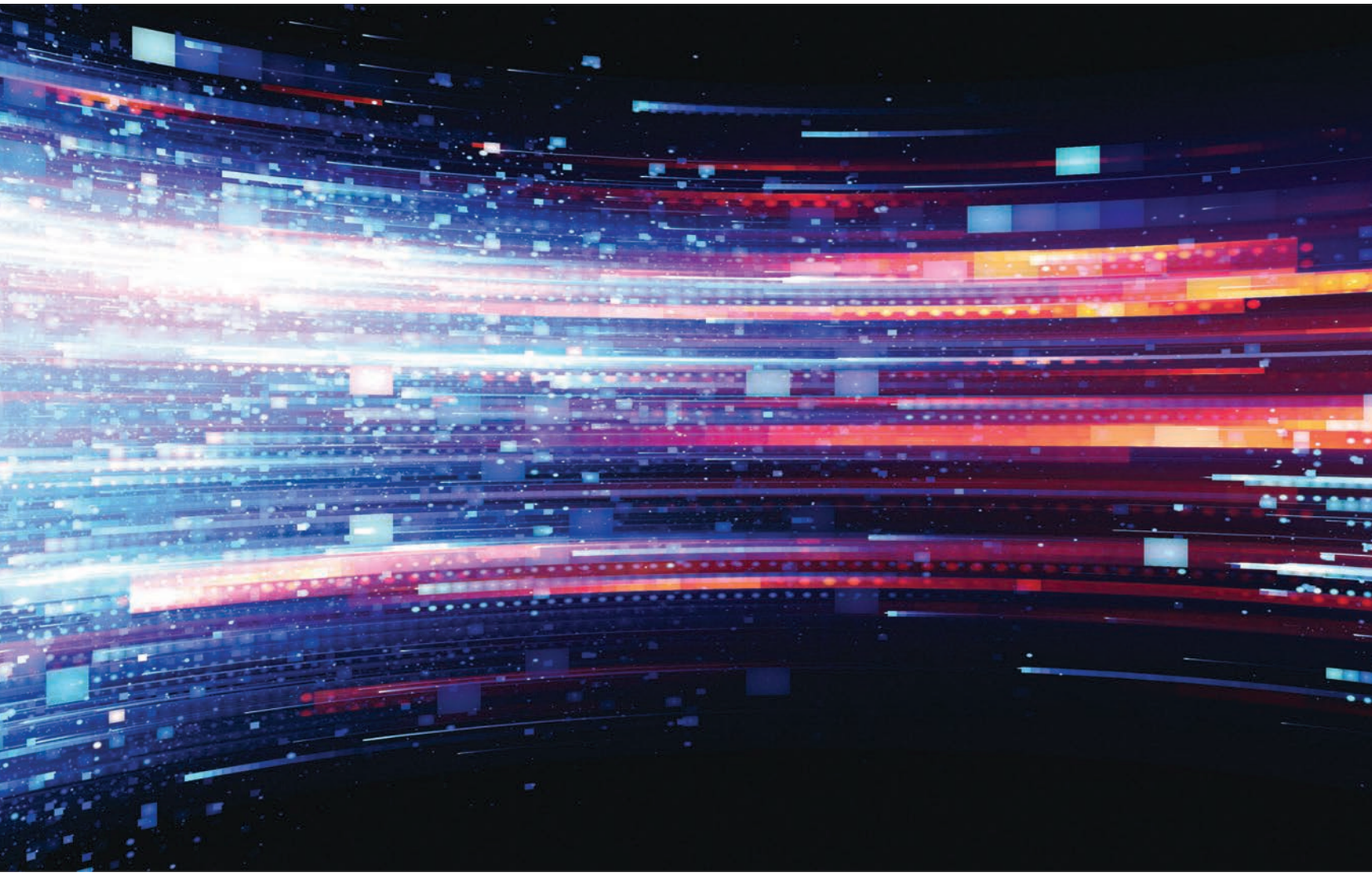
Are they proving to have a positive impact on employee retention and performance? Absolutely.

In this post-COVID-19 world, the needs, expectations, and demands of our employees are different. Therefore, if we want to retain, attract, and get the most from our people, we will have to change our environment to satisfy these new needs and expectations.

Alternatively, we could wait to see how this all plays out, but like my son's hockey team, if you don't take definitive action quickly to turn the tides in your favour, you might just lose the opportunity to play in the future.

Best of all, the strategies they are using aren't new; they are simply listening to and capitalizing on ideas their employees are sharing for what will make their workplace better.

Shawn Casemore *helps companies accelerate their growth. To learn more, visit his web site at www.shawncasemore.com.*



Factory of the future

PLANT spoke with Richard Kunst, President and CEO, and Mariela Castaño, Senior Vice-President and COO, at Kunst Solutions, about the factory of the future, focusing on various trends, technologies and automation. **BY MARIO CYWINSKI**

As manufacturers continue to recover in the face of COVID-19, they are exploring new ways to innovate and bounce back, changing the future of Canadian manufacturing forever.

Manufacturers are still investing in and adopting advanced technologies to optimize processes, improve operations, and create new products for the marketplace. In this Q&A, Kunst and Castaño give us an insight on what the future of manufacturing might look like.

Kunst has over 45 years of senior leadership experience in manufacturing, operations, retail, and supply chain. He was previously the President of the Canadian Region for the Association for Manufacturing Excellence, and is a regular contributor to *PLANT* magazine.

Castaño is an industrial engineer by trade. She has over 35 years of experience in operations, manufacturing, and continuous improvement. She is a Six Sigma Black Belt with a passion for "working with less" and a sharp eye for waste reduction.

Q **PLANT: Do you believe that the factory of the future is already here?**

Kunst: The answer is yes, and no. The factory of the future is like trying to chase the horizon; you think you're getting close, and all of a sudden, it shifts.

We have grandiose visions that the factory of the future is a gleaming, huge enterprise filled to the brim with automation. However, seeing a bit of divergence, especially through COVID-19, as the technology of communication exponentially improved, not only in the quality, but in acceptance by society. We're seeing a lot of craft businesses that are being competitive. If you look at beer brewing industry, before it was dominated by the large breweries, today,

everywhere you have a craft brewer competing with the big breweries, and there's only a fixed market of beer consumption out there.

The factory of the future, I don't think it's been clearly defined. In North America, our factory of the future is primarily there to compete against the intrusion of low-cost country entries. Over time, we have allowed some critical infrastructure businesses to evaporate from our landscape. People are starting to acknowledge that factory of the future is here. As the technology comes, we're going to embrace it and it's going to be increments of continuous improvement.

Castaño: I will add that the plant of the future has always been in the making. Often, we see projects in the pipeline that have a status and have not moved forward, because they're going too fast. The customers are not ready for it. Maybe their equipment manufacturers don't have the technology that they need to bring this particular strategic move to realization. What been missing in the deployment to that future is the proper supply chain, and having the proper education between those manufacturers and the customers.

Kunst: As we saw COVID-19 impact our daily lives, we started to see other emerging trends. If you go to the grocery store today, I'm now competing in the aisles with order pickers, and other delivery services where people are doing online ordering. I'm not seeing a lot of warehouses going up, but a lot of organizations are using their existing bricks and mortar as their local regional distribution centre to pick orders.

Society is saying, "I'm not willing to wait 24 hours to get my order, how am I going to get it right now within an hour or two," which is becoming a competitor to Amazon. Amazon's highly automated, very sophisticated, large warehousing operations are competing against the grocery chains, with order pickers walking the aisles, picking orders using their smartphones, to satisfy that customer demand within a couple hours.

