PETER SCOTT: ENERGY SAVER

How GM’s propulsion plant is saving electricity

Plant fibres lighten composite panels
Goodyear researching tires in space
WatCar: your research collaborator
Blockchain and smarter supply chain transactions

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Cover: Stephen Urhaney
EDITORIAL

USMCA: It’s a deal, but not among amigos

Players in the automotive sector may feel relieved that Canada, Mexico and the US have agreed to terms on a revised North American trade deal, and that some business certainty has been achieved. Don’t get too comfortable. The NAFTA renegotiation was actually a US attack on its continental allies. So much for the Three Amigos. There are some comforting aspects to the United States-Mexico-Canada Agreement (USMCA), but a protectionist administration in the White House means there will likely be more disruption and trouble to come.

Despite President Donald Trump’s bellowing about NAFTA being the worst trade deal ever made, the USMCA isn’t so different from the 24-year agreement in structure, preserving the main features of freer trade, plus more local content. North American content is 75% for vehicles, 40% from plant’s where the hourly wage is $16 per hour, and 60% to 75% for parts, all with four-year phase-ins.

Yet the contentious tariffs on steel and aluminum, levied by executive order because of a “trumped up” national security issue (via Section 232), were still in place as of Oct. 1. They’ll be dealt with on a separate track and there’s no timeline. There is some protection in a side letter to the new deal, noting the national security ploy won’t be applied against imports of vehicles and parts from Canada and Mexico based on production up to 2.6 million units, even if the US decides to deploy a 232 against other countries.

Yes, Canada can hover safely under this ceiling. All the same, we should not underestimate Trump’s potential for creative application of the security play elsewhere.

Car companies will see some costs rise because of higher wages in Mexico and fewer lower-priced parts and components from Asia. Regulatory compliance costs will also be higher. And businesses lose the Chapter 11 dispute mechanism that allowed them to sue Canadian and Mexican governments over trade beefs. But Chapter 19 and 20 remain in place, a win for Canada.

The agreement, which goes into effect Jan. 1, 2020, will be up for review every six years. If it passes the first review, USMCA will be renewed for 16 years, but with another review in six years. If there are complaints, yearly reviews go into effect until the issues are settled, or the partners decide to craft a new deal.

This is a compromise from a five-year sunset clause, something the Trudeau government resisted because of the uncertainty that would result and have a direct impact on investment in Canada.

Nonetheless, uncertainty lingers. It could conceivably impact the shorter-term plans of Canadian companies and those who would otherwise consider Canada as a place to locate manufacturing operations. Trump will be gone or on the way out when the first review comes up. Except the next administration may be protectionist and inclined to bullying. Who knows? And that is surely the point.

Canada has taken the trade relationship with the US for granted. Thank you, Mr. Trump, for the wake-up call. He has demonstrated how fast a friend and ally can become an adversary. We will not soon forget his threat of a 25% auto tariff and a promise of ruination falling upon the Canadian economy for failing to arrive at a deal by his arbitrary deadlines. Post agreement announcement, he blew it off as a negotiating tactic. That’s some tactic, and an interesting way to treat a friend and ally.

Canada can no longer rely so exclusively on our neighbours to the south for economic prosperity. We’re amigos no more.

Joe Terrett, Editor
Comments? E-mail jterrett@plant.ca.
EVENTS

A3 Business Forum
A3
Jan. 14-16, 2019, Orlando
An annual networking event presented by the Association for Advancing Automation for robotics, vision and imaging, motion control, and motor professionals. More than 650 global automation leaders attended in 2018. Visit www.a3 automate.org.

CanWEA Operations and Maintenance Summit 2018
CanWEA
Jan. 30-31, Mississauga, Ont.
Canadian Wind Energy Association’s (CanWEA) annual summit. Network with wind farm operators, turbine manufacturers and service providers. The event covers the latest in technical innovations, operational strategies and turbine technologies. Visit canwea.ca.

Hannover Messe
Deutsche Messe AG
April 1-5, 2019, Hannover
An international trade fair focusing on industrial technology from R&D, industrial automation, IT, industrial supply, production technologies and services to energy and mobility. Visit www.hannovermesse.de.

Metalworking Manufacturing & Production Expo
FMA
April 3, 2019, Winnipeg

Automate 2019
A3
April 8-11, 2019, Chicago
Automatic, presented by the Association for Advancing Automation, showcases the full spectrum of automation technologies and solutions from traditional industrial applications to cutting edge. Held every two years. Visit www.automateshow.com.

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KUKA, Humber partner
Collaborating on robotics to advance Industry 4.0

TORONTO — Humber College and KUKA Canada Inc. are partnering to bring the latest robotics technology to the Toronto college and they’re working together on robotics systems integration applications.

The five-year agreement will see robotics manufacturer KUKA provide financial contributions each year, advanced software and two state-of-the-art, Industry 4.0-ready collaborative robots.

The college will also have access to the company’s virtual reality and simulation technology that will assist small- and medium-sized enterprises develop applications requiring vision or conveyor tracking.

Over five years, KUKA will participate in applied research projects as well as provide awards and scholarships. The company will also help develop recruitment opportunities for students and graduates, and it will join Humber’s Industry 4.0 consortia.

CIPEC energy winner
FCA Windsor plant projects saving 30%

WINDSOR, Ont. — A plant initiative that resulted in a 30% energy saving has earned FCA’s Windsor Assembly Plant a Canadian Industry Partnership for Energy Conservation (CIPEC) Leadership Award.

The auto assembler was recognized for process and technology improvements involving the chilled water system and a reduction of greenhouse gas emissions equivalent to the annual energy use of 21 homes.

