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FROM THE ARCHIVES

The August 1965 issue of *Canadian Plastics* reported on a new line of Italian injection molding machines just made available in Canada through Toronto-based sales firm B.J. Danson & Associates Ltd. The Metalmeccanica line of machines were introduced at a reception at the company's office in July, which drew scores of local industry members as well as Italian representatives and the senior commercial attaché from the Italian Embassy. The first Danson/Metalmeccanica unit – a Model 8SR with a 70-ton clamp and three-ounce shot capacity – was sold shortly after to custom molder Glenn S. Wooley.

Number of the month:

6*

* The number of in-house 3D printers owned by Italian startup firm Issinova. (See pg. 5)

Cover photo, p3,p10: © Jezper - stock.adobe.com

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COVID-19 reaffirms the importance of plastics

What a difference a few weeks makes.

Until the coronavirus started its deadly spread across the globe, 2020 was shaping up to be an *annus horribilis* for our industry – and a great year for the anti-plastics advocates – with serious plastic-use restrictions finally taking hold. A growing list of consumer companies – including Coca-Cola Co., which produces about 117 billion plastic bottles each year – had set targets to reduce their reliance on plastic packaging. France prohibited single-use plastic plates, cups, and cutlery starting January 1, and England was set to enact restrictions on plastic straws and stirrers starting in April. As late as March 1, New York joined a number of other cities around the world in banning the distribution of plastic shopping bags by retailers.

But the COVID-19 pandemic has shifted the world's priorities significantly. As an editorial in *Bloomberg News* in mid-March put it, "the virus plays right into the plastics industry's strong suits: disposability and hygiene." With health concerns at the top of people's minds, cities and states in the U.S. are changing course on banning single-use plastics during the pandemic, as many retailers are finding single-use plastics can give more certainty to employees that they're handling objects that haven't been contaminated. New York State's ban on plastic bags was meant to go into effect on April 1, but officials recently announced that they won't enforce it until after May 15. Likewise, Maine's legislature has decided that it won't enforce the state's plastic bag ban until next year over concerns that reusable bags may harbour more germs and could potentially spread COVID-19. Companies like Starbucks and Tim Horton's have announced that they will no longer refill reusable cups for customers, opting instead to only use disposable cups.

Further, plastics are a necessary component in many of the life-saving medical equipment that will become only more important in the coming weeks and months. Items like ventilators and medical masks will require plastic for production. And existing plastic items like single-use surgical gloves, syringes, insulin pens, IV tubes, and catheters all reduce the risk of patient infection.

So this must be a nervous time for the anti-plastics crusaders – including those in Canada's federal government. Almost completely overlooked amid the ongoing COVID-19 concern in Canada has been a development potentially more threatening to our plastics industry than the impact of the virus – because once the pandemic is over and things get back to normal, this new factor might still be here. As the *Globe and Mail* reported in mid-March, the Liberals are set to declare plastic a toxic substance under Schedule 1 of the Canadian Environmental Protection Act. This will give the government the authority to regulate and even limit certain products – making plastics processing, in essence, one step away from being illegal. A final version of a draft state-of-the-science assessment on plastic pollution will be released after public consultations on April 1, the *Globe*'s article said, and "will provide the government with the scientific basis to regulate plastics."

It now remains to be seen whether this regulation – which environmentalists in Canada have been pushing for for decades – will unfold as planned. But how smart does the plastic-is-toxic argument look now, when the material is saving countless lives around the world?

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Canadian Plastics magazine reports on and interprets developments in plastics markets and technologies worldwide for plastics processors, moldmakers and end-users based in Canada.

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Italian startup 3D-prints medical valves for COVID-19 patients

The 3D-printed Venturi valves connect oxygen masks to respirators, which are typically used by COVID-19 patients suffering from respiratory complications.

Photo Credit: Cristian Fracassi/Issinova/Facebook

Desperate times call for desperate measures – and times are indeed desperate in Italy which, as of mid-March, had become a new epicentre of the COVID-19 pandemic, recording up to 700 deaths per day and resorting to drafting soldiers to help enforce a lockdown throughout the nation.

Adding to the crisis, hospitals were filling up to the point that they're running out of room and beds for patients, as well as running out of materials and tools to help anyone infected.

And for one hospital in the northern city of Chiari, near Milan, the situation became particularly deadly. This region of Italy has been hit especially hard by Covid-19, and the hospital in Chiari had approximately 250 coronavirus patients requiring breathing machines. But when the original supplier was unable to meet the sudden high demand in mid-March, it ran out of the valves – called Venturi valves, after 18th century Italian physicist Giovanni Battista Venturi – needed to connect oxygen masks to respirators used by coronavirus patients suffering from respiratory complications.