Castaño: If you think about communication, for example, if we wanted

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to talk to people around the world, a conference call was the way to go. However, what if we can meet on site, that's even better. When COVID -19 came along, suddenly, using a video camera and having a video call became easier, and accepted. People who did not want it, are now on board.

What was thought to take 10 years for people to adapt , has taken a month for people to digest, and in the span

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of about a month and a half, people absorbed what some thought would take 10 years to absorb. COVID-19 has put a huge spin on manufacturing, but also on how people are seeing businesses, and how they are seeing the customer and trying to understand the customer needs.

PLANT: Automation is at or near the top of most trends lists. How do you see it impacting the factory of the future now and going forward?

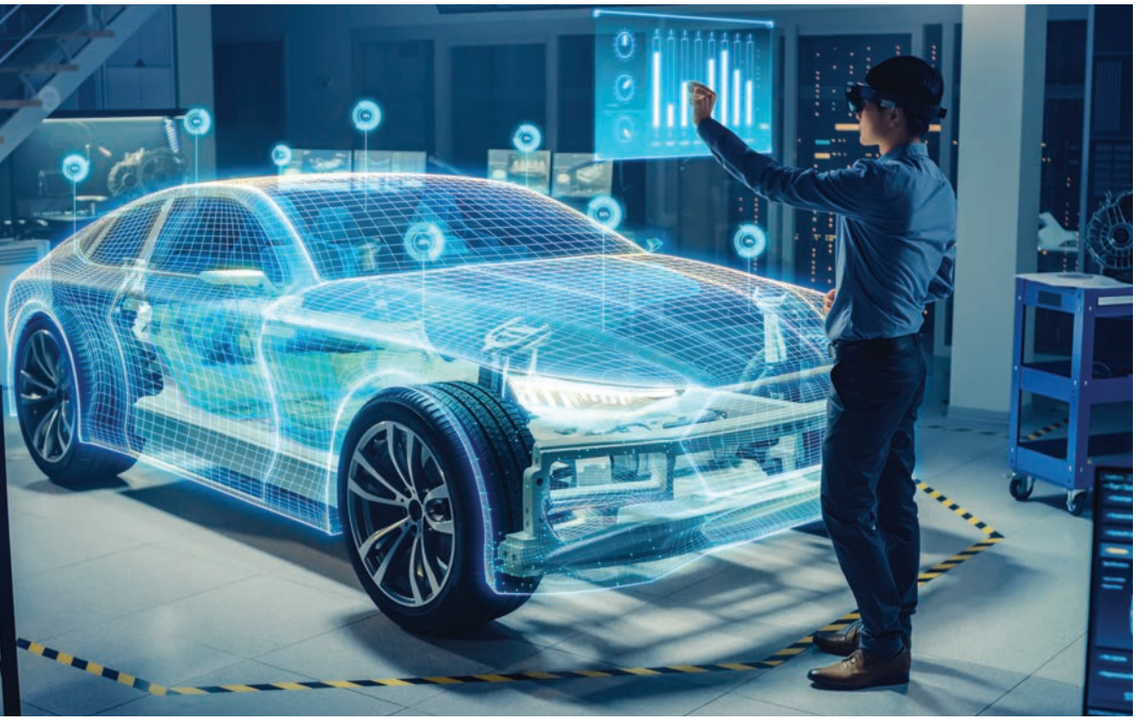
Kunst: There are different facets of automation that we have to take into consideration. We are in unprecedented times, data mining is at an exceptional high point, which is driving automated algorithms. They are capturing our personal profiles and customizing that solution. Looking at the production of widgets, we're seeing that high degree of automation, increased robotics, end of arm tooling, design and capability. Before, you were using three-axis robots, those are now antiquated. Now, everyone is going to a five-axis robot. We're seeing the evolution of wearable, automated technologies, creating a new specter of opportunity within the organization.

If we look at order entry, with COVID-19 not allowing us to touch anything, there are QR codes when you go to a restaurant, you scan your phone, see the menu and order it online. It's automated directly into the kitchen and the food comes out. Therefore, automation has many layers.

Castaño: With information there is also a lot of complexity and with a lot of data generated, if that complexity is not managed properly at the operational level, it is going to be overwhelming to the organization, and is going to become very expensive to the point that some people will not be able to manage their business efficiently.

There are millions of data points to which a piece of software can make decisions, but the people behind it need to manage those decisions, the people that need to manage behaviour, their organizations sometimes are not keeping up with the pace. You make a big investment in automation, but if you don't have the right systems behind it, that automation is going to fail you. In some instances, it's going way too fast for some organizations, as they have no way of defining that future. What is the future state for every organization? Not everyone can afford those big, very complex technologies, or have the proper systems in place to deal with them.

Kunst: Recently, we had the opportunity to talk to a lead engineer with an automotive company. The brand was always considered a premium brand; with advanced technology that they could put into their vehicles. They said



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Mariela Castaño

Richard Kunst

three to four years ago, they typically felt that based on their investment in R&D, they were on average, six to 10 years ahead of their closest competitor from a technical expertise. Today, they are lucky if they are one to two years ahead.

If you start taking a look at motor vehicle production today, quality is no longer a differentiator, no matter what level of automobile you're buying, you're pretty well guaranteed many miles out of the product. When you take a look at the features in the broad spectrum, there's very little differentiator between a high-end vehicle and an entry level vehicle. Therefore, it's interesting to see where that level of automation is going, and how accepting people are of that automation, and how affordable it's becoming.

PLANT: Do you see any other technologies emerging in the near future that we haven't discussed yet?

Kunst: What we're seeing with drone deliveries, at this

point, it looks like a toy. However, what starts off as a toy can have merit. I think autonomous vehicles, and the issue of labour shortage is going to impact industry quicker and harder than we anticipate. We have a huge mass of our current working population scheduled to retire. So autonomous vehicles will fill that void out of necessity. Some people although are going to extend their working careers, which is going to dull that transition.

The issue that we have when we talk about people, is the intellectual requirement that we're seeking of our operators and technical capability that our operators have is increasing at such a rapid rate. I don't know how we're going to train people to absorb this technology. What we're seeing is we're complementing it. It's like wearable technology. One of the areas that we're seeing a huge indent is in wiring. Particularly, in automotive wiring, there are miles of wire in a motor vehicle. Try and memorize how to put a wire harness together, how to thread the wire through the door of a vehicle, or through the engine compartment of a vehicle. I can virtually take an operator, put a wearable face shield on them and just say follow the instructions and the artificial intelligence knows where the operators located, tells them what kind of wire to pick up, how to thread it, etc.

Therefore, I don't have to train that operator. I'm not looking necessarily for a highly skilled operator, yet, if something goes wrong, that operator still has to be very quick to problem solve. We're seeing the same in how we build reliability into a lot of the emerging technology and I think that's going to be a little bit of our impediment.

Just as at the supermarkets, we're seeing people go with carts, you're picking four to eight orders concurrently, as they go through, as the as the picklist is merged. Automation is definitely going to come in almost like a vending machine; you punch it in, I want that particular candy bar, and boom, it'll come in a box and will be shipped to you within minutes.

3D

I can now send a part electronically to a 3D printer anywhere in the world, so my logistics problem starts to go away.

Castaño: The other technology that I feel is going to have a very strong play is nanotechnology., compacting more in any smaller footprint. If you look at TVs, for example, they are now almost as thin as a piece of paper. Look at the physical space that a TV used to take in a warehouse, versus now, where you can pack like 10 TVs where it used to take the space of one TV. I think that nanotechnology is going to be the future of manufacturing.