The plant builds Chrysler Pacifica, Chrysler Pacifica Hybrid and Dodge Grand Caravan minivans.

A new vehicle rolls off the line every 48 seconds and it takes approximately 27 hours to complete one, with eight to 10 of those hours spent in the paint shop.

That’s where a recent onsite study conducted by the plant’s energy management team identified opportunities to reduce energy consumption.

Throughout the plant large compressors of chilled water are used to cool air as well as equipment, during different processes. The paint shop’s chiller system maintains a set temperature and humidity level at all times for consistent paint application, while sustaining a cool temperature for the equipment.

The study recommended a multi-faceted chiller initiative that included resetting the supply temperature set point, retrofitting additional pumps with variable frequency drives, removing mechanical flow controls and adding PLC logic control to operate the system. The project was executed over a two-week period last summer.

“In the first quarter alone, we’ve achieved 113% of the anticipated savings, which is an incredible success,” said plant manager Michael Brieda.

CIPEC is a partnership between private industry and the federal government that promotes and improves Canada’s industrial energy efficiency while reducing greenhouse gas emissions.

$50,000 award for mobility research

VANCOUVER — Vancouver’s Human in Motion Robotic Inc. is one of 10 recipients from around the world to receive an award to continue research into human movement and mobility as part of Mobility Unlimited Challenge.

Launched by the Toyota Mobility Foundation, the Mobility Unlimited Challenge is a US$4 million global competition to expand mobility for people with lower-limb paralysis.

The Discovery Awards, in partnership with Nesta’s Challenge Prize Centre, provide seed funding of US$50,000 for 10 groups with promising concepts, while supporting their submissions to the main global challenge.

Teams from 25 countries applied for the grants. More than 10% of the applications came from Canada.

Human in Motion’s project is its Exomotion apparatus, a full mobility, wearable robotic exoskeleton.

It completely or partially supports a person’s weight and controls the guidance of leg movements, allowing standing and walking.

PHOTO: KUKA

PHOTO: FCA

PHOTO: FCA

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PHOTO: KUKA

PHOTO: FCA
**Martinrea recognized for excellence**

…and it has opened a state-of-the-art US technical centre

TORONTO — Ford Motor Co. has awarded Canadian parts supplier Martinrea International Inc. with a Silver World Excellence Award at its 20th annual event in June.

The Dearborn, Mich. automaker honours companies that achieve the highest levels of excellence in quality, delivery, value and innovation.

Martinrea, based in Vaughan, Ont., was recognized as a top-performing global supplier out of 88 companies selected from thousands of candidates as finalists.

Excellence categories include: primary brand pillars – quality, green, safe and smart; aligned business framework principles focused on quality, delivery, value and innovation; Lincoln luxury; and supplier diversity development.

Martinrea recently opened a state-of-the-art technical centre in Auburn Hills, Mich. The new energy-efficient facility combines research and development, engineering and testing capabilities.

The company employs approximately 15,000 people in 44 operating divisions in Canada, the US, Mexico, Brazil, Germany, Slovakia, Spain and China.

**CAMI hosts the community**

Open house shows Equinox start to finish

INGERSOLL, Ont. — CAMI Assembly and Unifor Local 88 welcomed the local community to tour its plant in August.

Visitors got to see the Chevrolet Equinox come to life – from the roll of steel in the stamping shop to finished vehicles rolling off the line in general assembly.

The wholly owned General Motors operation produced its five millionth vehicle in May.

The plant, which has 1,700,000 square-feet of floor space, has something else to celebrate: 30 years of production as of next year.

(Aerial view of the CAMI plant in Ingersoll, Ont. PHOTO: CAMI)
Uncertainty impacts growth
OECD revises global outlook

Prospects for global economic growth have weakened since a May outlook report, according to an update by the Organisation for Economic Co-operation and Development (OECD).

The Paris-based international policy organization says escalating trade tensions, tightening financial conditions in emerging markets and political risks could further undermine strong, sustainable medium-term growth in G20 economies. The OECD projects 3.7% growth in 2018 and 2019, up from 3.6% last year, but not the broad-based expansion seen in the latter part of 2017 and earlier this year. The May forecast was 3.8% this year, 3.9% next year.

Canada’s growth was also revised downward since May’s forecast of 2.1% this year and 2.2% in 2019. Now GDP is projected to be 2% next year. The OECD says strong US demand continues to support exports, but higher borrowing costs have begun to check household spending growth and the housing market, while rising trade uncertainty could “temper” business investment.

“Trade tensions are starting to bite, and are already having adverse effects on confidence and investment plans,” said OECD chief economist Laurence Boone. “Trade growth has stalled, restrictions are having marked sectoral effects and the level of uncertainty on trade stances remains high.”

She stressed the urgency for ending the slide towards further protectionism, reinforcing the global rules-based international trade system and boosting international dialogue.

The US is to blame for the trade friction, yet its growth remains unchanged at 2.9%. But it will decline to 2.7% in 2019 as US import tariffs kick in. Overall prices will rise by 0.3% to 0.4%. Some prices, such as washing machines, have jumped by as much as 20%. Additional tariffs on Chinese imports, autos and auto parts could raise overall prices to a little more than 1%.

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GM CANADA LIGHTS UP …WHILE REDUCING EMISSIONS AND COSTS

St. Catharines propulsion plant lighting project is cutting electricity use.

