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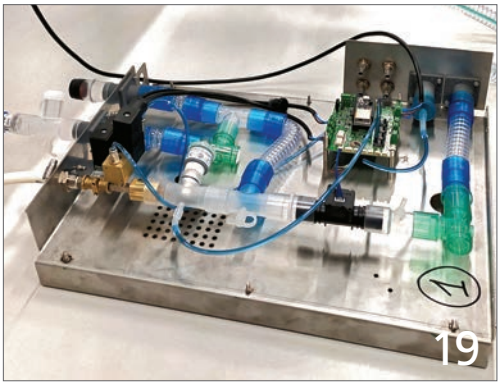
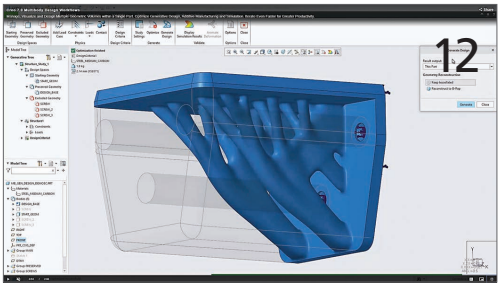
# Features










# On the Rebound

As the peak of the COVID-19 pandemic generally subsided in much of Europe, the U.S. and Canada in May, the conversation inevitably turned from PPE to GDP. After all, it's rare enough to see a single country's economy implode but to watch it happen on a global scale is historically singular. The financial fallout from the COVID-19 crisis will no doubt keep economists busy chewing through the numbers for decades.

In the meantime, governments have scrambled to mitigate the economic damage through various support programs. Generally, Canada has replicated the British and German model, pumping money to employers to maintain payrolls – a kind of cryogenic suspension that we'll hopefully wake up from soon. Even so, StatCan reported that Canada lost nearly two million jobs in April, roughly doubling the unemployment rate to a not-as-bad-as-expected 13 percent.

To pay for those programs, countries have substantially boosted government spending and subsequently taken on huge amounts of new debt. Over the past 30 years, Canada had thankfully reduced its net debt-to-GDP ratio to one of the lowest of industrialized countries – roughly 34% going into the pandemic shutdown, according to Statistics Canada.

On the provincial level, the numbers look a bit more dire. According to the *Spring 2020 Economic and Budget Outlook*, a report released in mid-May by the Financial Accountability Office of Ontario, the province's GDP is projected to plunge by an unprecedented 9 percent this year. In addition, the province's budget deficit could quadruple to CAD$41 billion in 2020-21 and its net debt-to-GDP ratio rise to 49.7 percent over the same time period.

On the upside, the report also predicts Ontario's GDP will roar back in 2021-22, increasing by 8.5 percent or a nearly full recovery. Yet, even with the inflow of tax revenue, the province's debt will remain high compared to what it was going into the COVID lockdown (CAD$25.3 billion).

Those are certainly some ugly numbers and ones that may be with us for a long while. The UK, after all, didn't finish paying off the debt it incurred during the Napoleonic Wars until 2014. Even so, Canada's debt load pales in comparison to other OECD countries. Before the pandemic, Germany's debt ratio was near 60 percent while the UK's was in the mid-80s. And that's not to mention outliers like Japan which has hovered around 200 percent debt-to-GDP since 2012.

But no matter how fiscally responsible we've been or how clever we may be, Canada's recovery will depend on our biggest trading partner. The U.S. still represents around 70 percent of Canada's global exports.

However, with its Federal Reserve focused on maintaining liquidity, the U.S. has experienced significantly worse employment numbers to date. According to the U.S. Department of Labor, more than 36 million people have filed for unemployment benefits in the last two months. As a result, consumer spending there decreased by an average 33 percent in March, according Opportunity Insight's Economy Tracker. Even post-recovery, that's a lot of people not buying things.

With the global economy's biggest shopaholic potentially maxed out for the foreseeable future, it may well be time for an export-dependent economy like Canada's to start looking elsewhere for rebound trade relationships.

Mike McLeod

@ I enjoy hearing from you so please contact me at MMcLeod@design-engineering.com and your letter could be published in an upcoming issue.

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# MDA contracted to support ISS' robotic operations

The International Space Station's Canadarm2 and Dextre. (PHOTO CREDIT: NASA)

MDA Corporation received a CAD $190 million contract in May to continue support of robotic operations on the International Space Station (ISS) from 2020 to 2024. MDA has provided logistics and sustaining engineering (L&SE) services to the Canadian Space Agency (CSA) and its international partners since the start of the ISS, which this year will celebrate 20 years of continuous habitation by humans.

According to the company, the contract provides for ongoing operations and maintenance of the Canadian contribution to the ISS, the Mobile Servicing System (MSS), which comprises Canadarm2, Dextre and the Mobile Base System (MBS). Areas of support include mission planning and real-time operations support, software engineering, systems engineering, hardware engineering, logistics engineering, program management, product assurance, and MSS Robotic Operations Training Support for astronauts and ground mission controllers. The contract includes the option for Canada to extend the term of the contract by up to four additional one-year periods under the same conditions.

"This contract further strengthens MDA's global leadership in operational mission-critical space robotics and will provide an opportunity to advance robotic system capabilities and techniques using the ISS as a proving ground for future human exploration," said MDA CEO, Mike Greenley. "We value our role as prime contractor and partner to the Canadian Space Agency and enjoy the opportunity to work closely with the ISS partners, in particular NASA and the ISS industrial team."

In early April, the historic company announced its return to Canadian ownership following the official closing of the sale by Maxar Technologies to a consortium led by Toronto-based investment firm Northern Private Capital (NPC). The NPC-led consortium acquired all of MDA's operations across Canada and the UK in a transaction valued at CAD$1 billion.

**www.mdacorporation.com**

# DEW Engineering, Supacat team bid on Canada's next-gen fighting vehicle program

The DEW Supacat team's HMT Extenda Mk2 converts between 4x4 and 6x6 in hours, by adding or removing a 3rd axle module.

PHOTO CREDIT: DEW ENGINEERING

Ottawa-based DEW Engineering and Development and UK defence vehicle developer, Supacat, announced the companies will team up to pursue the Canadian Special Operations Forces Command's Next Generation Fighting Vehicles (NGFV) program.

The program requires that the 55 to 75 vehicles it intends to buy be optimized for survivability, lethality, mobility and durability, as well as sustainability, transportability, interoperability, electrical architecture and reliability. The vehicle's primary role, according to the program, is in support of counter terrorism, high value task operations and conventional warfare.

To satisfy those requirements, the team is submitting the Supacat High Mobility Transporter (HMT) Extenda Mk2, which is designed to transport personnel and equipment into operational zones. Transportable by air, the HMT is certified to be driven on all roads but can also be converted between 4×4 and 6×6 drive, by adding or removing a third axle module, so it can operate in a variety of combat environments.

The HMT can also be fitted with NATO Generic Vehicle Architecture to enable the integration of a wide variety of mission systems, including Remote Weapon System, Intelligence Reconnaissance and Surveillance systems and C4 systems. In addition, users can select between open or closed cabs, different levels of protection, seating layouts and payload configurations, not to mention weapon systems.

"I have no doubt there will be stiff competition to win NGFV," said DEW President, Ian Marsh, "but I am confident that the DEW Supacat team have a winning next generation fighting vehicle."

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# Spartan Cube COVID-19 test receives Health Canada approval

In April, Ottawa's Spartan Bioscience received Health Canada approval for the company's Spartan Cube, a rapid and portable COVID-19 test. Funded in part by the National Research Council's IRAP program, the test consists of a portable DNA analyzer paired with Spartan's COVID-19 test cartridges and proprietary swabs, manufactured in Ottawa. According to the company, the automated test takes less than an hour and can be operated by non-laboratory personnel in settings such as airports, border crossings, doctors' offices and remote communities.


"We are grateful to the Government of Canada for working closely with us to expedite the review and approval process," said Paul Lem, M.D., CEO of Spartan Bioscience. "We are ready to start shipping our portable COVID-19 test to the federal and provincial governments, and to make them widely available to Canadians. There is an urgent unmet need for rapid COVID-19 testing and, as a proudly Canadian company, we are excited that our technology will be an important part of fighting the COVID-19 pandemic in Canada."

**www.spartanbio.com**

# Multi-polymer produces high strength parts from low-end 3D printers

While the U.S. military would like to be able to 3D print replacement parts on or near the battlefield, U.S. Army researchers say current additive manufacturing technology isn't up to the job. On the one hand, parts produced by Fused Filament Fabrication (aka FDM) aren't strong enough to endure the rigors of combat, while 3D printers that do produce high strength parts are too large and require too much power to be feasible.

To overcome the problem, army researchers have engineered a multi-polymer build material that can be run through low-end FFF-based machines, but create much stronger and mechanically robust parts. According to Dr. Eric D. Wetzel, the research area leader for Soldier Materials at the U.S. Army Combat Capabilities Development Command's Army Research Laboratory, their filament combines ABS and polycarbonate to produce an inexpensive and simple-to-make filament that is stronger than either material on its own.

To make the filament, the researchers essentially 3D printed an ABS pre-form with a star shaped polycarbonate core. The cylindrical slug is then run through a custom designed thermal draw process to create a filament that can be used in the same FFF 3D printer used to create the preform. Parts made from this dual material filament are then annealed between the glass-transition temperatures of ABS and polycarbonate.

According to a study published in the journal, *Advanced Materials Engineering*, the dual thermoplastic material produces parts, "with ductility comparable to injection-molded ABS and fracture toughness values 15 [times] higher than comparable as-printed ABS structures." In addition, the paper says the internal polycarbonate skeleton preserves the resulting parts' geometric accuracy (i.e. resists creep and polymer relaxation) during the annealing process.