Kunst: Along with 3D printing, because I can now send a part electronically to a 3D printer anywhere in the world, so my logistics problem starts to go away. Have I got the durability, capability in a 3D printed product? I think the evolution of the materials used in 3D printing is another frontier that's coming very quickly.

Mario Cywinski *is the Editor of* PLANT magazine, Machinery and Equipment MRO magazine *and* Food and Beverage magazine, *a member of the Automobile Journalists Association of Canada.*

Micro fibre – maximum performance

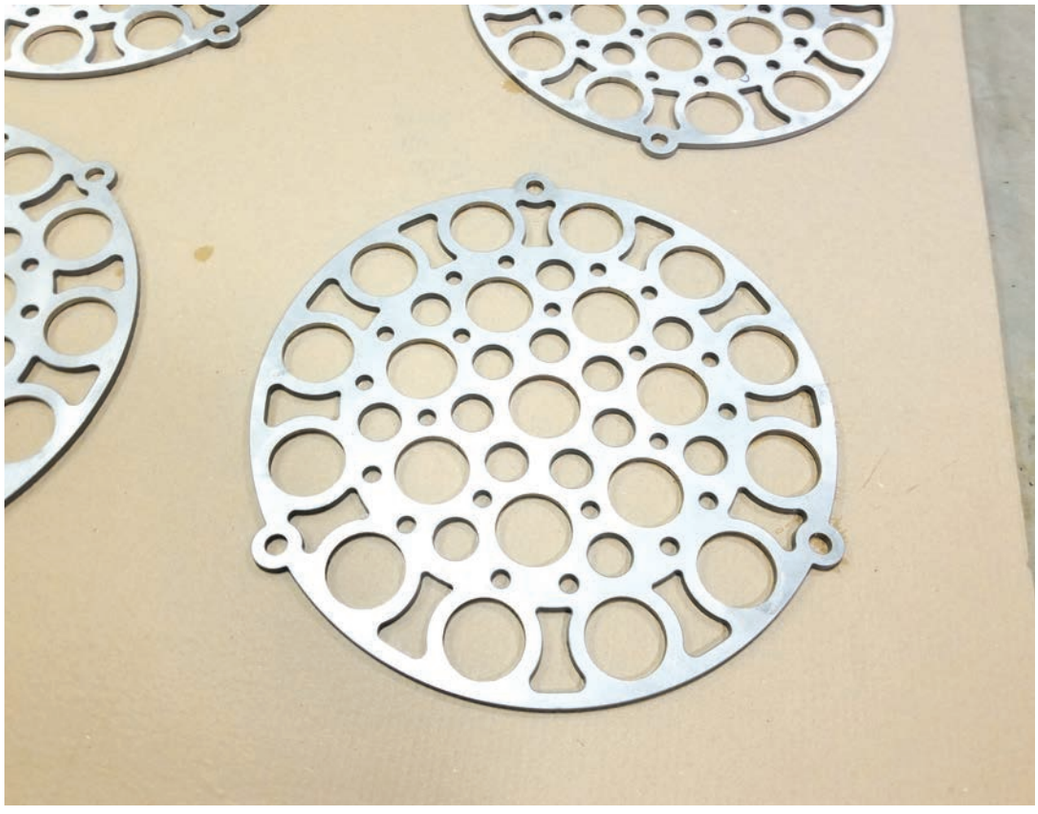
How the first micro fibre laser in Canada is being put to a multitude of uses.

BY TREENA HEIN

Adapt to thrive, or stagnate and die – that's a universal truth which all business leaders know well, including those at Intricut in Niagara Falls, Ontario. Over the years, this custom tool and die shop has continued to evolve, adding machines to expand its range of services and go in new directions.

Before we look at Intricut's newest purchase, let's take a quick look at its history. The company was started in 1996 by Mike Stoll, in a small building with one wire EDM. Things moved along well and he moved the business into a bigger space. Stoll's son, Kevin, joined the business after high school in 2001.

(Below and next page) Parts cut with the new micro fibre laser cutting machine.



But in 2007, manufacturing in Ontario was showing signs of slowing down. This serious situation left Stoll wondering how he might survive and even thrive. He decided to invest in a conventional waterjet, which would expand what he could offer. It turned out that he'd made a good decision, and Intricut chugged on successfully through the downturn.

In the years that followed, Stoll and Kevin noticed a growing demand for quick turnarounds for small, high precision parts and assemblies made from advanced materials. To fill this demand, in 2019 they bought a micro waterjet. Although it took several years to educate customers about what this machine was capable of, it's become an invaluable asset. Small high-precision components such as shims, gaskets, spacers, grippers and gauges, mostly for automation applications, make up the majority of the work.

"Currently our main customers are involved in automation, electronics,

Photos: Intricut

Micro fibre laser with (from left) Keith Waller, Mike Stoll and owner Kevin Stoll.

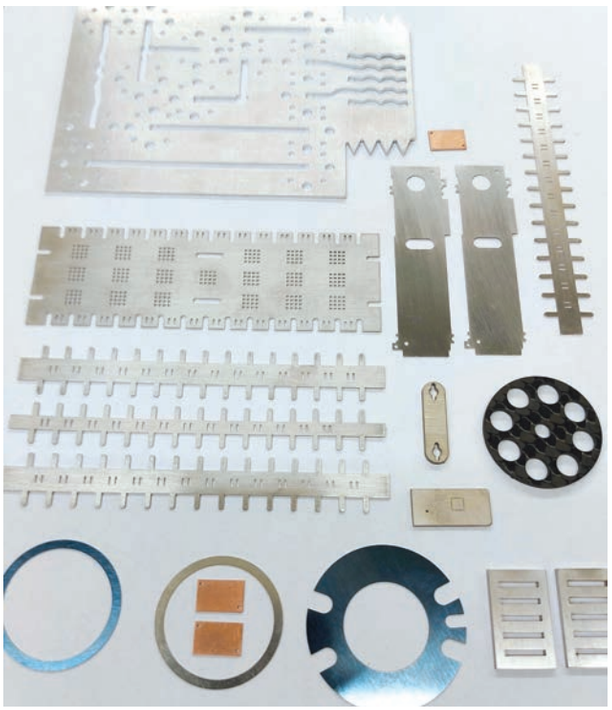
power generation, automotive and food-beverage," said Kevin. "Initially, the machine didn't see much use for close to a year, but now it's the busiest machine in the shop. We're happy with the growth in the past 18 months. We basically took work that would have gone to our wire EDM and used the micro waterjet, explaining to our customers that 'we can produce parts with high precision with much better turn-around time and at a better price point.' It really headed in the right direction from there. The general transition is that we see a high volume of repeat jobs that are now dedicated to the micro waterjet."

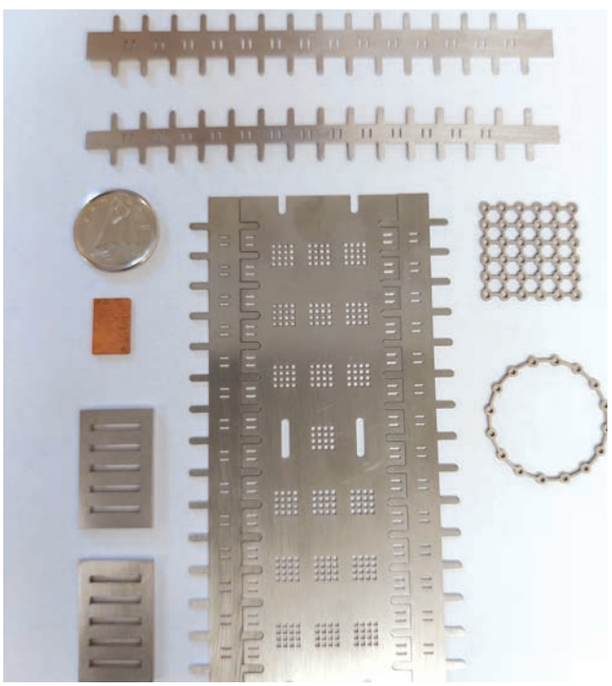
Typically, it cuts metals under half-inch thickness, but also plastics, glass and composites. Edges finishes are in the 16Ra inch range and cut tolerances of 0.001 of an inch are achievable, depending on material type and thickness.