BY KIM LAUDRUM

Looking to reduce energy costs? Take note of General Motors of Canada’s efforts at its St. Catharines, Ont. propulsion plant. Spurred by an ambitious corporate objective to reduce energy, carbon, water and waste intensity by 20% as of 2020, plant engineers sought advice from GM’s electricity supplier, Alectra Utilities Corp. Through Alectra’s Independent Electricity System Operator’s (IESO) Save on Energy conservation program, GM has saved over the past six years 30.7 million kilowatt hours (kWh) of energy annually and reduced carbon emissions by 1,535 tonnes. That’s enough electricity to power 3,600 homes each year.

“GM has been working with Alectra for more than eight years, and together we’ve successfully implemented many exciting energy and greenhouse gas-reduction projects,” says Peter Scott, manufacturing engineering manager at the St. Catharines plant. “These projects not only support our energy conservation efforts, but also help us mitigate high electricity costs and improve our competitiveness.”

Alectra’s lighting project lead Wayne Allen describes the collaboration as “evolving.” In 2012, GM started working with Alectra’s Save On Energy program, which offers incentives for businesses and homeowners to help reduce energy consumption. Allen, a certified electrical engineering technologist working for the industrial automotive, machinery and parts branch of Alectra, collaborated with the GM team to identify, implement and validate ways they could retrofit lighting to meet the 20% reduction goal by 2020. Together they identified project costs and Allen helped GM with the program application process.

GM received incentive funding through the
Retrofit Program and Process and Systems Upgrade Program (PSUP) for many projects to date, Scott says. This includes the first GM Canada renewable micro-hydro project where gravity-fed canal water from the St. Lawrence Seaway is used to cool process equipment.

“The Save On Energy program incents electrical energy savings in any form,” Allen says. “We incent the retrofit program at $0.05 per kWh or $400 per kW for lighting; and $0.10 kWh or $800 kW for non-lighting, whichever is the highest number. These are capped at 50% of project costs, on the lighting and the non-lighting. So if the energy savings were so great but the costs of the equipment were not, you only get half of the project costs.”

Big projects
There’s also the bigger and more complex Process and Systems Upgrade Program for larger projects like GM’s. “We incent them at $0.20 per kWh, 70% of project costs or one-year payback, whichever is the lowest. Overall energy use at a propulsion plant is quite high,” Allen says.

GM builds V6 and V8 engines, and GF6 transmissions at the 2-million-square-foot site. The engines end up in vehicles such as Sierra, Silverado, Yukon, Tahoe, Escalade, Camaro, Corvette, Impala, Colorado, Traverse, Enclave, XT5, Equinox and Malibu. The automaker has invested more than $1.85 billion over the past 15 years at the facility that employs 1,389 people.

“Many cross-functional team members from both companies were involved in this process,” Scott says. These members included representatives from the St. Catharines plant team, corporate team, approval agencies, subject matter expert consultants and contractors. “All members were responsible for ensuring the successful implementation of the projects.”

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greenhouse gas emissions by more than 1,500 tonnes annually. This represents an ongoing substantial savings for our plant.”

Scott says GM realized the benefits of these projects immediately upon implementation with the unique set of factors for each project yielding a different payback in each case. “The energy incentives are helpful and often essential in developing viable business cases,” he says.

GM reduced its lighting kWh by more than two-thirds, Allen says. He doesn’t want to say what that would translate into dollars, but suggests it depends on what GM pays as a Class A client of an energy utility. The automaker will pay less per kWh than most customers. If GM reduces consumption during peak periods, it will save even more. The going rate per kWh, depending on time of day and peak use, could be between $0.14 kWh and $0.16 kWh. GM would pay less.

“Lighting is the low hanging fruit, especially if you have metal halide lighting in your plant. LED is really the only way to go right now. The energy saving is huge. It drops by approximately one third of what you had before,” Allen says. “For a big company like GM, if there isn’t a two-year payback they won’t do it. Without the incentives, some of these projects would not have met their rate of return.”

Once the payback has been achieved, the savings continue. “We’re in a 3% world. The payback is continual. After the payback, the rest is just gravy,” Allen says.

In addition to lighting there are also potentially deeper savings with pumps and fans. A bonus of the GM retrofit is an improvement in safety. “The plant lighting retrofits contribute positively to creating engaging workspaces, better area lighting and work environments, better occupancy sensor and controls, and useful life of the fixtures. Plus, reducing our electrical energy demand from the grid indirectly helps to reduce greenhouse gas emissions from the electricity generation plant,” Scott says.

Metal halides quickly lose their lumens over time while LEDs have a life span of 10 to 20 years. Alectra and GM have a lot more on the go at the St. Catharines plant. In addition to the lighting retrofit, Alectra has helped GM establish the micro-hydro initiative. These projects have already saved GM much and pushed it closer to a 20% energy reduction by 2020.

Were there any lessons learned at GM that could be shared with other plant managers across Canada? Scott doesn’t hesitate. “Just do it!”

Kim Laudrum is a Toronto-based business writer and regular contributor to PLANT. E-mail klausudrum@rogers.com.

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**PHOTO: GM**

Energy savers (L-R): Hugo Vargas, Wayne Allen and Raegan Bond from Alectra; and Peter Scott, Gary Athoe, Duc Hoang and Mike Ford from GM.
Assembling vans in Scarborough

General Motors Canada used to have a plant in Scarborough, Ont., which opened in 1952. Located in Toronto’s Golden Mile retail district (between Victoria Park Ave. and Warden Ave.), the plant employed 2,800 workers before closing in 1993. It’s two-shift, five-day work schedule produced about 90,000 vans annually.