Currently, the Army's research team is experimenting with new material pairings, print conditions and annealing protocols to further improve mechanical properties and reduce processing times. The goal is to reduce current annealing times of 24-48 hours to four hours or less. In addition, the U.S. Army says it's looking for commercial partners to develop the team's patent pending technology.

**www.army.mil/ccdc**

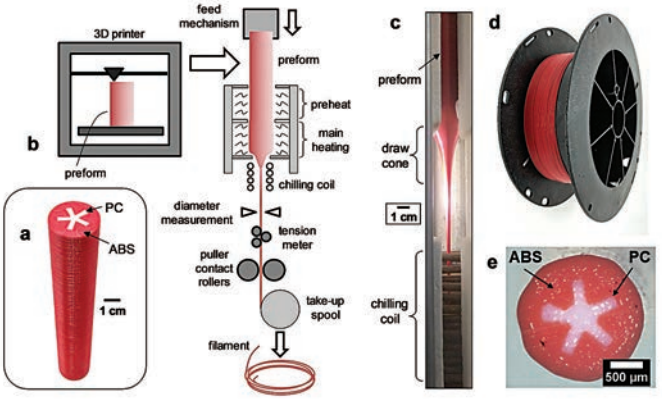


PHOTO CREDIT: U.S. ARMY RESEARCH LABORATORY

# U of T-developed medical device monitors COVID-19 patients remotely

A team from the University of Toronto's Faculty of Applied Science & Engineering has created a small medical device for remotely monitoring the vital signs of COVID-19 patients, so that medical workers can preserve personal protective equipment (PPE). Currently, hospitals use a fingertip probe to monitor patient's blood oxygen levels but they require that nurses read it every four hours and at-risk patients require more frequent readings.

"Because health-care workers need to put on and remove PPE before interacting with patients, this requires considerable time and use of resources," says Associate Professor Willy Wong in the Edward S. Rogers Sr. department of electrical and computer engineering and the Institute of Biomaterials and Biomedical Engineering, who led the project.

So that medical staff can responsibly keep their distance from COVID-19 patients, staff at Toronto's Mount Sinai Hospital contacted the University of Toronto's engineering depart to see if researchers could come up with a way for clinicians

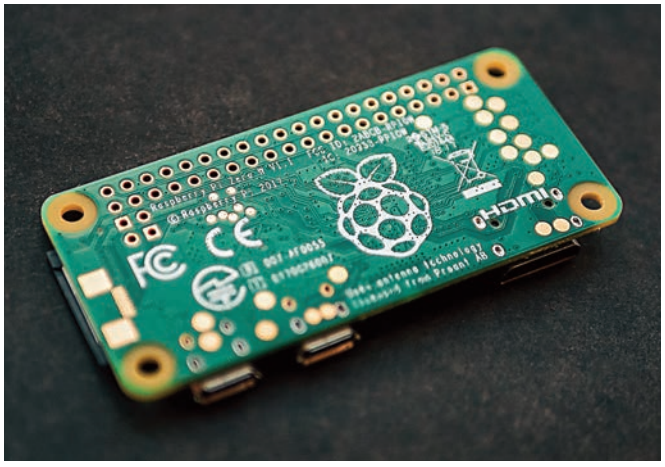

PHOTO CREDIT: HARRISON BROADBENT

to monitor respiratory probes remotely. During the following week, Dr. Wong and PhD candidates Bill Shi, Yan Li and Brian Wang designed a prototype using a small Raspberry Pi Zero to test in a hospital setting.

The small device allows doctors and nurses to read a patient's oxygen saturation levels every few minutes from a nursing station. The team is currently working with Mount Sinai and Toronto General Hospital to determine the feasibility and demand for these devices. If successful, the team says their device is rapidly deployable and scalable to other facilities and applications.

**www.engineering.utoronto.ca**

The UV-Disinfection robot currently being evaluated by the Research Institute of the McGill University Health Centre.

PHOTO CREDIT: RI-MUHC

# McGill testing Canada's first UV-Disinfection robot

The Research Institute of the McGill University Health Centre (RI-MUHC) announced it is evaluating a UV-Disinfection robot. The robot is programmed to emit concentrated UV-C ultraviolet light, which is known to kill microorganisms on surfaces and in the air. According to the Danish manufacturer, UVD Robots, the robot helps prevent and reduce the spread of infectious diseases, vira, bacteria and other types of harmful organic microorganisms by breaking down their DNA-structure.

"It is not new to disinfect with UV-C, but the combination of ultraviolet light and robotics makes this technology very interesting," explained Rami Tohme, Director of Infrastructure and Biomedical Engineering at the RI-MUHC. "The UV-Disinfection robot can autonomously drive around and position itself optimally in a relation to infection hotspots in any hospital setup. It can apparently achieve a higher disinfection efficiency in less time compared to existing solutions. It's definitely worth evaluating."

The Montreal-based biomedical and healthcare research centre says the technology assessment will determine the potential value of the UVD robot technology compared to existing technologies using safety, efficacy and effectiveness criteria. It will also include a user interface and automation test to assess the mapping function, path planning and the autonomous capabilities of the robot at the MUHC Glen site.

According the Canadian Patient Safety Institute, about 8,000 Canadians die from hospital-acquired infections each year and 220,000 others become infected. Healthcare-associated infections also result in significant extra costs for hospitals due to additional days of hospitalization and readmissions. Considering the added impact of COVID-19, RI-MUHC says there is an increased interest in this technology.

**https://muhc.ca**

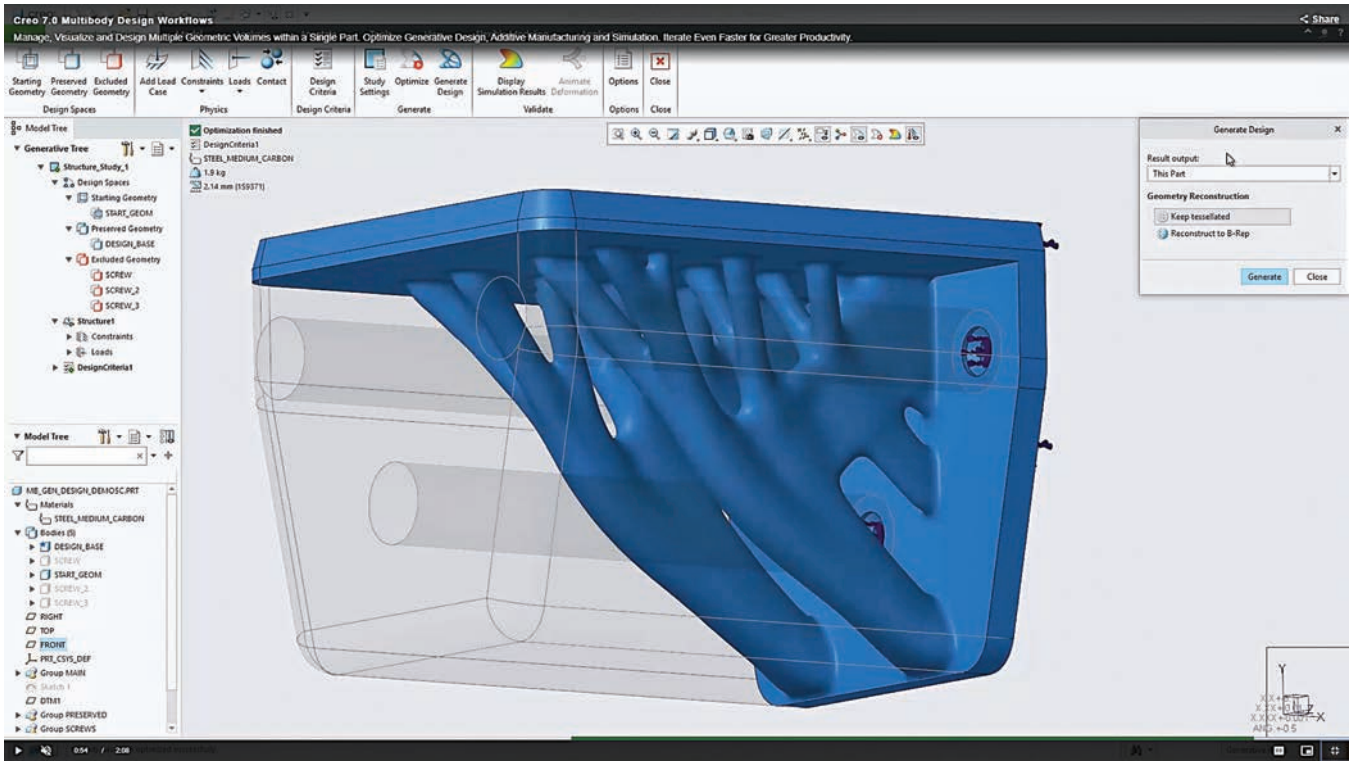


PHOTO CREDIT: PTC

# A STATE OF CHANGE

## PTC embraces cloud-based CAD, augmented reality and generative design with Creo 7 and related design software.

By Ralph Grabowski

PTC has been a stalwart of the MCAD industry ever since its founding in 1988 when it commercialized the algorithms for the revolutionary 3D parametric modeling system invented by Russian mathematicians. By comparison, AutoCAD that year got an UCS icon for 3D orientation and took its first stab at 3D meshing.

At the time, PTC's software ran on only Unix computers; to be fair, all CAD software back then ran on either Unix or DOS, and Unix was the more powerful. Its salespeople sold Pro/Engineer aggressively and PTC became successful.

But then it got caught flatfooted. Dassault Systemes snapped up the then-new Solidworks, which proved serious MCAD could work on the relatively new Windows operating system. A few years later, PTC lost out to Autodesk in its bid for Revit, which was just as well, since its own architectural software, Pro/Reflex, never sold well.