Changes in 2020

In January of last year, Intricut achieved ISO certification, recognizing its ability to measure, inspect and certify parts in-house to ISO standards. To complement their ISO goals, Kevin had researched vision measurement machines, which utilize very high-accuracy cameras, and purchased one in 2019.

"The ISO certification has meant that a lot of the customers we've reached out to over the last 18 months have been able to say yes to our marketing incentives," he said. "I would say it's allowed us to add close to 10 new clients in the past two years that we wouldn't otherwise had an opportunity with. Most of our customers are Canadian, but we have a couple of regular US





It had been roughly seven years since fibre lasers had become widely available in the industry. In these machines, a laser beam is delivered through a fibre optic cable, which provides high accuracy cutting in metallic materials at incredible speeds and accuracies. Indeed, a fibre laser generally operates at 10 to 100 times the cutting feed rates of a micro waterjet, with nearly the same accuracy.

customers and we've provided several others with some specific material sample cutting. Hopefully we will get regular work from them as well."

However, something else came into focus in 2020. It had been roughly seven years since fibre lasers had become widely available in the industry. In these machines, a laser beam is delivered through a fibre optic cable, which provides high accuracy cutting in metallic materials at incredible speeds and accuracies. Indeed, a fibre laser generally operates at 10 to 100 times the cutting feed rates of a micro waterjet, with nearly the same accuracy.

"It's a flatbed cutting machine, designed to produce highly-accurate small parts very efficiently," said Kevin. "It would mean we could offer customers a much more reasonable price point for higher-volume orders, impossible on the micro waterjet. So, we purchased one in 2020 and it arrived in December. So far, we've found that the two machines complement each other well."

Micro level

The Intricut shop team usually use the micro fibre laser to cut thicknesses of six millimetres down to 0.05 mm. However, the machine's 4000-watt generator enables it to cut up to 12 mm. Because of the radiation emitted from the laser beam, all the cutting takes place inside of a fully-enclosed cell.

"We had the manufacturer set our machine up with a 100-micron beam diameter, roughly the size of a human hair which allows us to produce very fine part features," said Kevin. "It's a fully enclosed programmable system, with high-thrust linear-driven motors and cutting speeds of 2400 inches/minute."

So far, Intricut has used the machine to cut several grades of stainless material, as well as titanium, molybdenum, Inconel, Hastelloy and red metals like brass and copper.

"Recently we've been experimenting with some diamond materials for one customer," said Kevin. "It also routinely cuts layered/laminated materials like carbon fibre as well as sintered or rolled materials. Materials with up to four layers are in common usage these days in many industries."

In terms of heat effect, it's minimal. "We get a lot of questions about that," said Kevin. "The tiny beam diameter is surrounded with a supersonic blast of assist gas which helps to flash-cool the material, so there is very little heat saturation. However, if no heat effect is desirable, we have to use the micro waterjet."

It's also been an interesting challenge to find the proper cutting parameters for a variety of materials with the laser – finding the optimal edge and surface finishes as well as tolerances.

"Titanium in particular has been challenging," said Kevin. "We've also had to adopt and design some interesting parts holding techniques. The laser uses various process gases, nitrogen with stainless, oxygen with copper and argon with titanium for example. The pressurized gas, anywhere up to 240 psi in some cases, can be flowing around the part, so the material must be held secure with no flexing on very thin materials. We've had to design and build the fixturing, clamping base plates and jig plates to hold an array of parts so that they're fully supported and held rigid."

The machine's vision alignment system is automated and highly accurate for locating fixturing as well as picking up on existing parts which need various features added. That is, a part can be placed inside the machine's cutting envelope in any orientation of the cut surface, and the machine takes a picture and orientates itself according to the CAD geometry.

Kevin and his team are very pleased with the use of the micro fibre laser so far. "With the reasonable cost for prototyping or high-volume orders, the range of materials we can cut and having ISO certification, we feel we are really well-positioned to service a very wide range of customers and industries," he said. "I'd say rapid prototyping (mainly shims, gaskets, grippers and spacers) is about 50 per cent of what we do and the other 50 per cent is low or high-volume production runs."

Intricut would like to see more high-volume orders and Kevin says there seems to be strong opportunities for this in several industries. In terms of future evolution at the company, there are several other laser technologies he is keeping an eye on. "I think lasers will be a bigger and bigger part of manufacturing," he says, "in the decades to come."

Treena Hein *is a freelance business writer based in Pembroke, Ont. E-mail her at treenahein@outlook.com.*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Knowing your human talent to create a lean culture

It has been said that the factory of the future will only require two occupants; one human and one dog.

BY RICHARD KUNST

The primary purpose of the human is to feed the dog, and the purpose of the dog is to bite the human if it touches any of the equipment. But a culture will still reside in any factory of the future, no matter how sophisticated or automated.

Creating a lean culture seems very difficult, but it does not have to be that way.

"How do we create a lean culture?", that's a question we often hear from managers and associates. For years this has been a prime concern of many lean practitioners. However, focusing on lean culture as "the answer" can impede people's ability to gain a deeper understanding of the lean management system and how to improve. In other words, searching for the secret to creating lean culture can become a harmful distraction.

Consider a rock-and-roll band. To excel at making good music, each band member must possess several important characteristics:

- Have a burning interest
- Be highly motivated
- Deeply committed
- Hungry to learn various technical and non-technical aspects
- Practice relentlessly to gain mastery
- Develop discipline to sustain daily practice
- Not forgetting what they learned in practice when it is time to perform

They must set realistic but achievable goals, and also be sensible—e.g. quickly stop doing things that do not help them meet their goals. While a band might not become world-famous, band members will likely have a lot of fun along the way.

They will also encounter some frustrations, as success usually does not come easily. But bands that do these seven things make it look easy to those of us who have no idea of time and effort that they put in to making good music. Is this the culture of rock bands?

You can easily replace the word "band" with the word "company", and see that the same things would apply if a company wants to become successful in their efforts to practice lean management.

Organizations that practice lean management well do not possess a mystical culture. Instead, it is the people, the "band members", that do these seven things.

However, it is common to find managers:

- With an interest in Lean, but not a burning interest
- Motivated, but not highly motivated
- Committed, but not deeply committed
- Interested in learning, but not hungry to learn
- Who practice periodically, but not relentlessly
- Are disciplined when they are in the mood, but not every day
- And forget what they learned in practice when business conditions change

Rather than searching for a secret formula, it is much better to "just do it,"; Kaizen, the process for continuous improvement that is practiced daily by people at all levels in an organization.

Participating in Kaizen is the

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key activity that leads to the formation of new beliefs, which are the foundation for creating a lean culture. It is also very important to stop doing things that do not help an organization achieve its goal of creating a lean culture, such as continued use of policies and metrics that contradict lean principles and practices.

What we see in the companies that practice lean well is a clear and consistent pattern among managers and associates who have a strong desire to succeed, and also skillfully practice both lean principles: continuous improvement and respect for people.