Models produced between 1970 and 1993 included the Chevrolet Van, Chevrolet Beauville, Chevrolet Sportvan, GMC Rally Wagon, GMC Vandura and the GMC Vandura HD (from 1985). GM announced the plant’s closing in 1989, moving production from Scarborough and Lordstown, Ohio to Flint, Mich. Most of the Scarborough employees ended up at the truck or car plants in Oshawa, Ont. Production at the combined operation in Flint was projected to be 170,000 units a year.

Impact of the Windsor Ford strike in 1945

Look back to the 99-day strike at the Windsor Ford plant in 1945 as the catalyst for strengthening unions and changing the union-management dynamic. The Ford plant unionized in 1941-42 and achieved employment gains when workers were scarce and the automaker had to ensure production was uninterrupted. But by war’s end with the imminent influx of veterans, Ford was looking to return to pre-war conditions. The union was campaigning for layoff and vacation pay, improved medical benefits and pay for working on Sundays and holidays. After 18-months of negotiation between Ford, the union and an Ontario government conciliator, the UAW called a strike. It began Sept. 12, 1945 and ended Dec. 19, when the two sides agreed to return to their corners and await arbitration by Superior Court Justice Ivan Rand. This led to the Rand Formula, which established that union dues are deducted from any employees covered by a collective agreement. This principle was eventually extended across Canada.
Tire maker is harnessing microgravity conditions on the International Space Station.

BY PLANT STAFF

Space is about to be the new frontier for tire research and development. The Goodyear Tire & Rubber Co. plans to test tire materials as part of a project to be conducted on the International Space Station (ISS) US National Laboratory.

The tire maker, with Earth headquarters in Akron, Ohio, expects the experiment to launch later this year. The plan is to study the formation of silica particles in the space station’s microgravity environment. From there, Goodyear’s engineers and scientists hope to determine if unique forms of silica should be pursued for use in tires running on terra firma.

Success in space could lead to improvements in fuel efficiency and other tire performance factors.

The silica project is being conducted through an agreement with the Center for the Advancement of Science in Space (CASIS), which is tasked by NASA to manage the laboratory.

“Goodyear has been a pioneer in tire innovations related to space, with the first and only tires on the moon, numerous projects with NASA and now this,” says Eric Mizner, Good- year’s director of global materials science.

The ISS National Lab can provide companies and researchers opportunities to evaluate materials within their product line and in ways not previously possible,” says Cynthia Bouhot, CASIS director of commercial innovation.

Other clients include Procter & Gamble and Merck & Co. Delta Faucet announced in July it would use the space lab to study the formation of water droplets, flow and pressure in the microgravity environment. (To learn more about the on-orbit capabilities including past research initiatives and available facilities, visit www.spacestationresearch.com).

Tires for EVs

The space station, orbiting Earth for 18 years, may need to drum up a lot more business. The Trump administration would like to stop funding its annual $3 billion operating cost and turn over responsibility to the private sector. Current partners include the US, Canada, Europe, Russia and Japan.

Meanwhile, back on Earth, Goodyear has developed a prototype tire for the growing electric vehicle market that will be on the road in Europe by 2019.

Testing reveals regular EV tires wear out up to 30% faster due to the powerful, instant torque from electric motors and additional weight from heavy battery packs.

Automakers are also looking for enhanced rolling resistance. Greater range is a high priority for consumers with the underdeveloped electric recharging infrastructure in most countries. Quiet and comfort from tires is another consideration. At low speeds, electric vehicles generate as little as half the amount of noise as traditional vehicles.

To increase mileage, Goodyear’s EfficientGrip Performance prototype with Electric Drive Technology has thinner channels for greater rubber contact on the road surface than radial grooves. More rubber on the road improves handling at high levels of torque while maintaining high performance in wet conditions. The tread design also prevents sound waves from entering its grooves, reducing interior and exterior tire noise.

The tire’s optimized cavity shape supports the added weight from batteries. Material properties of the tread compound are tuned for ultra-low rolling resistance to extend the vehicle range while coping with the torque.

And the sidewall reduces aerodynamic drag while the profile yields less rotating mass, resulting in reduced consumption of energy.

Goodyear’s drive to innovate includes extending its network to add Mcity, the University of Michigan-led public-private partnership in Ann Arbor, to advance connected and automated vehicles and technologies.

It’s testing with electric and autonomous vehicles at the Mcity Test Facility to further develop its intelligent tires and the application of sensors.

Mcity is a proving ground for testing connected and autonomous vehicles and technologies in simulated urban and suburban driving environments.

Goodyear joins nearly 60 other companies working with the facility. They include automotive manufacturers and suppliers, chip and hardware makers, insurance providers, and companies engaged in advanced modelling, big data acquisition and intelligent transportation technologies.

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Blockchain and the law

Vermont and Arizona have recently enacted a law rendering blockchain contracts enforceable. Moreover, the US federal Electronic Signatures in Global and National Commerce Act, as well as the Uniform Electronic Transaction Act, provide sufficient legal foundation for blockchain-based smart contracts to be enforced under current US law.

In Australia, the Electronic Transactions Act 1999 offers sufficient flexibility to analyse the validity of blockchain-based contracts.

The French contract law reform of 2016 included provisions enabling parties to contract via distributed ledgers.

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to the mine. Avoiding materials originating from questionable locations could positively impact a manufacturer’s brand and allow consumers to make more informed decisions.

**Warranty issues.** Recently, a European start-up created an application aimed at solving a general lack of transparency related to an automobile’s history and how this affects the vehicle’s warranty. The application enables every piece of information regarding an automobile to be saved by the owner in a streamlined, tamper-proof and secure digital car maintenance passport, rendering any potential product recall issues much easier to manage.