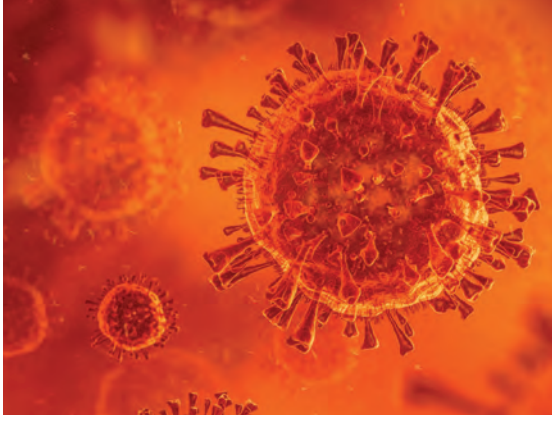
Local officials contacted Cristian Fracassi, founder and CEO of 3D printing startup firm Issinova, located in the nearby city of Brescia. When they weren't able to obtain design information from the valve's manufacturer, Fracassi and his team realized they would have to reverse engineer the product themselves. Fracassi and Issinova coworker Allessandro Romaioli visited the hospital in person to inspect the valves, and then 3D-printed a prototype in six hours on-site, using a filament extrusion system. The new respiratory valve was tested on a patient and, when it proved to meet all requirements, Isinnova teamed up with LonatiSpA, another local 3D manufacturing company, to mass produce the valves using a polymer laser powder bed fusion process and custom polyamide-based material.

Issinova's six in-house 3D printers and Lonati's SLS 3D printer were able to print 100 respirator valves in 24 hours at the rate of one device per hour. The valves are currently in use in the Chiari hospital.

Responding to numerous expressions of gratitude on his Facebook page, Fracassi denied that he and his team had done anything heroic. "People were about to die, and we only did our duty," he wrote.

The company's achievement has been covered by media around the world and – Fracassi's modesty notwithstanding – their actions inspired thousands of people who decided to use their 3D printers to create the most diverse health protection measures: masks, face shields or functional tools hindering the spread of coronavirus. **CPL**

Plastics industry responds to COVID-19 pandemic



As COVID-19 continues to spread, plastics and petrochemical manufacturers are facing unprecedented challenges and opportunities across the globe.

In Canada, both Ontario and Quebec ordered all non-essential businesses to shut down in an effort to help contain the virus. The order in Ontario came into effect on March 24 and – as of this writing – will remain in place for at least two weeks. In Quebec, Premier Francois Legault ordered all non-essential businesses to close on March 24 and until at least April 13. As businesses that extract, manufacture, process, and distribute goods, products, equipment, and materials, most – if not all – companies in the plastics and chemical sectors have been declared essential in those provinces, and will not shut down.

And that extends to newer processing technologies like 3D printing. "Several of our clients are classified as essential services, and as part of their supply chain we're open to support them," said David Slimowitz, president of 3D printing technology provider Additive Metal Manufacturing (AMM) in Concord, Ont. "We've put protocols in place with respect to cleaning and sanitizing of our offices and maintaining social distances and, where possible, our employees work from home."

Which means that it's not business as usual for AMM – or any other company, in Canada and beyond. As an aftermath of the pandemic, the plastics industry is seeing cancellations, work-from-home rules, and shipping complications with each passing day as companies have prioritized safety and prevention issues.

To take advantage of plastics processors and other manufacturers remaining open as essential services, the Ontario government has publicly called for the manufacturing sector to prepare to retool its production capacity toward making "essential equipment like ventilators, masks, and swabs," and a special "Ontario Together" website has been launched for companies and the business community to share creative solutions and submit proposals on how the government can quickly procure required goods and services.

FROM AUTO PARTS TO HEALTHCARE DEVICES

Globally, demand for plastics – particularly single-use plastic products in the healthcare sector – is expected to remain robust as hospitals scramble to respond as the coronavirus pandemic threatens to overwhelm their supply of critical medical devices. In one example of many, Evansville, Ind.-based packaging supplier Berry Global Group said it has shifted capacity to its maximum output of materials for products like hard-surface disinfectant wipes, face masks, N95 respirators, and other protective apparel. And processing and auxiliary equipment supplier Wittmann Battenfeld has been deemed an essential business by the State of Connecticut because many of its customers are ramping up production of vital plastics parts such as caps and closures used in hospitals, laboratory supplies, suction canisters, thermometers, heart valve replacements, and more.

Manufacturing sectors that are suddenly underutilized, meanwhile, are contributing to relieve shortages – in some instances by using 3D printing. Ford Motor Co. plans to build respirators and ventilators in partnership with manufacturing company 3M and GE Healthcare to aid medical workers; Ford says that it's also going to be building face shields, leaning on its 3D printing capabilities, with an anticipated production rate of more than 100,000 units per week. In addition, General Motors Co. is working with ventilation system supplier Ventec to rapidly scale up production of their respiratory products; and Fiat Chrysler Automobiles is tooling up to produce breathing masks in one of its own factories.