The many benefits of lean management, practiced correctly, are undeniable. However, until people—especially senior managers—possess the seven characteristics listed above, it will be difficult to create a lean culture, and the best examples of lean management practices will be few.

The good news for those that are succeeding is a much brighter future, built on a customer-first foundation.

But there is also good news for companies that are not having much success: they can become more successful—though it may require a board of directors to intervene and ensure most of the top managers possess the seven characteristics that we have described.

The question is, how will they know?

It turns out that in most cases, they don't, and so unfortunately something bad happens. Often the people who get promoted within the first year or two after starting the lean transformation are the ones with the poorest understanding of lean principles and practices —though they are usually able to talk a good line. They tend to be people who can reliably "make the month" the old-fashioned way, and thus help the CEO and CFO stay out of trouble.

Top managers often say that lean is critical to the company's future. If lean really is critical, then the leading candidates for advancement should be the people who understand lean best. And it will be among those who regularly participate in Kaizen. Promoting the right people will motivate others who do not understand lean to learn and improve.

Implementing lean means top managers and directors must make a clear shift away from tired political-based promotion practices that favour the "good old boys and girls," to a truer meritocracy that advances those who understand and implement lean very well. Indeed, this is exactly what happens in companies whose managers possess a very deep understanding of Lean.

They recognize that saying one thing: we must all eliminate waste, and doing another, promoting people who don't know how to eliminate waste, is variation; a wasteful inconsistent behavior that adds cost (e.g. causes people to disengage or actively subvert lean efforts), and does not add value. This is one of many very important aspects of the lean transformation that are not well understood by most senior managers.

In summary, successful efforts to create a lean culture are preceded by the seven characteristics we identified. Further, it is essential to improve the criteria for advancement and also ensure that promotion processes are consistent with lean principles and practices. Doing so would clearly support efforts to create a lean culture.

What we see in the companies that practice lean well is a clear and consistent pattern among managers and associates who have a strong desire to succeed, and also skillfully practice both lean principles: continuous improvement and respect for people.

Richard Kunst *is an author, speaker and seasoned lean practitioner based in Toronto, who leads a holistic practice to coach, mentor and provide management solutions to help companies implement or accelerate their excellence journeys. You can reach him at www.kunstsolutions.com.*

Safely returning to work after injury

Preventing illnesses and injuries is a shared responsibility among everyone in the workplace, and when an employee is injured on the job, or develops an occupational illness, the workplace is accountable for ensuring the employee receives the care and support that is required.

CANADIAN CENTRE FOR OCCUPATIONAL HEALTH AND SAFETY

At any given time in Canada, eight to 12 per cent of the workforce is off work due to injury and receiving workers' compensation, long-term disability, or weekly indemnity benefits. So how can you, as an organization, continue to support employees' return to work after a workplace injury?

Whether an employee is coming back from a mental or physical injury, the guiding principles remain the same. Their return-to-work plan – a written action plan outlining the steps to keep the worker employed and returning them to work safely, should focus on their functional abilities and not on the injury, illness, or cause. It is important that all parties work together so that the injured employee can return to work safely.

Elements of a return-to-work program

Your organization's return-to-work program should include a policy statement that outlines management's commitment to a safe-and-early return to work by specifying the scope, principles, and intent of the program.

The program should be developed by a representative committee, including labour, management, and union representation from all areas of the organization. Ensure that the program outlines the responsibilities of everyone involved in the return-to-work process, and that all injured workers are treated in a fair and consistent manner. The program should focus on action, rehabilitation, and efforts to return the employee to their pre-injury position, or a position that is comparable in function and income. While every effort should be made to return the worker to their pre-injury position, some workers never fully recover from their injuries and require permanent accommodation. Make sure the program describes how they will be accommodated, with clear transition steps.

All staff need to understand the program and know how to access this information. The policy and program highlights may be shared during the health and safety or human resources orientation for all new and transferred employees. The program should be reviewed regularly for legislative changes and for any opportunities for improvement that arise while going through the return to work process.

Get involved right from the beginning

Finding the right balance of a safe and healthy return to work may be challenging. Returning to work too early may increase the risk of re-injury, however, the longer the employee is away from work, the less likely they are to return to their job.

Studies have shown that in the case of an illness or injury, early intervention is critical. Make early and considerate contact with the injured worker and discuss next steps. Show your concern, be understanding when addressing their issues, and reassure them that you will be working together on their return-to-work plan.

What's in a return-to-work plan?

An injured worker will need to

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According to the Association of Workers' Compensation Boards of Canada (AWCBC), the manufacturing and construction industries account for some of the highest numbers of workplace injury lost time claims.

have an individualized return-to-work plan. Every step may not go as planned; be flexible and allow for revisions as necessary.

Focus on safe, meaningful, and productive duties while balancing the needs of both the workplace and the injured individual. With input from the worker's health-care professional, accommodations should align with the organization's needs and based on the current functional abilities and limitations of the worker.

It is a good practice to review and identify meaningful tasks or jobs at your workplace and assess any modifications or accommodations that may be suitable. The physical and mental demands of the tasks and jobs can be presented to the employee and their health care professional to ensure that the tasks are a good match for their abilities and limitations.

Document the offer of suitable work, listing details of what duties or tasks are available for the worker. Any support that will be provided or available to them should also be documented.

Identify any modified tasks they can do if they're unable to perform their usual tasks. Include milestone dates, times, tasks, and expectations and involve the injured worker throughout this planning process.

When discussing accommodations, if possible, ask what some of the challenges before the absence were and what could potentially be a challenge now that they are back at work.

Employees returning to work after an injury or illness may also have concerns about stigma, judgement or what their colleagues may think or assume happened. A return-to-work plan should outline what information will be communicated and shared. Let the team know that the employee will be returning so that any retraining can be planned and just as importantly, they can be welcomed back. Do not tolerate gossip and other uncivil behaviours that can lead to stigma and an unsupportive environment.

When the employee returns to duty following their injury, go over any changes to procedures, the department, or the organization. Check in frequently to see how they are doing, and if any further modifications or accommodations are needed. Review their individual plan within the first two weeks to make sure that progress is being made and that a gradual increase to full duties can be achieved. Through regular contact and a shared goal of a successful return to work, the organization demonstrates that they care and are interested in the well-being of the employee.

Finally, treating all workers with civility and respect, and including them early in the return to work process, will help ensure that all workers are provided with the necessary support for a healthy and safe return to work.

The Canadian Centre for Occupational Health and Safety (CCOHS) *promotes the total well-being — physical, psychosocial, and mental health — of workers in Canada by providing information, advice, education, and management systems and solutions that support the prevention of injury and illness.*

Opportunities for industrial manufacturers at the Intersection of sustainability, AI and ethics

How industrial manufacturers can leverage sustainability, artificial intelligence, and ethics to lastingly profitable ventures.

BY JUDY CUBISS AND CHAO YI

The quest to uncover new sources of revenue, value and growth in a world that is increasingly digitally driven and resource-constrained has brought manufacturers to a critical confluence (or some might say, collision) of three factors: sustainability, artificial intelligence and ethics.

As resource-dependent as their businesses tend to be, industrial manufacturers now must also factor sustainability — specifically, carbon reduction and the reuse-repurpose-reduce waste principals of the circular economy — into their operations and their strategies to meet their customer, employee and even shareholder expectations. "By 2029, the circular economy will be the only economy, replacing wasteful linear economies," Gartner said in 2019.