Vehicle information is currently spread across many actors such as insurers, repair shops and governmental agencies. Using blockchain, the manufacturer matches a defective part to the specific vehicle, making recalls more targeted and less costly.

**Counterfeit parts.** This is a major global problem. Abu Dhabi officials confiscated more than 500,000 of them from a store (approximate value US$4 million) last year. Apart from the financial consequences of counterfeiting, lives are at stake, especially when it comes to brakes and airbag safety. But accounting for counterfeit parts is a time-consuming and arduous task because of the volume of paperwork involved, plus information concerning each part is stored across multiple databases.

Blockchain offers an efficient solution by registering each part as a unique entity within the blockchain as soon as it’s produced. The ease and speed at which any given part could be traced back to its origin would in turn make the sale of counterfeit parts much more difficult.

**Legal pitfalls.** Implementation of blockchain technology will almost certainly present legal issues. For example, the use of smart contracts is one area that could prove difficult to regulate.

For a contract to be valid between parties, various legal notions must be satisfied. It’s unclear how the more subjective legal concepts such as reasonableness, implied duty of good faith and the intention to be simultaneously on nodes in numerous locations. In the event of an erroneous transaction, how would it be determined which laws apply and which courts have jurisdiction? At the moment, only a few regulatory bodies have provided some guidance on whether blockchain technology can truly create valid contracts between parties (see *Blockchain and the law*). Barring any tailor-made legislation, the courts will most likely try to solve any blockchain-related dispute by using existing principles and laws.

From a warranty and product liability standpoint, blockchain-based technologies would need to meet regulatory requirements and withstand scrutiny from the relevant enforcement agencies. That could be a challenge given the technology is not yet fully understood. Since many product recalls result in class-action litigation, manufacturers will need to test their blockchain solutions to ensure reliability of the technology can be successfully demonstrated in court.

**Setting disputes**

Jurisdictional issues are another legal concern. A blockchain transaction is fundamentally decentralized and distributed, being performed and recorded

**What does the future hold?**

Blockchain has much to offer the automotive industry, such as reducing inefficiencies in the supply chain, enhancing the user experience and preventing fraudulent manipulation of a car’s history.

However, adoption presents significant challenges. Most people are not fully aware of potential legal pitfalls; the technology is in its infancy, and numerous technical flaws still exist; and integration raises numerous technical flaws still exist; and integration raises questions regarding liability for technical errors. The decentralized nature of the network also makes it difficult, if not impossible, to identify the responsible party for glitches, errors or data breaches.

These and other issues such as lack of expertise and hands-on training in the area must be addressed before the technology is widely implemented.

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Comments?
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COLLABORATION

U of W is working on the auto industry’s innovation challenges.

BY WILL MAZGAY

Auto manufacturers are continuously looking to improve their products, systems and processes. Vehicles and parts need to be lighter, stronger, easier and cheaper to make. They must also be more fuel efficient, environmentally friendly and increasingly – as autonomous technology takes over – more intelligent. But innovation is expensive and labour-intensive, so where do companies turn when they need to enhance a product or solve a pressing problem when they don’t have the resources in-house?

The University of Waterloo’s Centre for Automotive Research (or WatCar) draws on the expertise of more than 125 university faculty across its sciences and engineering departments to help companies in the automotive space nail down their next big idea.

WatCar helps with projects involving lightweighting, autonomous driving, connectivity and next-generation powertrains in a number of ways, depending on the scope of the challenge and how much time the company has to solve it.

Collaborative research tackles the big picture. A project involves a professor and members of a research team, typically running between 18 to 36 months, though in some cases it can stretch over five years.

“You can have a multi-phase collaborative research project in three phases over five years and you don’t even really know what phase three is going to entail,” says Ross McKenzie, WatCar’s managing director.

Limited partnerships

For those looking to address smaller issues and don’t have 18-plus months to spare, WatCar offers more limited partnerships through contract research.

A professor and a team will apply a narrower focus, or if a project is relatively simple and doesn’t require the expertise of a professor, WatCar would pull a graduate student off a research team to intern with the company.

Companies pay 100% of the cost, but get a targeted solution to an urgent problem.

Another option is leveraging undergraduate co-op placements by breaking a project into four-month work modules and hiring one or two students to work on it full-time. These students are paid salaries for their services, but McKenzie asserts it’s worth it: co-op engineering students must complete a work term every other semester, so it takes five years to get a four-year degree. That makes a fourth-year undergrad from Waterloo the equivalent of a first-year post-graduate student somewhere else.

The centre looks at the potential project, breaks it down and finds the most effective solution given the firm’s technological needs, budget and time constraints. If the project doesn’t result in anything feasible, there’s still value derived from the effort. The company avoids wasting money in development.

WatCar’s advantage is the breadth of research projects and testing labs housed on campus. “The project that gets the most attention is our autonomous vehicle research,” McKenzie says. The university has modified a Lincoln MZK Hybrid with autonomous driving features, called “Autonomoose.” The vehicle is

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firm and participating governments (federal and/or provincial).

Protecting IP

Regardless of the scope a project, one of the biggest sticking points that companies have to navigate when working with a university is the protection of their intellectual property, and how to assess ownership of IP derived from the collaboration.

“We have a very unique intellectual property policy at the University of Waterloo. It’s unique in North America if not the world,” says Ross McKenzie, WatCar’s managing director.

Any IP that results from a project is negotiated between the lead professor and the firm. The university administration is not involved. McKenzie contends that this makes non-disclosure agreements far less onerous at Waterloo than at other institutions.

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equipped with nine cameras, radar, sonar and lidar sensors. Researchers just completed a two-year project with automotive microprocessor manufacturer Renesas Electronics Corp. to create a software stack to improve object perception and detection.