Overall, the response has been effective enough that environmental lobby group Greenpeace is accusing the plastics industry of "exploiting" the COVID-19 outbreak to lobby for increased use of plastic – what Greenpeace calls a "pro-pollution agenda."

UNCERTAINTIES FOR THE CHEMICAL INDUSTRY

For the chemical and resin industry, the COVID-19 pandemic spells dangerous uncertainty. For resin buyers, periods of calm are alternating with bursts of activity during the pandemic, as some processors take a conservative approach to ordering material while others are ordering extra resin in case supply channels are crimped or shut off. According to a mid-March report from online buying and selling site The Plastics Exchange, resin prices continued to hold relatively firm, although larger discounts were spotted for off-grade materials.

Among chemical producers, Germany's BASF – the world's largest chemical company by sales – is worried, and it's probably not alone. In a statement issued in February alongside its FY 2019, BASF said the viral infection could result in a second year of falling profit for the company and reduce global chemical production to about 1.2 per cent. That would be the worst growth for the sector since the Great Recession in 2008 and a significant dip compared to 2019, when it grew 1.8 per cent. Growth is especially being hampered in China, BASF's CEO Martin Brudermueller observed. "Lower demand and production outages in many industries are visible because of the measures taken to prevent the spread of the virus," he said. **CPL**

CPIA to dissolve, regroup under Chemistry Industry Association umbrella

The Canadian Plastics Industry Association (CPIA) and the Chemistry Industry Association of Canada (CIAC) have agreed to a transaction that will see the dissolution of the Toronto-based CPIA and a new plastics division created under the CIAC banner.

The merger – which is set to take place on July 1, 2020 – was first announced in November 2019, and was ratified unanimously during a meeting in Toronto in late February.

In a statement in early March, CPIA said the decision "follows an extensive due diligence process that determined the CIAC and CPIA have complementary strengths and committed members, but that the challenges for plastics require even greater collaboration." With CPIA president and CEO Carol Hochu having stepped down in mid-March, Jon Pyper, former CPIA board member, will take the helm as CPIA's interim transition leader to move CPIA through to the July 1 merger date.

CIAC is headquartered in Ottawa, Ont.

The main rationale for establishing the new CIAC plastics division, CPIA said, was to allow the plastics industry "to speak with a strong, unified voice and to move quickly in what is a fast-changing environment for plastics." The combination of the two organizations "will deliver a stronger, clearer. and more unified voice for plastics at a time when unity is needed by the industry to educate Canadians and different levels of government on the value of plastics and policy alternatives to product bans," added Joel Rudolph, chair of the CPIA board of directors.

More details of the transition and dissolution of CPIA will be released in the next few months, the two groups said. **CPL**

Former CPIA head Carol Hochu looks back

After eight years as president and CEO of the Canadian Plastics Industry Association – arguably the most important job in our country's plastics sector – Carol Hochu stepped down from the Toronto-based organization in mid-March. Just before she left, and as CPIA prepares to dissolve and reemerge as a new plastics division under the Chemistry Industry Association of Canada (CIAC) banner, Hochu talked with *Canadian Plastics* about CPIA's past, present, and future.

Q: When you took the helm in January 2012, what was the state of CPIA, and how did the organization change during your tenure?

A: When I joined CPIA the effects of the recession were still being felt, and CPIA had taken a hard look at itself and narrowed its priorities slightly, to focus on sustainability, issues management/opportunities, and outreach. After I became involved, our efforts towards sustainability involved diverting plastics from landfill towards recycling and recovery programs. We became the national voice for plastics sustainability in Canada, and I'm proud of that. As a result, the growth in the number of CPIA member companies that focus on the recovery of plastics and the circular economy has been significant.

We also began to partner more with other plastics industry associations to form a unified front against anti-plastics initiatives. We collaborated with the Plastics Industry Association and the American Chemistry Council in the U.S., which led to good results. And we also partnered with CIAC in 2018 to set two goals for the industry: an aspirational goal of 100 per cent of plastics packaging being reused, recycled or recovered by 2040; and an aggressive interim goal of 100 per cent of plastics packaging being recyclable or recoverable by 2030.

Q: Nationally and globally, the plastics industry came under unprecedented attack through bans and boycotts while you were leading CPIA. How did these affect CPIA's work, and how successful were you in pushing back?

A: When I started, one of the hallmarks of CPIA was that it led the way in successfully overturning a number of single-use plastic bag bans in Canada, beginning with Toronto. That has transitioned more recently into fighting back against a broader, more global campaign against plastics, which is a harder fight because it's a phenomenon beyond Canada. The marine litter issue, driven in part by images on social media, captured the hearts and minds of people around the world. Add to that China's National Sword policy, which banned the import of most plastics and other materials headed for that nation's recycling processors, and it created a strong global backlash against plastics, leading to broader deselection attempts.