Today, the company is undergoing change. Seeing what Autodesk had done with subscriptions, PTC spent the last two years pushing its customers hard to do the same. With subs mostly in place, bringing in 95% of software revenue, the company is now looking to move all its software onto the cloud with the help of its Onshape acquisition last fall.

That deal cost PTC nearly half-a-billion dollars but it was a better-late-than-never move for a company trailing far behind Autodesk and Dassault Systemes in the brave new world of cloud-based CAD. In October 2019, PTC's always-optimistic CEO told investors he considered the money well-spent, as it saved the company "five years and several hundred million dollars" in trying to develop something similar on its own. Given that Dassault, after a decade, still hasn't figured out how to cloud-ize Solidworks, five years may well have been the optimistic forecast.

### Not Just MCAD

Now thirty-two years old, PTC is best known for wandering its attention from here to there. The natural outgrowth of MCAD software is to manage design projects with even more software. Industry initially gave project management the acronym of EDMS (engineering document management system), and then moved to the all-encompassing PLM (project lifecycle management). CAD vendors, including PTC, saw PLM as a significant revenue enhancer and a way to extend their influence to all stages of product development.

So PTC became the PLM company with Windchill PLM. Then it became the

technical documentation company with the acquisition of Arbortext, then the SLM/ALM company, then back to being an MCAD company with the launch of Creo (Pro/Engineer with direct modeling). Most recently it wants to be known as the IIoT/AR company through its acquisitions of ThingWorx and Vuforia.

Like Dassault Systemes, PTC wants to be all software to all people. The good news for customers is that all these niches do connect to one another. Customers can output their CAD models as technical drawings and AR for SLM (service lifecycle management), which are connected to IIoT for near-immediate feedback and design optimization. "Fortunately for PTC," said CEO Jim Heppelmann, during Q2 2020 earnings conference call with industry analysts, "IoT, AR and PLM are all about remote work" during coronavirus.

Figure 1: PTC's Vuforia Chalk app lets users mark up smartphone video to facilitate real-time collaboration. (PHOTO CREDIT: PTC)

## PTC in a Time of COVID-19

With CAD operators currently required to work at home due to COVID-19, a number of CAD vendors (but not all) are offering their customers respite (e.g. an automatic second license, free access to training and/or no-charge collaboration software).

Here, PTC is offering customers no-cost license options to work from home for a temporary period. It has also made Onshape free to schools that offer virtual STEM and 3D CAD classes to students learning at home, provided they are running their own devices. PTC's eLearning site is free for now so that users can upgrade their skills. Medical device and health-tech customers receive the highest level of support at no additional charge. The annual LiveWorx conference this year is a free one-day virtual event on June 9.

As its primary COVID-19 solution, PTC is heavily pushing Vuforia Chalk, a collaborative remote assistance app that's like a Zoom meeting for the MRO crew. The AR-like software lets users capture video from a smartphone camera and share it with remote engineers. The shared video can then be marked-up (redlined) in real time by either party to communicate and address maintenance and repair issues (see figure 1). The slick bit of the software is that on-screen mark-up stays in place even as the camera pans and zooms in on the environment.

PTC is offering the augmented reality app free of charge through to the end of June, however the time may be extended. In late April, Heppelmann reported that the use of Chalk had gone up 10-fold, with the hope that free use of the collaborative AR app will seed future sales. "These companies using Chalk represent a big up-sell pipeline to pursue in Q4 and beyond," he told financial analysts.

## What's New in Creo 7

As to its MCAD software, PTC released Creo 7, the 35th version of the company's MCAD software, which began under the name Pro/Engineer, early this year. The two emphases in this release are on generative design and integrated analysis.

In 2018, PTC purchased Frustum to acquire the software company's generative design software and thereby catch up with competitors already offering it, such as Autodesk (through Fusion), Siemens (in NX), and even Hexagon (from AMendate). In Creo 7, it's available through two extensions. Generative Topology Optimization (GTO) runs a single analysis at a time inside Creo (see figure 2), while Generative Design Extension (GDX) lives in the cloud so that users can run multiple design analyses at the same time. Right now the two extensions also handle structural analysis, with modal (vibration) and thermal analysis to come later this year.

PTC takes pains to point out the difference between topology optimization and generative design. Topology optimization minimizes material use through stress analysis, such as using an I-beam in place of a solid bar of steel. In generative design, designers specify constraints, like the bounding box and connection points, which the software then uses to calculate and automatically generate all possible designs that satisfy the constraints. PTC now offers both modes, and claims that, unlike its competitors, only its generative designs are parametric.

In marketing Creo 7, PTC talks up AI but, the best I could determine is that some AI runs in GDX. Generative design has been criticized for its organic-looking output being manufacturable only by 3D printers, but Creo's version limits generative design changes to those that traditional subtractive machining (lathes, CNC, etc) can produce. According to PTC, it can even specify parting lines for moulds.

Last year, PTC made a deal with ANSYS to start integrating all of its simulation software into Creo. So far, we see two results from the agreement. Creo Simulation Live is ANSYS Discovery Live, which updates fluid flow and heat analysis in real time as designers change shapes of parts (see figure 3). Other types of analyses aren't available in Live, so the "new" ANSYS Simulation add-on provides structural, modal, and thermal analysis functions inside Creo 7.

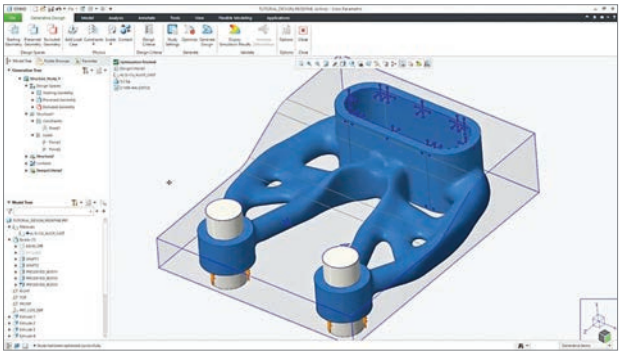

Figure 2: Creo 7's Generative Topology Optimization functionality is based on code from Frustum. (PHOTO CREDIT: PTC)

To further catch up to competitors, PTC has added multi-body design to Creo 7 so that users can work with disjointed, touching and overlapping geometry in a single part.

For additive manufacturing, Creo gets

stochastic lattices that identify and follow the edges of prismatic shapes. For subtractive manufacturing, the Mill Turn Work Center now outputs designs to Swiss-brand turning machines.

## The Future of PTC

PTC is the fourth largest CAD vendor in the world (or sixth largest, depending on how you determine what a CAD vendor is), and is popular with industrial companies, particularly in the complex field of designing automatic transmissions. Its reputation has suffered in the past from its overly-aggressive sales people and its uncaring attitude towards firms suffering financially during the last recession. It seems to have learned its lesson, as its work-from-home support is one of the broadest in the industry.

And, despite its age, PTC keeps itself up to date, relying more, however, on acquisitions than internally-developed innovations. The platform that underlays Web-based Onshape is becoming the basis for Atlas, the codename for a new platform that will "shoulder" all of PTC's software on the cloud – or software as a service (SaaS), as PTC prefers to call it.

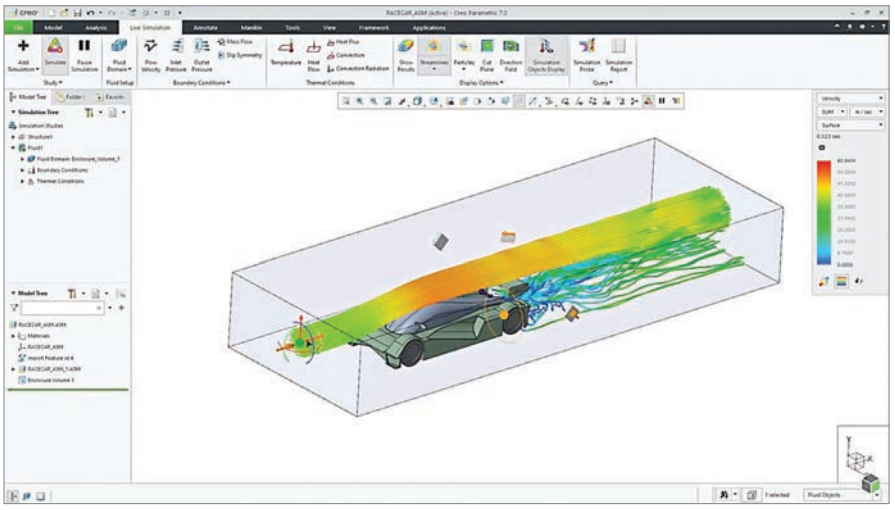

Figure 3: Creo 7's Simulation Live performing real-time fluid flow analysis. (PHOTO CREDIT: PTC)

Eventually, it will redesign itself to be like Dassault's 3dExperience platform, where its offering is 100% a SaaS suite. Later this year, we might see Atlas with Frustum and Vuforia AR, and then in later years most of the rest of PTC's software sitting on Atlas.

During is 2020 Q2 conference call, CEO Heppelmann forecasted, "We believe the COVID crisis will accelerate the SaaS tipping point for the engineering and software industry by several years." DE

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# BUILDING COOLER CARS FASTER

High-end restomod auto shop, Kindig-It Design, uses reverse engineering technology to create custom car parts.


**Dave Kindig, owner of Salt Lake City's Kindig-It Design, relies on 3D scanning technology from Faro to design custom auto parts for his high-end restomod auto shop's clients.** (PHOTO CREDIT: FARO)

Kindig-It Design in Salt Lake City, Utah, is a high-end, custom automotive shop with a team of artists and fabricators who specialize in restomod; they've been restoring a broad range of vehicles, and modifying them to be more modern, since 1999.

Due to their TV show on the Discovery Channel's Motor Trends network—which gives a behind-the-scenes look at their process for building some super cool cars—the company has be come popular; their current lead time is about three to four years.