The campus also has an anechoic chamber. This echo-free, sound absorbing room used for antenna and radio system research holds up to a 2.5-tonne pick-up truck.

Another laboratory uses a treadmill and miniature vehicles that test semi-autonomous driving functions such as adaptive cruise control, lane keeping assistance, lane departure warning and forward collision detection.

WatCar even dabbles in autonomous robotics through Robo-Hub, a Waterloo facility where ground, aerial, humanoid and magnetically levitated robots are built, tested and researched – a program that has applications for auto manufacturing.

This network of accrued knowledge doesn’t just help WatCar fulfill its mandate of helping to solve the auto industry’s most pressing challenges, it allows the centre to play a role in the future of Canada’s advanced economy.

Funding

WatCar projects receive contributions from the Natural Sciences & Engineering Research Council (NSERC) – the federal government’s primary source of funding for science and engineering projects – along with the Social Sciences and Humanities Research Council (SSHRC), Canada Research Chairs (CRC) and other federal organizations. Provincial assistance comes from the Ontario Research Fund and Ontario Centres of Excellence.

“Schools are in the business of training the next generation of skilled employees,” McKenzie says. “We need to do more than just provide workers for the production line. We’ve got to provide people who can modify the production line, and people to contribute the next generation of products.”

Waterloo’s students and research capabilities were a draw for General Motors when it opened a software engineering centre in Markham, Ont. in January.

Uzma Mustafa, General Motors Canada spokesperson, says the automaker chose Markham because of the community’s proximity to the Toronto-Waterloo tech corridor, and because “we have access to world-renowned universities, along with first-class research institutions, academic experts, which Waterloo of course has, and the next generation of innovators.”

The automotive industry is undergoing a transformation as it adapts to advanced technology and climate concerns. WatCar is helping manufacturers pave the way to a greener, higher tech future.

Will Mazgay is the associate editor of Canadianmanufacturing.com. E-mail wmazgay@canadianmanufacturing.com.

Comments?
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Exoskeletal tool assists with repetitive overhead tasks in auto assembly.

BY PLANT STAFF

Manufacturers whose workers perform a lot of overhead tasks will be interested in a contraption developed by the Ford Motor Co. and Ekso Bionics, a manufacturer of exoskeleton devices.

Ford assembly line workers lift their arms during overhead tasks as many as 4,600 times per day or one million times a year. To relieve the fatigue and prevent injury, Ford and Ekso, based in Richmond, Calif., have come up with a new upper body exoskeletal tool.

Employees in 15 plants and seven countries, including Ford’s plant in Oakville, Ont., will use the EksoVest following successful trials in two US plants.

The vest elevates and supports a worker’s arms during overhead tasks, such as reaching up with a power tool to screw bolts that secure the car’s brace. It fits workers ranging from 1.5 metres (five feet) to almost two metres (six feet, four inches), and provides adjustable lift assistance of 2.3 to 6.8 kilograms per arm. It’s lightweight, not bulky, and workers move their arms freely to perform tasks requiring tools that weigh up to 3.6 kilograms.

“My job entails working over my head, so when I get home my back, neck and shoulders usually hurt,” says Paul Collins, an assembly line worker at Ford’s Michigan Assembly Plant. “Since I started using the vest, I’m not as sore, and I have more energy to play with my grandsons.”

EksoVest pilot

The device is suitable for environments other than factories, such as construction sites and distribution centres where there’s a need to reduce strain on a worker’s body.

“I don’t want the EksoVest to ever leave,” says Nick Gotts, an original EksoVest operator at the Flat Rock plant. “Any job that’s overhead, I wouldn’t work without it.”

Ford piloted the EksoVest during the past year at the Michigan Assembly Plant in Wayne, and Flat Rock plant, both in Michigan. The feedback from plant operators helped refine the technology before the company rolled it out globally.

Investing in the latest ergonomics research, assembly improvements and lift-assist technologies is paying off. Since 2005, the Dearborn, Mich-based automaker has recorded an 83% decrease in the number of incidents, resulting in days away, work restrictions or job transfers – to an all-time low of 1.55 incidents per 100 full-time North American employees. There’s also a 90% decrease in ergonomic issues such as overextended movements, difficult hand clearance and tasks involving hard-to-install parts.

Ekso Bionics has another connection with Ford. Its headquarters in Richmond was a Ford factory. Opened in 1931, it was the largest auto assembly plant on the West Coast. The plant manufactured Model As before it was retooled during WWII to make tanks and jeeps.

Relief for overhead TASKS

FORD EKSOVEST PREVENTS UPPER BODY INJURY

The EksoVest in action at a Ford assembly plant.

The EksoVest is shown in action at a Ford assembly plant.

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Strain leads to PAIN

HOW TO RECOGNIZE AND PREVENT RSI ISSUES

It’s best to address the source of repetitive strain injuries.

Whether your team members work at a computer, at a machine or on an assembly line, the job likely involves performing the same task or movement repeatedly. That can lead to repetitive strain injury (RSI).

RSI is a general term used to describe a variety of painful injuries that affect tendons, tendon sheaths, muscles, nerves, joints and other soft tissues. They cause persistent or recurring pain mostly in the neck, shoulders, forearms, hands, wrists, elbows and lower limbs.

Symptoms vary but include joint stiffness, muscle tightness, redness and swelling of the affected area. Some workers may also experience sensations of “pins and needles,” numbness, skin colour changes and decreased sweating of the hands. Symptoms usually develop gradually with the injury progressing in stages ranging from mild to severe, eventually causing longer periods of pain. Eventually, without treatment, the symptoms can become constant and impede job performance or even lead to light duties. At this stage the condition may be irreversible.