CPIA worked hard to set the record straight, to work with key influencers at all levels of government, but I don't think our messaging to the consumer about the everyday benefits of plastic resonated as well as we hoped. People often didn't trust the positive information about plastics that we made available – such as life cycle assessments conducted by the governments of several countries proving that thin plastic bags have much lower environmental impacts than the alternatives – because they thought it was research that our industry paid for, when it wasn't.

Photo Credit: Canadian Plastics Industry Association

Q: How do you see the former CPIA functioning as a division of CIAC?

A: I supported the notion of the two groups coming together, and worked closely with CIAC executives to bring it about. Our collaboration with CIAC dates back to 2018, when we worked together to help develop, and then review and endorse, the G7 Ocean Plastics Charter.

Our two organizations complement each other quite well. CIAC is based in Ottawa, and are very effective at lobbying federally, while CPIA has always been stronger at the provincial and municipal level; and CIAC is more focused on plastics policy, and we've been focused on actual programs related to sustainability and recovery. The match is very good, and with the headwinds buffeting our industry, we need all the marshalling of forces, and all the clout, that we can get. I have no doubt that CPIA will do well as the plastics division of CIAC.

For me personally, it's bittersweet to leave, but I think the time has come to move on. There's so much to love about the plastics industry, and I'll still be a very vocal cheerleader from the sidelines. **CPL**

PEOPLE


Musabbeh Al Kaabi


Zachary Ament


Martin Baron


Alberto Capodicasa


Nick Dearent


David Theberge


Admir Dobraca


Florian Geiger


Chris Heming


Paul Lemmers


Woon Keat Moh


Michael Garratt


Mike Wilhoit


Michael Zobel

– Calgary-based polyethylene and specialty plastics maker **Nova Chemicals Corp.** has named **Musabbeh Al Kaabi** as chairman of its board of directors.

– Pawcatuck, Conn.-based extrusion machinery maker **Davis-Standard LLC** has named **Zachary Ament** as executive vice president. He replaces Ernie Plasse, who is retiring.

– Mississauga, Ont.-based plastic film and sheet extrusion machinery supplier **Macro Engineering and Technology Inc.** has named **Martin Baron** as director of sales.

– Chester, N.S.-based machinery maker **GN Thermoforming Equipment** has appointed **Alberto Capodicasa** as sales manager for Mexico and Central and South America.

– Worcester, Mass.-based **Absolute Haitian**, the distributor of Haitian and Zhafir injection molding machinery in the U.S. and Canada, has named **Nick Dearent** as territory sales manager based in Worcester; and **David Theberge** as territory sales manager for the West Coast, based in Los Angeles.

– Branchburg, N.J.-based **Kautex Machines Inc.**, the U.S. subsidiary of German extrusion blow molding machinery maker Kautex Maschinenbau, has appointed **Admir Dobraca** as CEO. He succeeds outgoing CEO Bill Farrant.

– Lucerne, Switzerland-based mold steel supplier **Schmolz + Bickenbach Group** has named **Florian Geiger** as CEO of its Steeltec bright steel production division. He replaces Gerd Münch, who stepped down at the end of 2019.

– Newton, Kan.-based magnetic separation equipment maker **Bunting Magnetics Co**. has appointed **Chris Heming** as Master Rep for Western Canada. Heming is based out of Winnipeg.

– York, Pa.-based blow molding and extrusion systems manufacturer **Graham Engineering Corp.** has named **Paul Lemmers** as vice president of operations.

– Material supplier **PolyOne Corp.**, headquartered in Avon Lake, Ohio, has named **Woon Keat Moh** as president of its colour, additives, and inks segment for the Americas and Asia regions; and **Michael Garratt** as president of colour, additives, and inks for the Europe, Middle East, and Africa region.

– Archdale, N.C.-based industrial shredder maker **Vecoplan LLC**, a subsidiary of Vecoplan AG located in Germany, has appointed **Mike Wilhoit** as parts and service director.

– The Saltigo advanced intermediates subsidiary of Germany-based specialty chemical maker **Lanxess AG** has named **Michael Zobel** as CEO. He replaces outgoing leader Torsten Derr.

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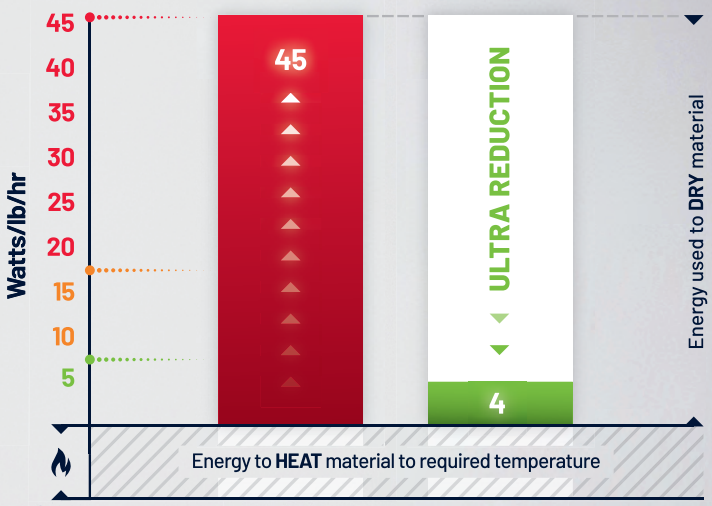

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How to get into COEXTRUSION

Making the leap from monolayer extrusion to coextrusion involves having more than just good intentions. From the right extruder sizes and tooling to matching material viscosities to properly trained operators, here's what you need to know.