Owner Dave Kindig has been designing cars by hand since he was a kid. Along with Kindig-It Design metal fabricator, Greg Hebard, and engineer Will Lockwood, the trio have increasingly leveraged reverse engineering for a variety of applications ranging from designing new trim, body and engine components to recreating components you can no longer buy or find.

"What's great is that the guys back there, Greg and Will, take my hand-rendering and use Geomagic Design X to take all of the information that we've gathered off of the FARO ScanArm and put it into the computer, which is a game changer," says Kindig.

## Building Cooler Parts

One of the things that sets Kindig-It Design apart is that they get to use their creativity to make cool cars even cooler. Basically, Dave Kindig only has to tell Hebard and Lockwood what he wants and they can start building cool stuff three-dimensionally, looking at it and knowing that it's actually going to fit the vehicle. Pushing boundaries, making nicer cars and doing the most with the time that they have is what they're ultimately after.

"We want to exude our art on these cars," says Lockwood. "Geomagic Design X and the FARO ScanArm scanning capabilities have just exponentially increased that for us. And it's a huge value, not only in dollars and cents, but in our enjoyment of the process."

While Kindig-It does use reverse engineering on some parts to save time, a lot of the parts they create are pushing the envelope. Cars have a lot of complex surfaces and the body lines all have slight curves with very little flat areas or straight edges. Consequently, it's hard to measure the side of a car. And designing something in CAD that works with the existing lines

Kindig-It Design metal fabricator, Greg Hebard, scans the front of a 1971 VW Karmann Ghia to design an air-intake grill. (PHOTO CREDIT: FARO)

of a car is often challenging.

Kindig-It is using reverse engineering to make things that fit to existing body panels for parts with interesting surfaces that would be hard to mock up including pieces that have to fit on a surface (like emblems and trim pieces) as well as pieces that need to avoid surfaces or have space constraints (like an intake pipe or other engine component that needs to avoid a radiator fan, alternator, or other part; float; and be mounted a certain way).

"Being able to design in the computer, I can make something that looks a lot nicer and has flowing lines that you couldn't accomplish with traditional manufacturing," Hebard says. "And it takes less time."

One of Hebard's projects is scanning a 1953 Chevrolet Corvette starting from the frame up and building all of the systems in the computer first. For example, he took the fiberglass body, cut out the openings for the headlights, scanned it with the FARO ScanArm, redesigned the headlights in Geomagic Design X to follow the body line and then 3D printed them.

Another project is an air-cooled 1971 Volkswagen Karmann Ghia where the customer wanted to add air conditioning. To create a way to bring air into the front of the car and cover up the new holes, Hebard scanned the entire front of the car with the ScanArm, designed grills with Geomagic Design X, 3D printed sand-casting patterns, had them cast out of aluminum, and then sent them to chrome.

"The trim for the Karmann Ghia is a prime example of pretty crazy shapes, and they all fit perfectly on the curved surfaces of the car," says Hebard. "There's not a lot of straight lines on it. I think it looks great."

## Using X-Ray Vision

Building custom vehicles is a bit tricky because everything's a one-off. At Kindig-It Design, there's no time to do something twice. Every project is an experiment that has to be right the first time. So, every prototype they make is the final part.

Designing and fabricating a part for a finished car by hand that fits and doesn't scratch the paint is not only a time-consuming chore of trial and error, it's also stressful. Because the fit and finish on the cars needs to be perfect, using the FARO Design ScanArm and Geomagic Design X to design trim pieces takes the guess work out and allows Hebard and Lockwood to create parts that fit perfectly to a painted surface on the first try without too much effort.

"Getting something to fit right the first time is absolutely what I'm after," Lockwood notes. "And the ScanArm, the Geomagic Design X software make it foolproof. It's paid off every time we've used it."

Hebard adds that when he's scanned something, he can trust that the part he's building can fit within a couple of thousands of an inch. For example, in the past, they dealt with under-hood components that didn't fit because, once the hood is shut, you couldn't see the clearances. Now they can scan the engine bay and hood with the ScanArm, assemble them together and close the hood virtually in Geomagic Design X. They can then see what space constraints they actually have to deal with. Hebard says its like having x-ray vision.

## Saving Time and Reducing Costs

Since they started using the FARO Design ScanArm and Geomagic Design X, Kindig-It Design has saved days, weeks and sometimes months of work, improved delivery time, and reduced labor costs by taking the guesswork out and eliminating trial and error. According to Lockwood, some of the biggest challenges they face in the custom auto business are timeline and budget.

"In some cases, it's saving days' worth of work. It would take maybe two weeks to hand-make a piece of trim. But if I can scan it and get it in the computer, it might take me a day and a half. It's just invaluable," Hebard says.

For example, the intake pipe that Hebard built for a 1966 Chevy Nova would have taken him about a week to manufacture in a traditional way. By scanning it and reverse engineering the engine bay in Geomagic Design X, he was able to do it in about a day. And he built the trim for the 1971 Karmann Ghia in about two weeks using reverse engineering and 3D printing, which would have taken him months to do by hand.

Another way Hebard and Lockwood have been able to streamline design is by forgoing other CAD software and modeling everything in Geomagic Design X. "I thought I'd be importing things into Solidworks, but I really haven't. I just go with Geomagic Design X the entire time," Hebard notes.

One of Hebard's favorite tools in Geomagic Design X is mesh sketch, which enables him to pull a plane in the middle of a sketch so that he knows exactly where everything is, all the edges. Lockwood really likes the region grouping tool that recognizes shapes.

"I remember that was kind of the game changer for me and when I started really pushing that we needed to get this software in house." They both also really like the auto surfacing tool that allows them to make sure their designs will fit perfectly against the curve of a car's body panels.

## Looking Forward

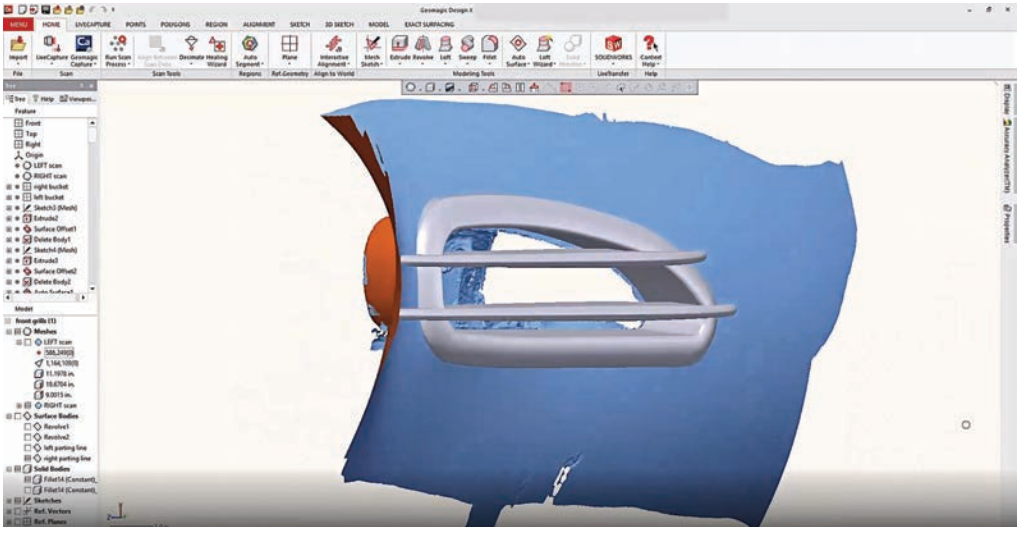
"Ultimately, if Dave would let me, I would scan these entire cars. They would absolutely be entirely virtually built in the computer before we even touched them. One day, that will happen," Lockwood predicts.

In the meantime, they're getting into inspecting their finished, reverse-engineered parts with Geomagic Control X metrology software. For example, Lockwood did a post inspection on the grills they got back from chrome for the 1971 Karmann Ghia so they could compare their CAD drawings, to the castings, to the chrome and see how accurate their process was. This procedure helps them improve their design methods and compensate for casting imperfections. Turns out, they were pretty spot on.