Not everyone goes through these stages in the same way, however the first indication of pain is a signal that muscles and tendons should rest and recover.

Gripping, holding, bending, twisting, clenching and reaching are not particularly harmful during regular daily activities. What makes them hazardous is the continuous repetition. Other work factors also contribute to injuries, such as awkward postures and fixed body positions, excessive force concentrated on small parts of the body such as the hand or wrist, and a fast pace of work with insufficient breaks or recovery time.

RSIs are best eliminated at the source. Focus on eliminating repetitive work through job design, which may involve mechanizing certain tasks. In addition, jobs should be structured so workers rotate between various tasks where they do something completely different, using different muscles groups.

If it’s not practical to eliminate the repetitive aspect of a job, a well-designed workstation adjusted to fit the worker’s body size and shape will help. Workstations should be fully adjustable and allow standing, sitting, or sitting-standing positions.

Appropriate, carefully maintained tools and equipment reduce the force needed to complete tasks and prevent muscle strain. Providing equipment to help with tasks that require holding elements (vices and clamps for machining) saves a great deal of muscular effort in awkward positions.

Prevent strain

Because RSIs develop slowly, workers should be trained to understand what causes these injuries, how best to prevent them, and how to recognize early signs and symptoms. Workers need to know how to adjust workstations to fit their tasks and individual needs. Employers should also encourage workers to take short, frequent rest breaks and to consciously control muscle tension throughout the shift.

Many RSI cases resolve themselves once the source of the problem is eliminated. If nothing is done to address the injury or remove its cause, the damage could become permanent.

Prevention and control measures are more likely to be effective if they have been established with the participation of both employers and employees.

The Canadian Centre for Occupational Health and Safety (CCOHS) in Hamilton contributed this article. CCOHS provides information, training, education, management systems and solutions that support health and safety programs and the prevention of injury and illness in the workplace. Visit www.ccohs.ca.

Comments?
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WEED

Legalized pot

A management tool for the workplace

Recreational use of cannabis will be legal as of Oct. 17, which is heightening the focus on impairment in the workplace.

The Canadian Centre for Occupational Health and Safety (CCOHS) has produced a helpful infographic (www.ccohs.ca/products/posters/impairment/) for distribution via social networks or e-mail that can also be printed as an 11- x 17-in. handout, or you can download a poster (www.ccohs.ca/products/posters/).

The infographic covers causes and the impact of impairment in the workplace, tips for employers, workers’ responsibilities and legal considerations.

CCOHS has also produced a white paper (Workplace...
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sewcan.ca/smartmove
A new binder technology addresses the challenges.

It doesn’t matter to the engineers who designed your car whether you drive a crumb-coated minivan, an urbane compact, a cottage-bound crossover or a supercharged sports car.

In all likelihood, the number-one design challenge was how to create the best, but lightest version of the vehicle.

Competition is fierce and the consequences loom for automakers that fail to meet government-mandated CO2 emissions standards in North America and Europe. No single part in a vehicle is too insignificant to optimize for weight. That’s because every pound shed counts toward one kilometre per litre, and a better fuel economy rating, which most consumers continue to prioritize even when oil prices are low.

There are a lot of ways to lightweight a vehicle, and automakers are using a combination of all of them. It’s not enough just to downsize the powertrain or consolidate parts with injection-moulded thermoplastics. Manufacturers and their OEMs must also scrutinize every metal, plastic, glass and composite material used in the vehicle, as they look for opportunities to swap them out for something lighter.

But in addition to being lighter, the new material has to be just as strong and as easy to process. Material selection is where innovation gets serious, because it’s downright molecular. All fibres are up for consideration. Even plants.

Natural fibres such as flax, jute, and hemp have become increasingly popular for non-structural composite panels – think door panels, trunk liners, back panels – replacing even conventional glass and carbon fibres.

Natural fibres are used in door panels, trunk liners and back panels.

The 2017 Mercedes-Benz E-Class uses Acrodur resin in its sunroof frame.

PHOTOS: BASF

Losing WEIGHT

PLANT-BASED FIBRES LIGHTEN COMPOSITE PANELS

It makes sense. Natural fibres are lightweight, renewable, relatively cheap, recyclable, and they don’t off-gas. Their acoustic and thermal insulation properties are also noteworthy, outperforming glass fibre.

Where natural fibres lack in strength, durability and fire resistance, the resin binder – typically polypropylene (PP) or ABS (acrylonitrile butadiene styrene) – picks up the slack.

The binder is where chemistry plays a crucial role. Not only does the polymer have to
Bamboo: Fibre to watch

Automotive panel manufacturers are constantly looking for fibres that will work well in composite panels. Bamboo has caught their attention. Bamboo fibre is strong like wood, but it’s technically a grass, so it grows fast and tall, and it can be harvested twice a year. There are a lot of bamboo families, it grows in different climate zones around the world and it’s readily available. But it’s not competing with any food value chains, so it’s sustainably harvested.

BASF sees bamboo as an ideal material to be cut into shorter fibres and made into a non-woven fibre mat. It hasn’t taken long for the auto industry to find new opportunities for savings. The 2017 Mercedes-Benz E-Class is already using Acrodur in its first non-woven natural fibre sunroof frame, which is reported to provide up to 50% weight savings compared to conventional metal-reinforced sunroof frames.