By Mark Stephen, editor

Sometimes two really is better than one. Think about the pleasures of a double album (if you're old enough to remember LPs) or the always popular "buy one, get one free" sale.

Coextrusion falls into this category. Developed because some service demands, particularly from the food packaging industry, couldn't be satisfied by a single polymer, coextrusion presses two or more materials through a single die, with separate extruders required for each distinct material. Sometimes five or more materials are used in a single cycle – automotive fuel lines can contain up to six – and each extruder has to deliver the precise amount of molten plastic needed for the operation.

If that sounds like two – or maybe five or six – times the hassle of monolayer extrusion, you might be missing the bigger picture: When multiple plastics are combined, the result can yield properties difficult or impossible to produce from a single material, including oxygen and barrier properties, puncture resistance, stiffness, and tensile strength. This makes coextrusion a powerful method to produce multilayer films and sheets for a wide range of applications, as well as multilayer tubing and pipes with inner and outer layers that offer different functional advantages.

But coextrusion also requires more polymer and extrusion knowledge than monolayer extrusion, which means you won't reap the benefits without making the right decisions and investments up front. For those looking to make the leap, here's what to consider.

MATERIAL CONSIDERATIONS

First, not all plastics are well-suited for coextrusion, since some polymers won't adhere to others and therefore won't bond to form a strong structure. "A material like Teflon FEP is difficult to use in coextrusion due to the difficulty of other materials to adhere to it," said John Christiano, vice president of technology with Davis-Standard LLC. "Highly elastic material may also be very difficult to coextrude." And using rigid PVC in any coextrusion application is usually a challenge, said the members of Graham Engineering Corp.'s process engineering team, as are applications that require high levels of regrind due to inconsistency in the material.

This is where adhesive or tie layers come in, which bond neighbouring layers of limited compatibility. These will require additional extruders. "HDPE and EVOH are commonly used together, though requiring a tie layer," said the Graham Engineering team. "EVOH will delaminate from PP, HDPE, and some grades of PET without an adhesive, but it's frequently used in multilayer applications with each of these materials."

Also, plastics with drastically different melting temperatures can sometimes be unsuitable for coextrusion, extrusion machinery suppliers say, because degradation will occur in the lower-melting material. But this isn't a hard and fast rule. "In some applications, for example when nylon is used as a barrier with a polyolefin, the difference in processing temperature – 520°F versus 400°F, or 270°C versus 200°C – is not the limiting factor. Balancing flow is often the biggest challenge," the Graham Engineering team said.

THE DIE IS CAST

A crucial decision at the outset – for sheet and cast film applications in particular – is choosing between a coextrusion feedblock or a multi-manifold die, which differ on the point at which the separate melt streams are brought together. Feedblock coextrusion normally combines the layers as close to the die opening as possible to minimize the influence of different melt strengths from one material to the other, whereas multi-manifold dies have complex die constructions in which separate melt path manifolds are arranged to merge at a point close to the die exit. "Coex feedblocks generally provide more flexibility for a lower cost and with less maintenance than multi-manifold coextrusion dies," said Jim Frankland, president of Frankland Plastics Consulting Ltd. "Both have valves of various designs to adjust the layer flow rates, but melt pumps are typically used to precisely control the output of each layer." Multi-manifold dies, by contrast,

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are typically required to process coextruded structures where individual polymer layers have significant differences in viscoelasticity, extrusion machinery suppliers say.

As already noted, one of the biggest challenges in coextrusion is balancing the flow through each extruder. "Every extruder you add multiplies the complications of getting this material flow and gauging correct, not only at startup but throughout the process," said Alan Landers, product manager for blending and upstream products with Conair Group. "Each additional extruder presents the task of managing screw speeds to compensate for a range of factors: barrel wear, condition of screen packs, presence of foreign materials, the varied tendency of materials to agglomerate around screens, and more."

Since each extruder will do its best to manage screw speeds to keep a continuous volume of material moving through the process, Landers continued, processors may see screw speeds ramping up over time. "But they don't all do so at the same rate," he said. "If one extruder has a screen where material tends to agglomerate during a single shift, it's going to ramp up screw speed until it can't maintain the proper flow, triggering a pressure alarm. Then, after that screen pack is changed, pressure is going to be dramatically lower and the screw speed will have to reduce dramatically to avoid a surge in output."