Artificial intelligence, meanwhile, will be instrumental in helping companies turn their sustainability and circular economy initiatives into lastingly profitable ventures by effectively informing how circular products, components and materials are designed, how circular business models are operated, and how circular infrastructure are optimized. As industrial manufacturers increase their use of AI, not only in a sustainability context but also in a variety of operational and supply chain applications, as well as in their own equipment, they need to be conscious of the ethical implications with how their products are sourced, manufactured and used.

In a 2020 webcast, Lian Jye Su, a Principal Analyst at ABI research in Singapore, commented on the business ethics challenge embedded within the convergence of sustainability and AI.

"Humans are such an intelligent being that we tend often to focus on the promises behind all these scientific discoveries, be it sustainable manufacturing methods, or AI, or robotics automation in general," he said. "Then we tend to further extrapolate what we see behind all these possibilities and potentials. But often, we tend to ignore the pros and cons that come with it."

The Business (and Broader) Case for Sustainability

There is both a business case and an ethical case to make for an industrial manufacturer to put sustainability at the centre of its strategic thinking, as it applies not only to its own operations, but also to the entire value chain of which it is part of.

In a recent report from Oxford Economics and SAP based on a survey of executives from companies across the manufacturing landscape, two-thirds said having a clear purpose and

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mission is a necessity to the long-term success of their business. Ultimately, the report asserts the sustainability of a company's extended supply chain and operations "may determine financial performance and company survival, not to mention creating a more hospitable world for future generations."

Customers will ultimately be the catalyst for companies to integrate sustainable practices into every stage of the product lifecycle, and to have visibility into their own processes as well as those of their suppliers.

"I think in the not-so-distant future, we will see all types of products and processes having CO^2 and other sustainability tags on it," our colleague Georg Kube predicted during the aforementioned 2020 webcast. "The powers of the consumer will drive behavior. Not only with [consumer products] companies, but all the way up to the manufacturers of the equipment that the [consumer products] companies use, and into the supply chain of products."

Fulfilling customers' growing appetite for sustainable products, and doing so cost-effectively, depends heavily on running automated, data-driven digital processes that use Industry 4.0 best practices, leveraging AI and the Internet of Things. For industrial manufacturers, that means designing and engineering products for more resource-efficient performance, with the ability to predict the cost tradeoffs involved in developing and operating these products.

It also means minimizing waste and environmental impact in the factory by extending asset life, monitoring and managing energy usage as a function of production volume, measuring CO^2 emissions and ensuring employee safety. So, it's vitally important that companies have the ability to track, measure and reduce emissions across the entire product lifecycle.

It's also important that manufacturers look beyond their own walls by leveraging their supply chain relationships and their business networks to further their sustainability goals. By working together, global supply chains and networks can collaboratively work to improve environmental impact, and to ensure more inclusive economic growth through ethical business practices. End-to-end supply chain visibility is key to this effort, from raw materials sourcing, to last-mile logistics, and even to product usage, returns and recycling processes.

Working together, manufacturers and their supply chain partners are modeling and developing logistics processes and pathways that optimize loads to reduce mileage, emissions and carbon footprint, for example, along with CO^2- and energy-optimized warehousing and transportation.

A Growing Role for Artificial Intelligence

AI and Industry 4.0 best practices are enabling manufacturers to evaluate and develop more sustainable products cost-effectively, and to optimize the new business models they're developing around these products.

> ***Customers will ultimately be the catalyst for companies to integrate sustainable practices into every stage of the product lifecycle, and to have visibility into their own processes as well as those of their suppliers.***

Photo:© BillionPhotos.com/ Adobe Stock

Manufacturers have only begun to scratch the surface of AI's potential for helping them create products, components and materials specifically for CO^2 reduction and the circular economy. Companies are using AI algorithms to design products to meet their own sustainability goals and those of their customers, and to illuminate simpler, more cost-effective circular pathways for repurposing, recycling and/or reusing materials and products at end-of-life — pathways they may otherwise have overlooked.

Industrial manufacturers have begun to leverage AI generative design to quickly propose solutions to design challenges, such as reducing the weight of machines. When parameters are entered, generative design programs are able to design, prototype and simulate testing of properties simultaneously – and propose many possible options – by using the power of computing to complete many iterations quickly.

Like all AI platforms, generative design depends heavily on input data and parameters. Here's where engineers will need to think more about the objectives/outcomes of their designs — essentially, their potential human impact. They also will need to parse the data and algorithms that inform their AI systems, and to identify bias in those systems. In a broader sense, companies and their developers will need to understand and explain how they expect an application of AI will impact stakeholders, employees, customers and the public at large.

Industry's growing reliance on AI raises weighty questions — about the future of human beings in the workplace, about intended and unintended consequences, about the handling of sensitive data, about organizational and individual values — the list goes on. Instead of waiting for regulators and lawmakers to answer those questions, now is the time for manufacturers to proactively start pursuing answers for themselves, so they can be part of a dialogue that results in policies that protect people while also preserving a company's ability to innovate, run a more sustainable business, and do so profitably.

Judy Cubiss *is the Director of Industry Marketing and Chao Yi is a Solution Manager in SAP's Global Industrial Manufacturing team. The team is responsible for developing and bringing solutions to market for industrial manufacturers.*

Handling Specialty awarded contract by Royal Caribbean

The Royal Caribbean contract is the largest fixed price contract in Handling Specialty's 58-year history. **BY PLANT STAFF**

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Handling Specialty was contracted in 1995 to produce the underwater stage lift system for C*irque du Soleil* at the Bellagio, in Las Vegas. The 'O' show continues to perform two shows per night after 24 years on the original Handling Specialty lift systems.

Since that moment, several underwater stage lift systems have been designed, built and installed into multiple theatres including the City of Dreams theatre, which runs The House of Dancing Water show in Macau. This undertaking gained Handling Specialty a spot in the Guinness Book of World Records.

Handling Specialty is a leader in underwater theatrical spectacles, and installs systems worldwide. They are also flown to remote vacation locations to provide skilled technicians to repair or maintain these multi million-dollar systems efficiently to ensure the show(s) go on.

The most recent project is the accumulation of a nearly 20-year relationship, designing and building for Royal Caribbean International.

"This project began 2.5-years ago with technical sales and conceptual engineering leading the charge to win this prestigious venture," said Tom Beach, President, Handling Specialty and Lead Sales Associate on the project. "We cherish our relationship with Royal Caribbean and with a revenue stream via new builds, service, and dry dock overhauls that will last over 10-plus-years, we understand what it takes to keep our customers happy."

Handling Specialty's turnkey solutions for Royal Caribbean includes conceptual engineering and contract settlements, to full design including all electrical and hydraulic networks, custom stage flooring, installation, training, commissioning and on-going MRO.

"Experience goes a long way in winning a project as large as this," said Beach. "Deploying professionals and skilled technicians to Finland over the next 6 years to install our equipment will be a challenge, but we've completed similar scenarios many times before."

In March 2021, Handling Specialty sent a team of technicians to Barbados where they quarantined on the Allure of the Seas for 14 days, one of the Oasis class of ships, and then performed planned maintenance on the ship's underwater stage lift equipment.

The same group of people then went on to Spain, where they completed similar work on Harmony of the Seas. Freighting the parts and flying people to these locations during a pandemic, and successfully completing the work ahead of schedule, is an example of Handling Specialty's abilities to organize massive projects and perform the work without interruption.

"Having worked together for almost 20 years on our Oasis class ships, I'm thrilled to be partnering with Handling Specialty again," said Christopher Vlassopulos, Superintendent SLVR and Architectural Lighting, Royal Caribbean International & Celebrity Cruises.