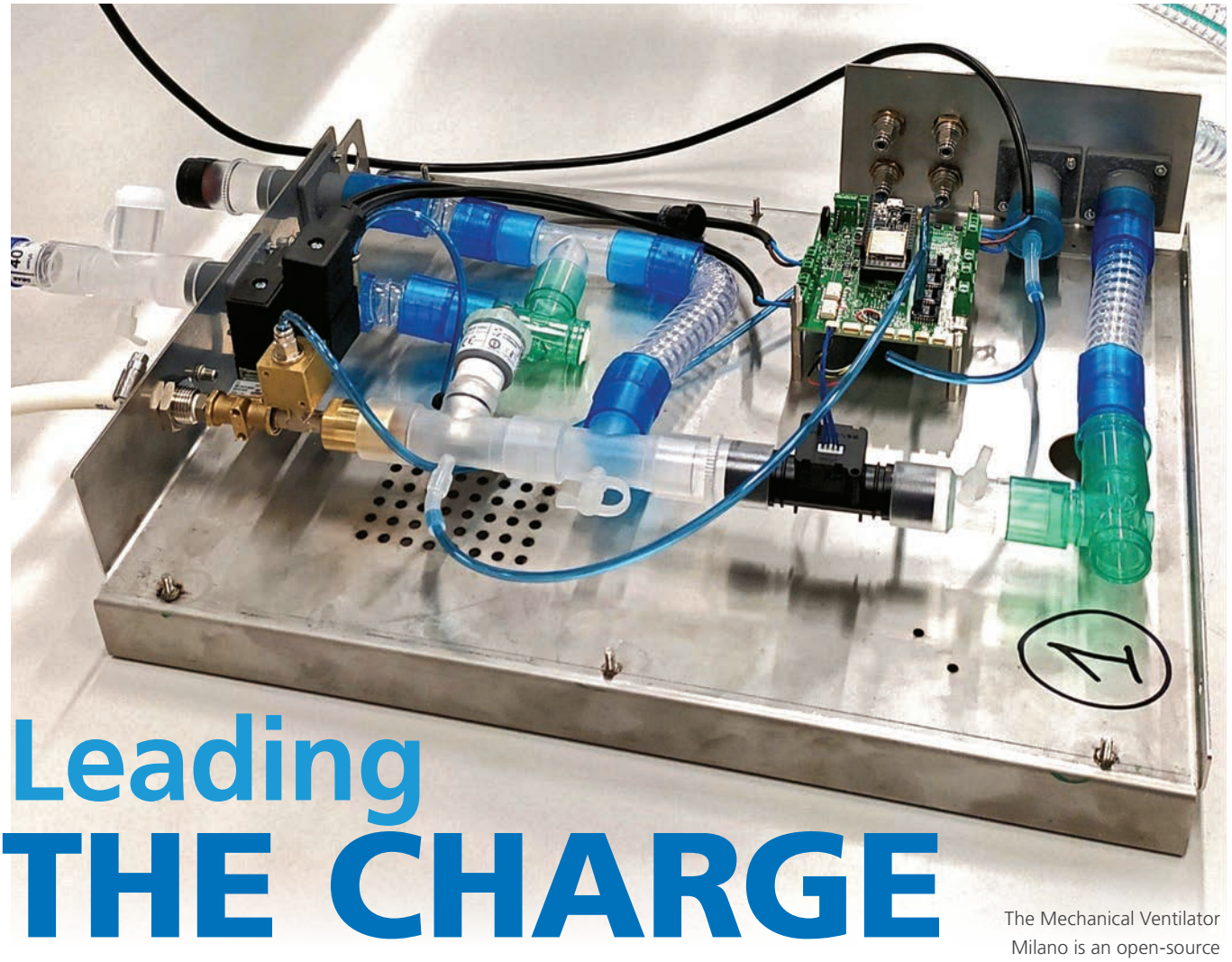
And, of course, they'll continue to use the FARO Design ScanArm and Geomagic Design X to keep building cool cars.

"There is nothing that we can't build at this point," Kindig says. "If we can dream it, we can build it. Quite literally, within a couple of hours, I have it ready to go." DE

**www.kindigit.com**
**www.faro.com**



Kendig-It Design used the scan data of the Karmann Ghia to design a chrome grill in Geomagic Design X to fit the dimensions and match the curves of the historic car. (PHOTO CREDIT: FARO)



# Leading THE CHARGE

The Mechanical Ventilator Milano is an open-source ventilator in development in Canada by the Ventilators for Canadians consortium, which includes JMP Solutions. (PHOTO CREDIT: JMP SOLUTIONS).

## Canadian machine builders' innovations help medical staff confront COVID-19.

By Treena Hein

During this pandemic, frontline heath care workers are critical to saving lives. To do that, however, they need the right healthcare equipment and plenty of it. Given the projected shortages of critical medical supplies, including ventilators, masks and other personal protection equipment, Canadian engineering companies have been mobilizing their teams to battle COVID-19, with promising results.

For example, London, ON-based JMP Solutions helped form Ventilators for Canadians (V4C), a consortium of entrepreneurs who intend to mass produce an open-source field-hospital-style ventilator called the Mechanical Ventilator Milano (MVM). Designed by a multinational group spearheaded by Princeton University physicist, Cristiano Galbiati, the MVM features a simple yet reliable construction, it's creators say.

Inspired by the 1961 Manley ventilator, the MVM controls the flow of gas via two normally-closed proportional valves that alternately open and shut throughout the respiratory cycle. Pressure is dynamically adjusted based on a complex fail-safe feedback control loop implemented by multiple pressure sensors controlled by an Arduino-compatible micro-controller in conjunction with a Raspberry Pi to handle the user interface.

JMP President and CEO Scott Shawyer explains that MVM ventilator's simple design allows it to incorporate readily-available components, which not only speeds assembly but also makes it easier to source the necessary parts. "[The MVM] doesn't need to look as pretty or be as compact as a conventional ventilator," he adds, "nor have all the functionality."

While it may suffer on looks, preliminary simulation tests run on the MVM showed that it out-performs commercial ventilators in regard to COVID-19 patients due to two key differences.

First, the MVM maximizes intake flow at the start of the inspiration phase which helps reopen the lung's small alveoli. However, pressure is increased gently and evenly during the last fifteen percent of air intake which prevents lung trauma and minimizes the long-term muscle fatigue that can happen

during forced mechanical ventilation.

According to Shawyer, manufacture of the MVM will begin now that approval has been gained from Health Canada. In late April, Shawyer said he expected JMP Solutions to begin mechanical assembly of the units in early May while Ontario-based electronic manufacturer, Vexos, would install the electronic components, test the machines and ship.

"It's been great to see how many people want to be involved and how much energy there is, but the flip side of that is there are so many people involved and so much energy. It's very complex," Shawyer says.

"There are multiple streams happening in parallel, with teams working together but also independently: Documentation, regulatory compliance, mechanical, electrical, software, testing, etc.," he adds. "We have about seven calls every day involving people in multiple countries, and we are working out roles and responsibilities. And every day it gets better and better."


The TidalPump, designed and built by Barrie, ON-based Innovative Automation, turns a common resuscitator bag into a mechanical ventilator. (PHOTO CREDIT: INNOVATIVE AUTOMATION)

## The TidalPump

Meanwhile, Innovative Automation in Barrie, ON has created a ventilator called the TidalPump, which is also awaiting approval from Health Canada. Designing a medical device was a big change from design for automotive manufacturing, says Trefor Armstrong, the company's application specialist.

"We were able to speak with a respiratory specialist at the very beginning of the project to understand exactly how the lung functions and what's needed in a mechanical ventilator," he explains. "In conjunction with Dr. Gantous at St. Joseph's hospital in Toronto, we came up with a simple way to actuate a resuscitator bag. We called our device the TidalPump because we're pumping a resuscitator bag to produce tidal volume."

The Innovative Automation team chose not to incorporate sensor feedback into the design, as that would place it in a medical device category requiring much more testing. The design did need to be compact and use lightweight materials where possible. At the beginning, a lot of the prototype's parts were 3D-printed before being machined out of appropriate materials.

In medical design, a material's 'appropriateness' relates to its ability to be sanitized by standard disinfectants and whatever disinfectants health care facilities had to start using as the pandemic progressed. Armstrong says workers at one hospital they spoke to had been using bleach wipes after running out of the usual alcohol cleaner.

Armstrong is happy to report that finding other parts needed for the TidalPump has gone very well, as has the planning for their production in large quantities.

"Some of our suppliers had their overseas plants manufacturing more of the product in case we needed more than what was in their North American stock," says Armstrong. "Some suppliers even created custom part numbers for us by manipulating a product they already had to meet our needs."

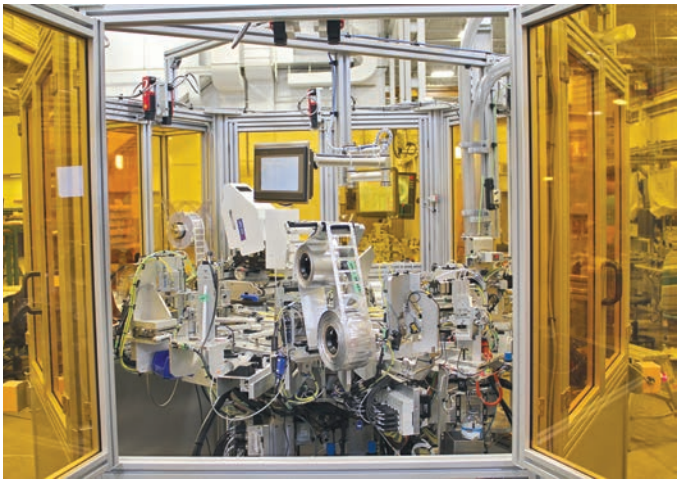
## Masks and more

For machine builders, like Eclipse Automation, the medical sector has been a key part of their business for years. Now, however, the company is applying that expertise to expedite the build of machines for making n95 masks. The Cambridge, ON automation firm recently announced it had secured North American rights for the equipment from China's Harmontronics.

CEO Steve Mai believes that to truly achieve security in the making of protective health care equipment, the entire process must be controlled from the start. He explains that Eclipse's role in this project is to facilitate any modifications necessary to ensure the machines are within the regulatory standards for North America, from an electrical and safety point of view.

"It isn't really a challenge for us; it is part of our expertise," he says. "Coordinating and validating that a system does what is expected of it by our customers is a crucial part of our service."

With its partners, Eclipse is ensuring the machine's motors, electrical systems and so on meet UL certification standards, so validation proceeds quickly. The company is also ensuring that installation, commissioning and training will be in line with North American standards. Raw materials for the masks



Cambridge, ON-based Eclipse Automation is applying their automated expertise to producing medical system, like this one, to mass produce N95 masks. (PHOTO CREDIT: ECLIPSE AUTOMATION)

are being certified as well.

Eclipse has also been called on to build machines that produce disposable medical 'test cards' for evaluating a patient's condition, such as respiratory capacity. These cards hold reagents which react with a droplet of blood; the healthcare professionals can then read the results using a handheld device. Mau reports that the design for the machine was finished in April.

In the design process, Eclipse uses its ISO-integrated GAMP (Good Automated Manufacturing Practices) methodology, designed to interpret validation requirements and apply them to all aspects, directly or indirectly, of the customer's desired automation processes.

"For this recent point-of-care application," Mau explains, "we are using this methodology on the following processes for a turn-key automated process: Precision nano liter dispensing processes, visual high-end custom algorithm volume inspection/qualification, multiple-station precision small-part handling and assembly, integration of robotic part transfers, and downstream packaging."