Multiply these factors by three or six or more and you begin to see why coextrusion is an extremely complex process. "To compensate for these variables manually, processors may tend to give themselves a safety margin – running some additional material to ensure that there's adequate material thickness at the low end of the tolerance band for each component in the extruded film or sheet," Landers said. "But that's expensive." According to Landers, when each extruder feed throat is fitted with a Conair TrueWeigh hopper, a single PLC can integrate and synchronize the entire coextrusion process, monitoring and maintaining the total throughput of the line.

SIZING IT UP

Also important is sizing extruders relative to their requirement in the structure, so they can develop similar melt temperatures without requiring special screws for every structure. As with monolayer extrusion, when selecting equipment for coextrusion it's important to first establish your throughput requirements, space constraints, input power requirement, and product profile specifications.

The extruder manufacturer will also need information about product material, and may request a sample for laboratory testing – this information is critical for determining the appropriate equipment size, feed requirements, and screw and die design. "As long as the extruders are sized properly and can deliver quality melt, there's no mechanical impediment to shifting them to coextrusion," the team at Graham Engineering said. "The technical challenge lies in how the melt streams behave when joined, which is governed by processing knowledge of each of the materials, the die, and the controls system."

Speaking of controls, having the right controller for coextrusion is a must – and an existing control system being used for monolayer extrusion might not cut it. To be clear, some controls can handle both. The Maguire + Syncro extrusion control system can be deployed in extrusion or coextrusion, as can Davis-Standard's EPIC III advanced Windows-based touchscreen extrusion process control system, and Graham Engineering's Navigator control system. Other controls can't make this leap, however, and will have to be updated to monitor multiple flow rates, temperature settings, polymer interactions, and other variables. "While it's possible to manage coextrusion without automated controls via offline measurement and then manual adjustments to the line, industrial controls and programs can ensure higher quality and process repeatability," the Graham Engineering team said.

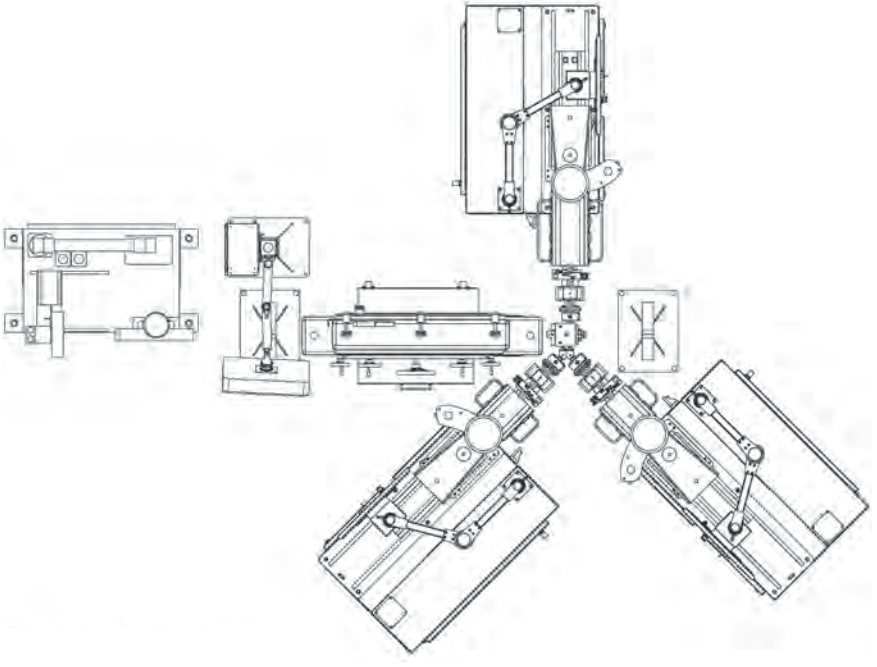


Image Credit: Graham Engineering Corp.

An overhead schematic of a coextrusion line.

TRAINING DAYS

On a day-to-day basis, the actual operation of a coextrusion line depends heavily on the melt viscosity exiting the extruders, which depends in turn on the melt temperature and shear rates in the downstream tooling as the various layers are combined. "Polymer viscosity mismatch leads primarily to distortion of the layers," said Jim Frankland. "However, excessive shear in any of the layers can lead to melt fracture, usually corrected by raising the melt temperature – but that results in having to raise the temperature of each layer." Non-uniformity of melt temperature causes zigzag patterns or wave effects in the sheet, Frankland continued, so the most stable system possible is needed. "Die swell varies between polymers, and is a function of temperature and shear rate for a particular polymer and may require changes in the layer thickness to meet profitable operating levels," he said.