The financial impact on the Niagara-based company is a welcome one. Entertainment industry builds have been scarce through the pandemic, and a project of this size is a boost to company moral, and a nod to Handling Specialty's track record.

"I feel certain that Handling Specialty will continue our relationship with Royal Caribbean International and international ship yards for decades," said Beach.

Photo: Royal Caribbean Cruises International.

YASKAWA MOTOMAN LAUNCHES MPX1400 ROBOT

The six-axis MPX1400 robot has been added to Yaskawa Motoman's MPX-series paint robot line.

The MPX1400 robot is used for home appliances and automotive parts, including instrument panels and headlamp assemblies. A straight wrist with a five-kilogram payload capacity enables the mounting of a variety of spray guns and small bells, and a small footprint slim-arm design allows for minimum installation space. The MPX1400 robot features a 1,256 millimetres horizontal reach, 1,852 vertical reach and a ±0.14 mm repeatability.

This model offers a reduced interference work envelope and can be installed close to workpieces for efficient use of floorspace. It can be floor, wall or ceiling-mounted for layout flexibility.

The MPX1400 and DX200-FM controller feature factory mutual approval for use in Class I, Division 1 hazardous environments. An intrinsically safe pendant is available as an option.

The DX200-FM controller includes application-specific software for paint applications and coordinates operation of the robot and painting devices, including spray gun, colour changer and gear pump.

www.motoman.com

CORTEC VPCI BIO-BASED PAPERS

Cortec's three VpCI papers are USDA Certified bio-based products: CorShield VpCI-146, VpCI-146 Creped paper, and EcoShield VpCI-144.

Cortec VpCI papers are premium nitrite-free multi-metal corrosion inhibiting papers, used for wrapping individual metal components or interleaving between layers of parts—rods, castings, bearings, auto parts, etc.

The VpCI coating on these papers vaporizes and reaches all metal surfaces within the package, forming an invisible molecular layer that protects against corrosion and does not require removal prior to further surface finishing.

CorShield VpCI-146 is made from 100 per cent recycled content paper and contains 92 per cent USDA certified bio-based content. It offers corrosion protection on both sides, eliminating packaging guesswork.

EcoShield VpCI-144 is another multi-metal corrosion inhibitor paper with an added dimension of moisture resistance. One side of the paper is coated with VpCI, while the other side is coated with a water-based barrier coating that resists water vapour, moisture and grease.

www.cortecvci.com

POSITAL KIT ENCODERS CERTIFIED FOR COMPLIANCE WITH BISS INTERFACE STANDARDS

Posital has received certificates of compliance for its family of kit encoders that feature BiSS C interfaces.

These encoders are designed to be installed in motors or drives, providing the control system with position feedback to over single or multi-turn operating ranges.

BiSS, which stands for Bisynchronous Serial, features several sets of communications protocols, including BiSS C for real-time operations and BiSS Line for single-cable implementations. These are designed to enable efficient communications between digital devices, such as servomotors and drives for industrial motion control systems. They are non-proprietary, based on an open source approach.

Certification will cover master units (controllers) and slave units (servomotors, sensors, actuators) in control systems. Verification testing will be carried out by Arteson, a Germany-based company that specializes in systems integration and testing.

www.posital.com

BIGRED 4D-54 INFRARED CONVEYOR TUNNEL OVEN

A new BigRed 4D-54 infrared conveyor tunnel oven from Vastex Industrial boosts temperatures to over 300°F (149°C) within the first several inches of conveyor travel, and maintains at-cure temperatures of up to 900° (482°C).

It is equipped with a 54-inch (137 cm) wide conveyor belt, dual heating zones and four height-adjustable infrared heaters capable of heating film, sheet, parts and metal products uniformly from edge to edge, at high rates.

An air flow mapping system draws 'make-up' air into the chamber's double-walled shell through filtered inlets along opposite exterior sides serving to cool the outer shell for safety, while preheating incoming air.

The six-inch (15.3 cm) diameter exhaust fan outlet can rotate 360 degrees for easy connection to ductwork, and the control box can be located on the right (standard) or left side of the chamber.

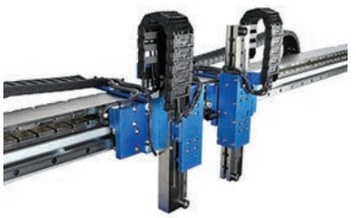
Exhaust flow sensors with warning lights alert operators to a clogged exhaust line, clogged filter or blower failure. Other safety features include a light tower to monitor oven status, and a 'cool down mode' for powering down.

With a total of 22,800 watts, it is wired for 240V as standard, and available in 3-phase, 208, 380 and 480 voltages.

www.vastex.com

FOUR AXIS YY'ZZ' LINEAR MOTOR DRIVEN STAGE

H2W Technologies' Four-Axis Gantry (YY'ZZ') is a four-axis positioning stage that consists of two SRS-007-03-006-01 brushless linear motor stages; each vertically mounted to two independently moving



horizontal linear axis.

Each horizontal linear axis uses a BLDM-D04 H2W brushless linear motor to generate a continuous/peak force of 16.5 lbs. [73.6 N]/49.0 lbs. [220 N] with each moving table capable of a total stroke length of 47.1 in [1196 mm].

Each moving table has an independent non-contact 1.0-micron resolution encoder head reading a single encoder scale allowing for precise positioning and is guided by a rigid recirculating ball linear bearing block sharing a single linear bearing rail.

Each vertical axis (SRS-007-03-006-01) uses a BLDM-B04 H2W brushless linear motor to generate a continuous/peak force of 6.2 lbs. [27.8 N]/18.7 lbs. [83.3 N] with a total stroke length of 7.0 in [177.8 mm].

www.h2wtech.com

For more products, visit: ***www.plant.ca/technology-centre***

POSTSCRIPT
BY JAYSON MYERS

Show me the money

This year's survey of Industry 4.0 deployment by Canadian manufacturers clearly shows that more companies are applying digital technologies to create value and improve operations. Two years ago, 32 per cent of manufacturers were applying or considering investments in digital connectivity; now 43 per cent are actively deploying technologies related to the Industrial Internet of Things.

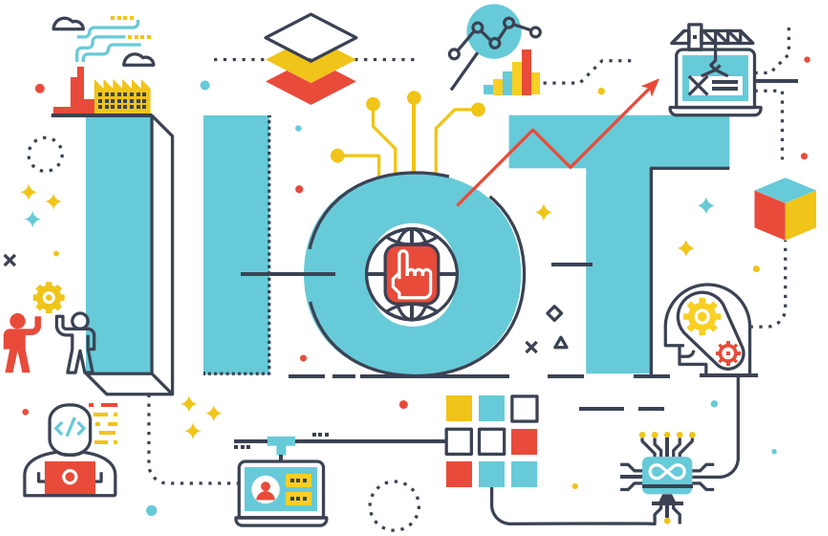
The pandemic has sped up the process a lot. Fully 78 per cent of companies say that the pandemic has accelerated digital transformation. While the pandemic has forced some manufacturers to reduce their investments in technology, 45 per cent of companies familiar with IIoT are increasing the use of advanced technologies in operations, and 36 per cent are using digital technologies to enhance business decision making.