## Multiple Fronts

Cambridge, ON's ATS Automation Tooling Systems has been working on many fronts to help stem the pandemic. The company is working with a large U.S. automaker, for example, to reconfigure its manufacturing facility and has delivered equipment to the site for large-scale production of filtering facepiece respirators.

The ATS team is also supplying ventilator production test equipment to two key U.S. ventilator manufacturers. Here in Canada, the international automation firm is working with O-Two Medical Technologies Canada to assemble ventilator components at ATS facilities.

In Germany, ATS engineers are developing faster manufacturing of COVID-19 test kits. Similarly, the company landed a $65 million deal from New York's Tessy Plastics to design and build two automated systems capable of producing 10 million COVID-19 testing kits per month.

In Italy, ATS company Comecer is developing an automated bio-decontamination system for hospitals based on the same technology used in Comecer's aseptic isolators. This will allow fast decontamination of hospital rooms and equipment, explains ATS CEO Andrew Hider, as well as potentially enable reuse of protective items such as n95 masks.

Developed by ATS Automation, this rapid tube-filling machine can fill products with an alcohol content of up to 70 per cent at an output of up to 4,200 tubes per hour. (PHOTO CREDIT: ATS AUTOMATION)

IWK, an ATS company in Germany with expertise in packaging solutions, has developed a rapid tube-filling machine for protective hygiene products including hand sanitizer. Hider says this special FP10 Tube Filler can fill products with an alcohol content of up to 70 per cent at an output of up to 4,200 tubes per hour.

Speed has obviously been of the essence in the design and manufacture of these machines, and Hider says they are being produced in batches to ensure a delivery worldwide within two to three months.

"The challenges are mainly to get all required sub-suppliers and parts manufacturing equipped with the necessary capacity within shortest time, which the team did a great effort together with our partners," he says.

"IWK will further invest in supporting global COVID19 actions and build up capacity to be able to supply the machines to all parts of the globe within shortest time possible." DE

**www.jmpsolutions.com**
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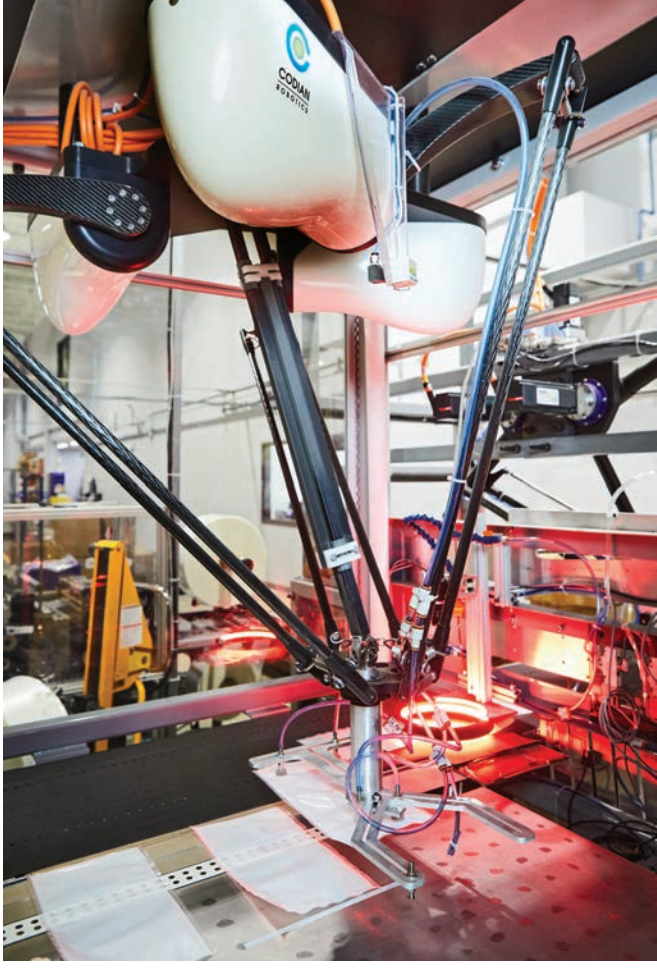
# ROBOTICS INTEGRATION BOOSTS PRODUCTIVITY

Quebec-based Labplas boosts sterile sampling bag production with integration of PC-based control and robotics.

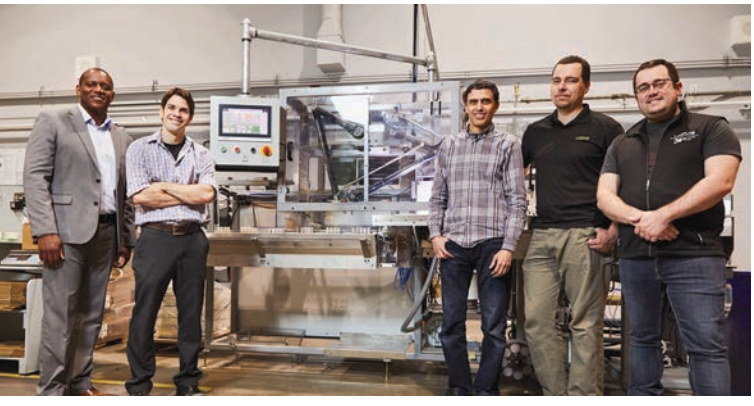


Through the use of pick-and-place robots and TwinCAT Kinematic Transformation software, among other things, Labplas's engineering team automated the assembly of sampling bag sets, which made the process six times faster. (PHOTO CREDIT: BECKHOFF AUTOMATION)

Canadian manufacturer Labplas specializes in the customer-specific production of sterile sampling bags and accessories in the most diverse dimensions and develops its own production machinery. In a redesign with PC-based control, the company has been able to increase productivity and integrate pick-and-place robots, which replace the manual insertion of accessories into the bags.

Labplas has grown exponentially since its founding in 1987. Based in Sainte-Julie, Quebec, the company serves customers in the food, agriculture, environmental, veterinary and pharmaceuticals industries. The company offers sterile sampling bags, testing wand kits and environmentally friendly biodegradable bags. Attention to demanding quality standards is crucial for manufacturers in the aseptic sampling industry. After all, sampling bags must carry sampling sponges, food items, pharmaceuticals or organic matter for testing in labs while protecting against contamination.

The ability to meet individual customer needs is a unique selling point for Labplas. Therefore, the company designs, builds and implements leading-edge manufacturing technologies. With its tailor-made machine line, Labplas creates custom products ranging from 3- to 33-inch-wide bags in various material types with few changeovers.



(From left): Beckhoff Area Sales Manager, Ted Sarazin; Labplas R&D Department Manager Christian Fontaine; Project Manager, Chafik Echehab; Automation Project Manager, Christian Roy; and Automation Project Manager, Guillaume Faucher. (PHOTO CREDIT: BECKHOFF AUTOMATION)

"We believe we have one of the best technological platforms in the world for these products, but we continuously improve our systems through automation to achieve even higher throughput for a larger number of products while maintaining our agility," says Benoit Brouillette, general manager for Labplas.

## Modular Control

During a recent redesign of several of Labplas' MM series production lines, the company implemented additional robotics and GigE cameras to improve throughput, repeatability and quality assurance. However, the key for Labplas in any machine upgrade is carefully considering the control platform down to the component level so that they remain versatile enough to produce custom products.

Most recently, the company wanted to upgrade its assembly technology to form sampling bags and insert the sampling accessories, such as sponges, cloths, spoons or scissors, with a robot arm instead of manually. To achieve the design upgrade of the lines, Labplas considered different form-fill-seal partnerships and designed a new way of integrating this equipment with a six-axis delta robot.

To achieve this, all the components needed to work together in real-time without cross-vendor communication issues, while

collecting data for reporting and process improvement. The redesign was expected to increase throughput and make it easier for operators and maintenance personnel to move from one line to another.

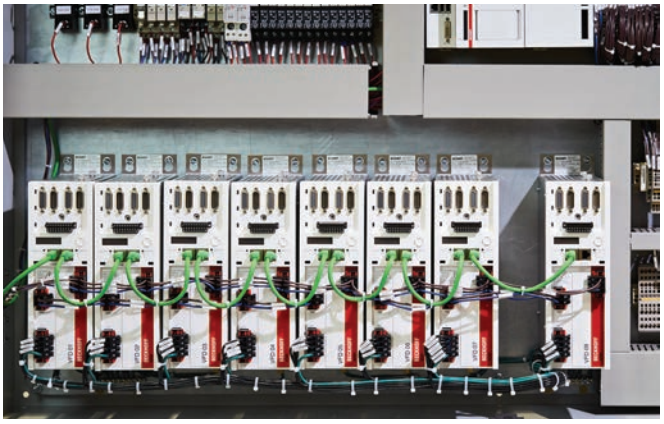
Since traditional PLCs from a previous vendor couldn't support the robotic and other requirements, Labplas selected Beckhoff as their new automation partner. During the implementation, Labplas R&D Department Manager Christian Fontaine and his team worked hand-in-hand with Beckhoff Canada applications and support engineers under the direction of Beckhoff Area Sales Manager Ted Sarazin.

## Powerful Drive Tech

Motion control hardware and TwinCAT 3 automation software from Beckhoff had large impacts in the machine redesign. Labplas now uses robots across 15 of their lines, and the pick-and-place robots and other motion axes are fitted with AM8000 servomotors for dynamic applications controlled by AX5000 EtherCAT servo drives.

They connect to the drives using One Cable Technology (OCT), which reduces wiring by combining power and feedback in a single cable. Labplas also chose to include the TwinSAFE drive card with built-in Safe Torque Off (STO) and Safe Stop 1 (SS1).