Last but definitely not least, proper training of the operating personnel will save both time and scrap. "Because coextrusion is more complex than monolayer extrusion, it's a step up in difficulty for the operators," said John Christiano. "Control systems can run the coextrusion, but the operator has to be aware of the many new functions, and be able to monitor them. They'll need education beforehand, and we have no problem helping them with this."

In the end, there's no denying that coextrusion presents problems which simply don't exist in monolayer extrusion, including layer non-uniformity, melt interfacial instability, choosing an optimum adhesive, and the scrap recycle of dissimilar polymers. But it offers benefits that don't exist in monolayer extrusion as well. "You don't coextrude just for the fun of it," Christiano said. "You do it to save costs, and to improve appearances and physical properties."

Adopted properly, it really is a case of two – or five materials or six – being better than one. **CPL**

RESOURCE LIST

Conair Group (Cranberry Township, Pa.); www.conairgroup.com; 724-584-5500
- **Dier International Plastics Inc.** (Unionville, Ont.); www.dierinternational.com; 416-219-0509
- **Industries Laferriere** (Mascouche, Que.); www.industrieslaferriere.ca; 450-477-8880
- **Turner Group Inc.** (Seattle, Wash.); www.turnergroup.net; 206-769-3707

Davis-Standard LLC (Pawcatuck, Conn.); www.davis-standard.com; 860-599-1010
- **Auxiplast Inc.** (Sainte-Julie, Que.); www.auxiplast.com; 866-922-0282

Frankland Plastics Consulting Ltd. (Cocoa, Fla.); www.flitetech.com; 800-327-9310

Graham Engineering Corp. (York, Pa.); www.grahamengineering.com; 717-848-3755

Maguire Products Canada/Novatec Inc. (Vaughan, Ont.); www.maguire.com; 905-879-1100

Turning up the INTELLIGENCE

When the power of Industry 4.0 – which marries physical production and operations with smart digital technology, machine learning, and big data – is applied to process cooling, the results are very cool indeed. Here are some of the latest Industry 4.0-ready chillers, chilling systems, and temperature controllers.

Piovan Group's new Easytherm mold temperature control unit.

By Mark Stephen, editor

If your idea of combining sub-zero temperatures with superior intelligence is Batman supervillain Mr. Freeze, you need to get out of the fictional world and into the very real one of process cooling and Industry 4.0.

The new quasi-standard for manufacturing technology, Industry 4.0 – also called the Industrial Internet of Things (IIoT) or smart manufacturing – uses transparent communication protocols and machine learning algorithms to collect and analyze production data to improve efficiency, reduce maintenance requirements, support human activity, and decentralize decision-making. And when applied to heat transfer equipment such as chillers, chilling systems, and temperature controllers – which are used by plastics processors when they need to control process fluid temperature – the latest smart technologies can keep a chiller operating at its most efficient point, store temperature and pressure data, assist with predictive maintenance, enable worldwide monitoring and supervisory control, allow machine-to-machine communication, deliver email alerts, and a lot more.

GET SMART

Launched in 2018, ACS Group's High Efficiency (HE) central chillers have new controllers with higher computing capabilities than the company's previous chillers, with more modern electronics and proprietary algorithms that allow more computations to take place within the machine. According to ACS Group's senior product manager Kyle Nelson, the smart controls offer fast system diagnostics, including live graphing and data logging, as well as the ability to monitor as many as 10 HE chillers by way of a smartphone, tablet or PC, which represents 600 tons of chilling capacity within the same control platform. The chillers also communicate with one another to maintain tank termperatures via Ethernet connectivity, Nelson said, and if one unit goes down, the others automatically compensate to keep the tank temperature at the optimum level.

First developed in 1979, ModbusTM RTU is an industrial communication protocol that establishes communication between intelligent devices, and is one of the most widely used network protocols in the industrial manufacturing environment; and ModbusTM TCP is the Modbus variant used for communication over TCP networks between machines. Advantage Engineering Inc., represented in Canada by Chillers Inc., is using both technologies for its portable and central chillers, temperature controllers, pump tanks stations, and tower systems. "Modbus RTU and Modbus TCP communication protocols are common to almost all our equipment and can communicate information including setpoint, actual temperature, deviation alarm, sensor failure, remote start/stop, and more," said Advantage Engineering president Jon Gunderson. "For example, digital pressure sensing has replaced analog gauges on chillers, so now pressure information is analyzed by our controls and can also be transmitted for analysis by some greater system." As a further example, Gunderson noted that Advantage's new MG series control system for its Maximum por-

Photo Credit: Piovan

table air- and water-cooled chillers – which replaces legacy M1 and LE series chiller controls – comes Industry 4.0-ready. "It has a standard RS-485 port and Modbus RTU or SPI communication interface," he said. "And our future controls will get even more capable in this area, including adapting OPC UA communication and Euromap 82.1, which is being adopted as a standard interface of the Plastics Industry Association."