IIoT enables manufacturers to automate more, enrich their monitoring and data analytics applications, and deploy additive processes, artificial intelligence, and virtual reality.

Yet, it is also clear from the survey that most manufacturers are not implementing digital tools simply for the sake of investing in technology. They are more discerning about why they should invest. Their business objectives are to increase throughput, enhance quality, overcome staff shortages, reduce downtime, reduce time to market, develop new revenue streams, and enable more product innovation.

Manufacturers want the benefits, but the technologies they are looking for need to be manageable, appropriate to the task, and supported by a workforce that has to know how to operate them in order to deliver desired business results. It only makes sense that decision makers want to understand the risks as well as the advantages of technology deployment. They expect a net return on their investments. And, they want to see the money fast.

One of the biggest changes from previous years is the proportion of companies that are intentionally monetizing the data they are collecting. Two years ago, 74 per cent of companies applying IIoT were looking for a payback on their investments; now 92 per cent are expecting to make money specifically as a result of the data they are able to collect from digital technologies. Roughly, 90 per cent of those companies applying IIoT see it as a business growth opportunity. Most are applying data to improve operating efficiencies, but an increasing number are looking to add new services and develop new business models.



While the pandemic has forced some manufacturers to reduce their investments in technology, 45 per cent of companies familiar with IIoT are increasing the use of advanced technologies in operations, and 36 per cent are using digital technologies to enhance business decision making.

They are confirming that digital technologies are not simply tools that can be used to displace existing production methods or business processes. As more materials, products, equipment, processes, factories, and value chains become digitized, they are also being transformed into data platforms. It's the information that is being collected from those platforms – not the technologies themselves – that enables companies to develop new ways of creating value and enhance operating performance. Identifying and analyzing the data that can lead to better business outcomes is what counts.

Still, 86 per cent of companies familiar with IIoT say that Industry 4.0 is a great concept but challenging to implement. It's interesting that the number of companies that do not see the economic benefit of deploying advanced technologies or finding them too costly to implement has fallen significantly over the past two years. Those aren't the main factors holding manufacturers back. More significant are the challenges involved in integrating new technologies in existing systems, avoiding downtime during technology deployment, developing the skill sets required to operate new systems effectively, concerns over cybersecurity, pressures on cash flow, and lack of available funding.

These are important operational concerns. For smaller companies, in particular, they can be formidable business risks and barriers to investment. But the risks are mainly around the selection of technology and the resources required to use it productively and profitably. As more companies are discovering, these are manageable risks if business objectives are clearly understood, practices are in place that maximize customer value and minimize waste, worker skills are being upgraded, and companies are open to learning from others.

Maybe though it's time to focus more on data – on what information is important, how it can be safeguarded and quality tested, and how it can be turned into the knowledge, prediction, and increasingly into the autonomous decision making that companies can use to increase agility, improve operational performance, and generate greater customer value. Only 38 per cent of companies say they have a comprehensive data strategy in place. That's not enough to ensure that the deployment of Industry 4.0, whether IIoT or other advanced technologies, will actually deliver the business objectives that manufacturers are expecting at the end of the day.

*Check out what MFI is doing at **www.themfi.ca.** And, for more information about how to get involved, contact **info@ngen.ca.***

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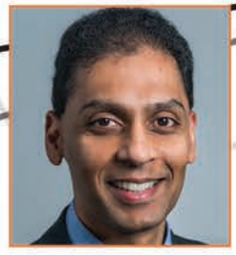
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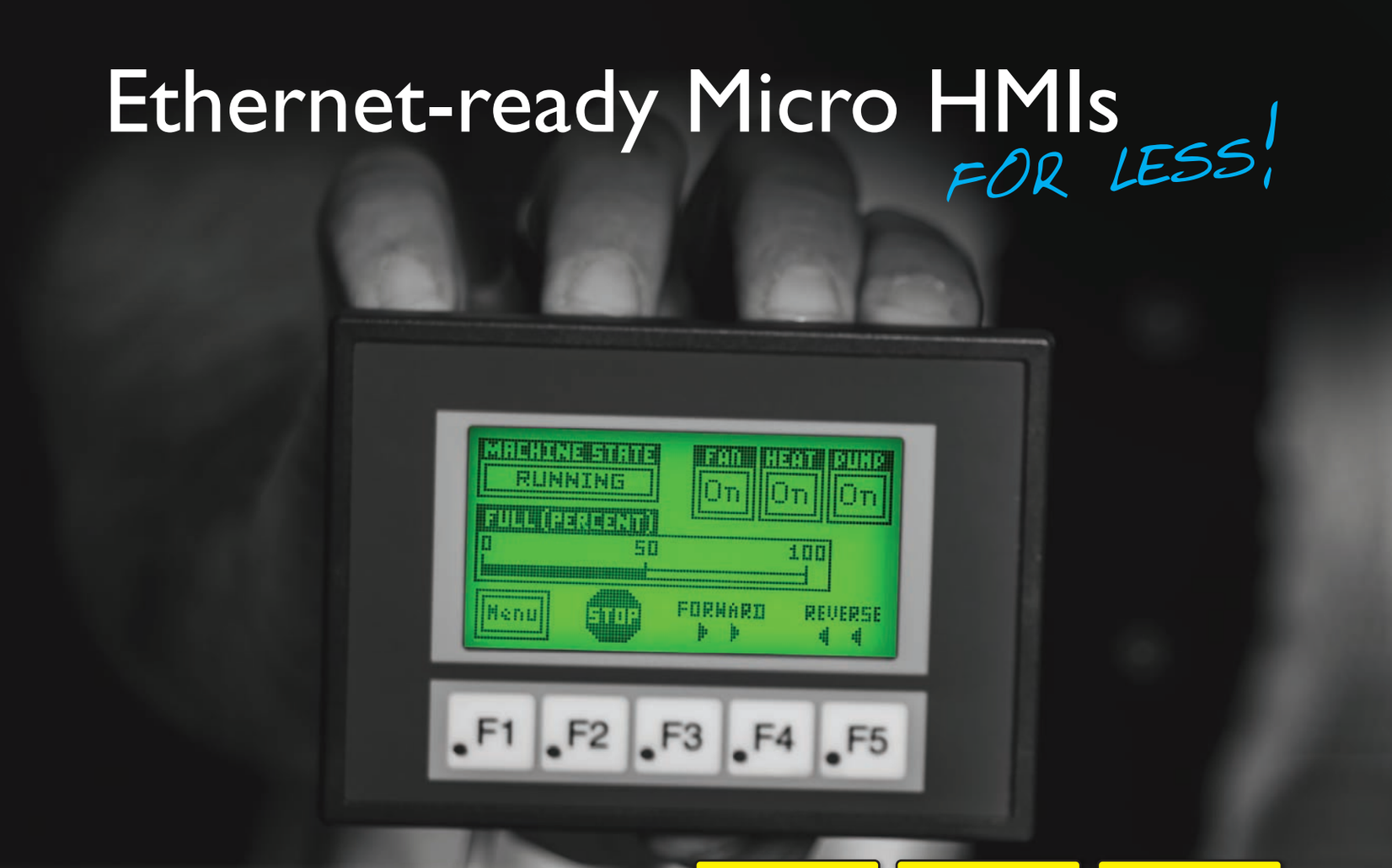

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