"With TwinCAT Kinematic Transformation, high-precision movement is possible even at high speeds and accelerations due to integrated dynamic pre-control," Sarazin says. "Most importantly, the powerful TwinCAT suite makes it possible to not only control the Codian robots, but also the entire machine line in real-time."



Beckhoff's CX2030 Embedded PC, with directly connected EtherCAT Terminals for real time communication and data acquisition, serves as main line controller, while the AX5000 servo drives control the AM8000 servomotors of the robots across several lines.
(PHOTO CREDIT: BECKHOFF AUTOMATION)

## Industrial-grade Hardware

Engineers and operators interact with Labplas' MM machines via CP29xx control panels. The panels are connected to a DIN rail-mounted CX2030 embedded PC via Beckhoff's CP-Link 4, a one-cable solution that combines video signals, USB 2.0 and power supply in a standard CAT 6 cable. The PC-based controller features a dual-core Intel Core i7 processor and serves as the main machine controller for the lines.

"On the MM9 iteration, for example, the small embedded controller has to deliver the processing power needed to drive our complex machine with seven axes of motion along with one five-axis and two three-axis Delta robots, and still have available CPU bandwidth for quality monitoring and potential self-healing software," says Fontaine.

The Beckhoff controllers also provide ample processing power for third-party software that runs in a Windows environment, including a customized AI solution that Labplas is implementing for quality control.

Space-saving high-density (HD) EtherCAT Terminals from Beckhoff with 16 channels connect with sensors, valves, terminal cards, solid-state relays (SSRs) and other devices on the machines.

By implementing open, PC-based solutions, each upgraded line achieved an ROI of less than one year, Labplas says. The company also increased the flexibility of its machines to produce more sizes with fewer changeovers.

In addition, the company enabled processes for enhanced quality control and the use of robotics to complete processes quickly and at the highest quality. Beyond increasing quality assurance, Labplas also boosted throughput, achieving an average productivity gain of 25% on its redesigned machines. DE

**www.labplas.com**
**www.beckhoff.com**

# PICK • PATH • PLACE

## Universal Robot's ActiNav kit puts autonomous bin picking and CNC machine tending within reach of SMEs.

While commercial cooperative robots (cobots) have been available since the early 2000s, their popularity didn't exploded until the past three to four years. In 2018 alone, global cobot market revenues grew to approximately US$567 million, a 56.6% increase over 2017.

Similarly, cobots shipments that year totaled roughly 19,000, a year-on-year increase of 68.0 percent. According to market research firm, Interact Analysis, the cobot market will reach $5.6 billion in 2027, accounting for 30% of the total robot market.

Given the growth potential, both traditional robot companies and new comers have entered the market but it is dominated by only a few. Between them, Denmark's Universal Robots and at a distant second, China's Techman Robots, own approximately 50 percent of the global market share.

As a result, UR has leveraged its global dominance in a Microsoft Windows-like manner – they create a popular, near-ubiquitous platform to which third parties are invited to hitch their wagon. The company's UR+ ecosystem encompasses multiple partners – including Montreal-based Vention and end effector maker, Robotiq – who've developed robotics accessories specifically tailored and certified to work with UR's line of cobots, right down to sharing a common software UI design.

More recently, the company has expanded the ecosystem concept to include UR+ kits, groupings of UR+ components tied to a UR robot, that address a common industry function or application. Announced in April, the company's latest UR+ kit, ActiNav, focuses on machine tending; that is, using a robotic system to pick-and-place metal or plastic parts to and from processing machines, including drilling, deburring or tapping operations up to full CNC machining.

"Machine tending has always been one of the mainstay applications for our collaborative robot arms," said Jim Lawton, VP of product and applications management at Universal Robots. UR estimates, based on U.S. and EU Bureaus of Labor Statistics data, that nearly 21 million employees globally count machine tending as part of their work function, a number higher than those involved in assembly. Considering that machining operations often involve batch runs of identical parts that spend 10 to 90 seconds being machined, such employees are chronically under-utilized, stuck performing dull and potentially dangerous work, the company says.

"We discovered a significant market need for a simple solution that enables UR cobots to autonomously locate and pick parts out of deep bins and place them precisely into a machine," he adds. "This is not pick and drop; this is accurate pick and part-oriented placement."

Unlike most machine tending robotic solutions, UR says ActiNav doesn't require parts to be presented to the robotic arm uniformly; that is, in a particular orientation and/or laid flat on a tray. Instead, the system can accommodate large batches of parts dumped, like popcorn, into a deep bin.

In addition to UR's collaborative robot, the ActiNav kit incorporates a laser-based 3D scanner vision sensor that generates a point cloud of the parts in the bin. A CAD model of the part, imported into the system, allows the system to visually recognize individual parts, pick them on pre-defined pick surfaces and then orient parts consistently as they are placed in a chuck or other workpiece-holder. To process the vision data and calculate the robot's motion, the kit includes UR's Autonomous Motion Module (AMM).

"People know, or think they know, that bin picking is complicated and risky, especially when the part needs to be placed in an oriented and precise location," said UR product manager, Eric Andersen. "ActiNav is designed to change that. It accounts for the whole end-to-end challenge of not only locating and picking the parts, but also navigating the robot through the space in a collision-free way to place them in a precise and oriented way."

According to the company, the system doesn't require vision or robotic programming expertise, but instead relies on the "teach-by-demonstration" principle. Using a combination of manual manipulation and a tethered tablet interface, UR's Teach Pendant, users define the boundaries of the environment and the pick and place end points, as well as which part surfaces are appropriate for the pick. The system then calculates how to pick up each part and move through the environment without colliding with the bin's walls, the machine or anything else defined within the system.

Despite the ActiNav's relatively steep price tag relative to other cobots (roughly US$100k including either the UR5 or UR10 cobot, one of two available 3D sensors, frame, choice of end effector and the motion module), UR estimates an 18 month ROI for the system based on a two shift operation. In addition, the company says that since ActiNav solves the vision and motion components of machine tending, and can be taught "in place" using the manual demonstration method, it significantly reduces deployment time.

"We're typically targeting companies that have 20 to 40 machining stations," said Andersen of the ideal ActiNav customer. "Not all of those stations will be suited but when we walk through any facility with more than 20 stations, we almost always identify two to five that are perfect for ActiNav."

"At the same time, automating some machine tending stations will require further expertise," he adds, "because customers will need to automate the unload, or program an inspection camera so this product is a great fit for our system integrators partners as well." **DE**

**www.universal-robots.com**

## Automation

### Soft Gripper

OnRobot unveiled its FDA-certified Soft Gripper that's able to pick irregular shapes and delicate items in food and beverage, cosmetics and pharmaceuticals production, as well as manufacturing or packaging. The gripper uses three interchangeable silicon-molded cups in star and four-finger configurations to pick up almost any small object under 2.2kg (4.8lbs). It also complies with FDA 21 CFR for non-fatty items and EC 1935/2004. Unlike traditional vacuum grippers, it requires no external air supply, so it can reduce both cost and complexity. The One System Solution now integrates with robots from ABB Robotics and Hanwha Precision Machinery.

**www.onrobot.com**

### PLC Controllers

WAGO has added two Generation 2 PFC200 PLC controllers along with two Generation 4 Ethernet based couplers to its XTR line of products. The 750-8212/040-010 and 750-8213/040-010 XTR controllers have two configurable M12 Ethernet ports and an onboard SD card slot for additional data storage for program updates. The 750-8212/040-010 has one configurable RS232/485 port, while the 750-8213/040-010 comes equipped with one CANopen port to connect to engine parameters via J1939. The 750-364/040-010 MODBUS TCP/UDP and 750-364/040-010 EtherNet/IP couplers each sport two M12 Ethernet ports with the rotary switches configuring the last byte of the IP addresses. All four of these devices feature a -40°C to + 70°C operating temperature range, 5g vibration and 25g shock and EMC protection.

**www.wago.com**

### Pitch and Roll Stages

Optimal Engineering Systems, Inc. (OES) introduced two pitch and roll stages for the measurement of angles and the curvature of objects. The PR100-45-01 (pictured) is driven by stepper motors while the PR100-45-02 features brushless servo motors with quadrature incremental optical encoders. The pitch axis (lower stage) is a high precision goniometer stage, featuring preloaded cross roller guides and a high-ratio worm drive for motion over a range of travel of +/- 45 degrees. It has a typical accuracy of 0.05 degrees and repeatability of +/- 0.01 degrees. The 100mm diameter roll axis (upper stage) has a 180:1 gear ratio, an accuracy of 0.05 degrees and repeatability of +/- 0.01 degrees.

**www.oesincorp.com**

## Industrial Networking

### Industrial Ethernet Switch

Westermo has developed a next generation industrial Ethernet switch platform designed for handling big data and IIoT applications. Powered by the WeOS operating system, the line includes the Lynx 5512, a 12-port switch and the RedFox 5528, a 28 Gigabit port switch for aggregating large industrial networks over long distances. The Lynx 5512 offers complete layer 2 functionality and increasing layer 3 functionality. The device has four SFP fibre ports and is suitable for operation in temperatures ranging from -40 to +74°C without the need for cooling. The RedFox 5528 also offers full layer 2 functionality and expanding layer-3 functions, as well as a redundant power supply and up to 16 Gigabit fibre ports. Both switches have industrial, trackside and marine approvals and offer extended cybersecurity and time synchronization IEEE 1588v2 applications.

**www.westermo.com**

### IoT/M2M Gateway

Antaira Technologies unveiled its AGS-7230-AC-T-US, an industrial dual-radio wireless router with a Modbus gateway which is designed for industrial and enterprise wireless access applications. The gateway features 802.11a/b/g/n/ac wifi with selectable 2.4 or 5Ghz frequencies. With MiMo technology, the wireless radio supports high-speed data transmission of up to 867Mbps. The AGS-7230-AC-T-US is capable of MQTT and Modbus Gateway and permits Modbus RS485 networks to connect directly to the device, converting the signal from Modbus ASCII/RTU to Modbus TCP. According to the company, the units allow users to position the wireless antennas in a better signal-broadcasting location for improved wireless coverage and signal strength.