A new binder technology from BASF addresses these challenges. In the process, manufacturers have been helped to achieve more in both weight savings and in overall sustainability. Acrodur Power 2750 X is a water-based acrylic resin system that’s formaldehyde-free and has only one component. Like other polymers, there are different grades available to offer flexibility in processing (even thermoplastic), and to provide specific properties in the final composite part.

Also notable, Acrodur allows up to 75% natural fibre content in the composite for additional weight savings. That makes the piece 40% lighter than conventional plastic components, without compromising on strength.

One of its major differences from PP or ABS binders comes down to process.

Let’s start by looking at the traditional impregnation method, which adds PP or ABS to the fibre granulates in a solid form. Here, the materials are heated up, the resin melts, and then it adheres to the surrounding fibres before solidifying in a cold mould. In essence, PP and ABS fill the gaps between the fibres.

Acrodur is a wet binder added to the fibres as a liquid. While the fibres soak, every surface gets coated in the adhesive, entangling the fibres and bond. With wet impregnation – whether liquid is added to a pre-produced mat or to the loose fibres before forming the mat – the resin acts more efficiently. Manufacturers end up using less of the resin to get a stronger bond.

It doesn’t have long for the auto industry to find new opportunities for savings. The 2017 Mercedes-Benz E-Class is already using Acrodur in its first non-woven natural fibre sunroof frame, which is reported to provide up to 50% weight savings compared to conventional metal-reinforced sunroof frames.

Acrodur technology certainly won’t be the end of lightweighting innovation for non-structural panels, or even natural fibre composites, but it sets a new standard for improvement.

This article was contributed by BASF Canada Inc., based in Mississauga, Ont. It’s a subsidiary of BASF SE, the German chemical company. Visit www.basf.com.

Comments?
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Driving SOLO
Electra Meccanica Vehicles’ first single-passenger, all electric SOLO has rolled off the assembly line in Vancouver. The designer and manufacturer of electric vehicles, which sources parts and components from India and China, is aiming to produce 5,000 of the commuter vehicles by September 2019. The EV designed for lone North American drivers (priced at US$15,500) features many of the comforts found in a regular sedan such as air conditioning, heated seats, backup camera and Bluetooth radio. The automaker also builds the Tofino, a two-seater electric roadster.

Bye-bye Beetle
Looks like that’s it for the VW Beetle, again. The German automaker has decided the latest iteration of the iconic rear-engine, air-cooled “Bug” has run out of gas. Production at its plant in Puebla, Mexico ends in July 2019. The love affair with the oddly shaped German car introduced in 1938 has run hot and cold since it came to the US in 1949. Canada saw its first shipment of 12 Bugs in 1952, according to GoldKey Auto Group. Hottest sales growth in North America was between 1960 and 1965. VW tallied US sales rising to 46,000 vehicles in 2013 following a revamp to a less bulbous look, but they’ve trailed off to just over 15,000 last year, according to Autodata Corp. Canadian sales as of August were down 34% to almost 1,600 units. So count the Beetle as another casualty of the consumer preference for SUVs. Perhaps VW will consider a Bug version of a crossover.

Some EV Clarity
Looking for some hands-on experience with an electric vehicle? Honda Canada has provided two 2018 Honda Clarity Plug-in Hybrids to the Electric Vehicle Discovery Centre in Toronto (North York). The centre, in partnership with the Ontario government (pre Rob Ford), was created to share the benefits of driving EVs with the public. Post-Ford, drivers will have to do without the Wynne government’s rebate program that provided up to $14,000 in EV incentives. The PCs cancelled it as a cost-cutting measure.

Muscle car sales are getting flabby
The future is looking less certain for the iconic muscle cars still made by the Detroit 3. Sales of Ford’s Mustang, GM’s Camaro and Corvette, and FCA’s Dodge Challenger and Charger declined 13% in 2016, 11% last year and they’re down almost 10% in the first half of this year, reports the Associated Press (based on Kelly Blue Book numbers). Baby boomers (born 1946 to 1964) are retiring and less likely to spend $30,000 to $60,000-plus to cruise in high performance splendour, so that leaves millennials (22 to 37), who have so far displayed an antipathy to car ownership. Ditto the upcoming Gen Zers. SUVs are the vehicles of choice these days, but they’re not much fun to drive. Automakers just have to figure out how to make the vroom-vroom more appealing to younger drivers.

A way to avoid road congestion
As foretold by the Jetsons, a Hanna-Barbera cartoon popular in the 1960s, the flying conveyance (defined as a vertical takeoff/landing electric or hybrid electric with driverless capabilities) is in development. A variety of players, such as Google, drone company Ehang and automaker Geely in China, Volkswagen, and Toyota (with its investment in Japan’s Cartivator), are working on the concept, according to the Associated Press. But there are also plenty of independent projects in the works, such as the Transition and a flying car called the TF-X from Terrafugia, a Chinese-owned corporation based in Woburn, Mass. Maximum road speed is about 110 km/hour with a flying range just short of 800 kilometres. The plan is to have a Transition ready to soar by next year.

I’m not using tariffs. I used tariffs to get the deal, because if they weren’t willing to make a deal, as an example, Mexico or Canada, then I would have used tariffs...
US President Donald Trump, interview on Tennessee television station WJHL

Bye-bye Beetle
Here’s the 2018 Beetle, and the end of line. PHOTO: VW

Some EV Clarity
Honda Clarity’s ready for test drives. PHOTO: HONDA

Muscle car sales are getting flabby
2019 Mustang Bullitt, celebrating the 50th anniversary of the iconic movie starring Steve McQueen. PHOTO: FORD

I’m not using tariffs. I used tariffs to get the deal, because if they weren’t willing to make a deal, as an example, Mexico or Canada, then I would have used tariffs...
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