**www.antaira.com**

### Industrial Ethernet Switch

Moxa introduced its EDS-2000 series of unmanaged Ethernet switches featuring up to 16 Ethernet ports and two Gigabit combo ports. The switch line enables fiber uplinks of more than 100 meters due to

the two Gigabit combo ports on several EDS-2000 models. The Moxa EDS-2000 Series features DIP switches on the top panel to enable Quality of Service (QoS) and Broadcast Storm Protection (BSP). It is available in five designs within two families: the EDS-2000-EL and the EDS-2000-ML. The entry-level EDS-2000-EL Series is designed for general automation, while the EDS-200-ML is intended for mission-critical automation in hazardous locations. Both feature high EMC resistance and an IP40-rated housing to withstand harsh environments, extreme temperatures (-40 to +75° C), vibrations and shocks.
**www.moxa.com**

## Fluid Power

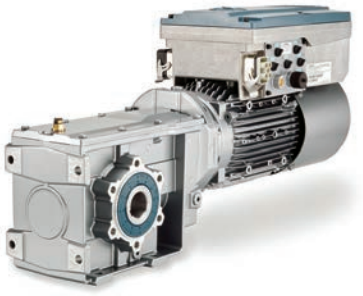
### Valve Controller

Festo's introduced its VAEM solenoid valve controller designed for applications requiring high speed and a low coefficient of variation (CV). The VAEM provides individualized control and calibration of up to eight solenoid valves and can open a valve in under 2 milliseconds. The controller also decreases CV from 3% to less than 0.5% in laboratory benchmark testing. The VAEM employs a "hit and hold" strategy to lower energy consumption. A short burst of high current "hits" the open position, and then the valve controller switches to a minimum current to "hold" the open position for a specified time. VAEM valve controllers are suitable for 2/2- and 3/2-way solenoid valves. They feature RS232 communication currently but future iterations will have options for Ethernet, Modbus TCP and IO-Link. A PC-based GUI facilitates pre-calibrating the dispense heads and to save the control parameters for standalone operation. External 24V trigger-input synchronizes the VAEM with other systems.
**www.festo.com**

## Motor Controllers

### Motor-integrated Drive

Siemens introduced its Sinamics G110M, a motor-integrated drive for the company's Simogear gear motors. With protection up



to IP66, the 110M gear motor drive comes pre-configured and includes onboard diagnostic features. Options include internal braking resistors and motor brakes, as well as integrated features such as "Quick Stop" and a limit switch function. The Sinamics G110M also offers integrated safety functions such as "Safe Torque Off" (STO), which can be activated via a fail-safe input or via Profi afe, without needing additional safety monitoring components. The gear motor drive also features integral USS/Modbus RTU, Profibus and Profinet / EtherNet/IP communication profi es.
**www.siemens.com**

## Motor Control Systems

igus released two control systems for the company's motorized drylin E drive axes. The D3 dryve controls simple linear or rotations axes with DC motors without software or a PC. Users connect the D3 dryve to a 24V power supply and set the operating mode, end-position switch-off and the motor current via DiP switches. The speed can be adjusted with an integrated rotary controller. Designed for more complex travels, the D1 can control stepper, DC motors of EC/BLDC motors. Its user interface is accessed via a web browser and IP address. The "motor" menu item is used to load all settings, either for igus or other motor suppliers. User can also use the menu to enter the settings for the linear or rotational axis as well as to set the route and feed rate. Networking with a higher-level control unit, such as a PLC, is also possible via Ethernet or CANOpen.
**www.igus.com**

## Motor Control Relays

AutomationDirect now offers the ProSense series, a 10A-rated phase motor control relay that provides protection against premature faults on 3-phase systems. The 120VAC alternating relays, used to optimize load usage, are available in SPDT or DPDT configurations; an onboard switch selects alternating or single-load operation. The pump relays give an alarm indication of a leaking seal and automatically reset when the fault condition clears. These relays include an LED fault indicator and are available for single or two-pump monitoring. The Macromatic intrinsically safe relays allow control of up to four loads with up to four corresponding discrete input devices. The onboard SPST relays operate at either AC or DC coil voltage ratings. All models offer finger-safe design and include LED status indicator(s) and are 35mm DIN rail or panel mountable.
**www.automationdirect.com**



## Motors

### AC Servos

Mitsubishi Electric Automation announced the release of its next generation MELSERVO-J5 Series of AC servo motors, amplifiers and motion control units. The series now includes a "quick tuning" function that allows users to tune servo mechanisms in

approximately 0.3 seconds. The servo amplifier sets the speed loop gain and suppresses machine resonance through the servo-on command. Additional functions and features include an advanced vibration suppression function, multi axes servo amplifiers, expanded predictive maintenance capabilities, a 31.25µs communication cycle time and compatibility with CC-Link IE TSN and EtherCAT.
**https://us.mitsubishielectric.com**

## AC motors

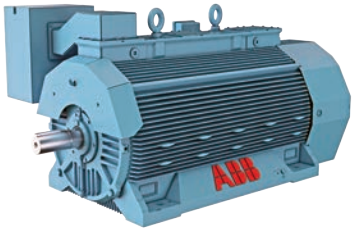
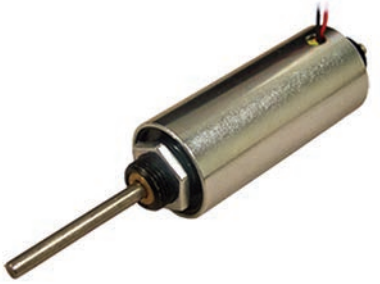



ABB released its Above NEMA (ANEMA) NXR 7100 motor line, which offers more hp per pound than conventional TEFC (totally enclosed fan cooled) motors, the company says. The series is Class I Div 2 capable and features an internal cooling loop that circulates air inside the motor, moving heat from the rotor to the frame, where an external fan blows air over the frame to remove the heat. NXR 7100 motors extend the power range of the existing NXR 5000 and NXR 5800 up to 1750 hp while offering the same features. These motors are available with up to an IP56 rating, for protection against contaminates and dust ingress.
**www.abb.com**



## Linear Actuators

Moticont introduced its DDLM-019-044-01 non-commutated linear actuator. The actuator has a 0.750 in. (19.1mm) diameter and 1.750 in. (44.5mm) housing length with a stroke of 0.460 in. (11.7mm). The linear actuator can develop 11.0oz (3.1N) of continuous force and 34.8oz (9.7N) peak

force. Its 0.125 in. (3.2mm) diameter shaft has an internal thread on each end, a total of length of 3.460 in. (87.9mm), and extends 1.085 in. (27.6mm) past the mounting end of the actuator. The shaft extends through the 3/8-32 UNF x 0.250 in. (6.4mm) long threaded studs at each end of the housing which can be used for mounting. Long life plain linear bearings support the internal shaft at both ends of the actuator.
**www.moticont.com**

## Sensors

### Linear Position Sensors

Alliance Sensors Group has added the SS-7 Series to its line of ME, MR and MHP Linear Position Sensors. The company's ME (embedded version) , MR (port-mount version), MHP (port mount 25mm hex housing) and SS-7 (Subsea port-mount) Series fit into a gun-drilled cylinder in the same way a magnetostrictive sensor would. The ME/MR/MHP/SS-7 sensors operate in

temperatures up to 85°C for standard products and 125°C for custom units. Resembling a magnetostrictive sensor, the ME/MR/MHP/SS-7 has a shorter stroke-to-probe length ratio and can thread into the same o-ring bosses (either SAE J1926-8 or ISO 6149-1 M18) that accept a magnetostrictive sensor. The IP-67 sealed housing uses no trimmer pots for setting Zero and Full Scale. Instead, ASG's proprietary Sen-Set calibration feature permits the user to match the analog output of the sensor to the motion of the actuator or cylinder on a stand-alone basis.
**www.alliancesensors.com**

### Radar Level Sensor

Endress+Hauser launched its Micropilot FWR30, a cloud-connected radar sensor, designed for level measurement and inventory management of mobile and stationary plastic tanks. As the world's first 80 GHz wireless IIoT sensor, the instrument continuously records liquid level measurement data via an integrated SIM card. An integrated battery allows operation without an external power supply. The free radiating measuring device covers measuring ranges up to 50 feet and temperatures between -4 and +140°F. Because it uses non-contact measurement, the Micropilot FWR30 can be used in all liquid media and is resistant to corrosion, abrasion, viscosity or toxicity.
**www.us.endress.com**


### Programmable Angle Sensors

Novotechnik U.S. released its Vert-X 37E Series of programmable touchless rotary sensors that are hermetically sealed, without any moving seals, to the IP68 rating standard. The absolute sensor series can be programmed for the slope of the linear output, zero and end-points, mid-point and switch steps. The Vert-X 37E's feature set include 0 to 360° measurement range limits, 5V and 24V supply versions, up to two switch outputs, resolution to 14-bit, linearity is ≤ ±0.3% and repeatability of ≤ 0.1°. MTTF is more than 50 years. Output options include 4 to 20mA, 0.1 to 10V, 0 to 4.5V, 10 to 90% of supply voltage, SPI and PWM.
**www.novotechnik.com**

# PROGRESS BEGINS HERE

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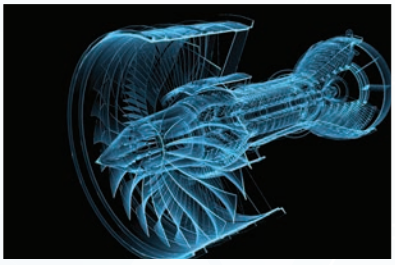

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