Conair Group's SmartServices cloud-based platform offers the ability to connect all plastics processing equipment in a plant – even some non-Conair equipment – to a single web-based dashboard for monitoring, alerting, and Artificial Intelligence-based algorithms. And the platform definitely extends to process cooling. "There's always been some interfacing between portable chillers and temperature controllers and other processing equipment," said Jim Fisher, Conair's sales manager, heat transfer. "But the cloud now seems to be the better place to manage all of this data, and that's what we've done with SmartServices." Compact wireless machine adapters are installed in the controls of each Conair temperature controller, as well as each portable and central chiller, Fisher said. "The information gathered includes flow and temperature settings, the staging of the compressor, and refrigeration pressures," he said. "In case of a mechanical issue, alerts are sent by email to operators and other assigned individuals designated to receive a machine alarm, including members of our support team."

COLD CALLING

Designed to complement its line of one- to 30-ton chillers, the new high-capacity VS industrial chillers from Delta T Systems are being touted for their Industry 4.0 connectivity. Controls include cloud-based, remote management with full-featured operational data sets. Process data including suction and discharge temperatures, water temperatures and pressures, tank levels, and other critical inputs can be stored, viewed, and analyzed locally or remotely via PLC, PC, tablet or smartphone. Ethernet connectivity allows for the use of mobile interfaces, cloud connectivity, and remote alarm monitoring. And the controls can log more than 40 data points, and have a USB connection to download data for analysis and preventive maintenance.

Available in 15 models rated to deliver 16 to 125 tons of cooling capacity, the new MRM line of air-cooled chillers from Frigel Inc. also offers state-of-the-art connectivity through touchscreen microprocessor controls. Serial connection with the Frigel 3PR Intelligent Control System allows for monitoring and adjusting the system to ensure optimum performance based on a wide range of operating parameters, while also enabling remote monitoring by Frigel technicians when needed. The ability to connect to a digital supervisory system, such as Frigel MiND, can further enhance system efficiency, performance, and uptime. MiND is a supervision and maintenance tool for all Frigel equipment and accessories, both central and machine-side,

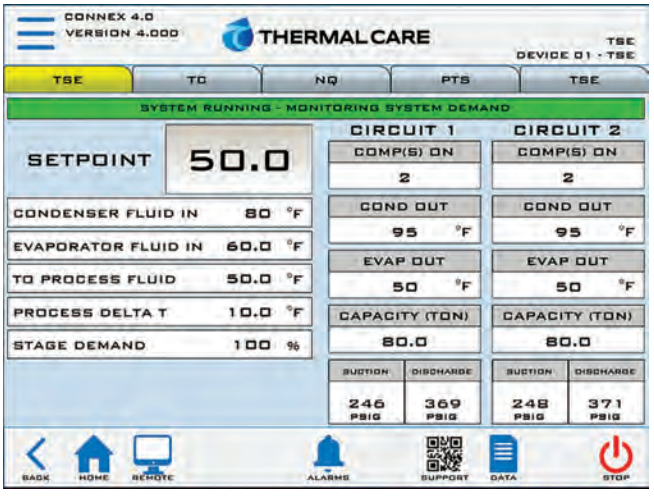


Photo Credit: Thermal Care Inc.

With Thermal Care's Connex 4.0 control panel, all systems can be accessed from any smartphone or tablet.

that allows monitoring and management of all cooling system components through a multifunctional user interface, both locally and remotely, through a user-friendly webpage.

GOING MOBILE

Piovan Group's new Easytherm mold temperature control unit – which operates at temperatures of up to 90°C or 195°F – incorporates the OPC-UA communication protocol, making it ready for communication with machines from different suppliers in Industry 4.0 environments with open standards. It can also be used with Piovan's Winfactory 4.0 plant-wide supervisory software, which can be accessed by mobile devices using the optional WiFi connection. Redesigned controls include a new tilted, 4.2-inch display with high brightness and strong colour contrast for easy readability in low-light conditions. Navigation in the submenus is managed with a convenient turn knob, and capacitive touch buttons provide immediate access to the main functions. A "basic" version with LED display is also available.

Thermal Care Inc.'s Connex 4.0 software allows users to monitor and control the working of any of the company's portable and central chillers, reservoir and pumping systems, and temperature control units from one central screen or remotely through an Internet connection. "Connecting a device with a master controller only requires an Ethernet cable," said Bob Smith, Thermal Care's director of product management. "If running an Ethernet cable isn't feasible, a wireless solution is also available. Our master controller module uses a Port 80 connection to the Internet, making the system firewall- and network security-friendly." With either a centralized machine-mounted industrial PC and 12-inch HMI or a dedicated Connex 4.0 control panel, Smith said, all systems can be accessed from any smartphone or tablet, and all operators and other plant personnel can set up automatic text or email alerts to remotely receive changes in equipment status. "And most of our chillers or other hard-

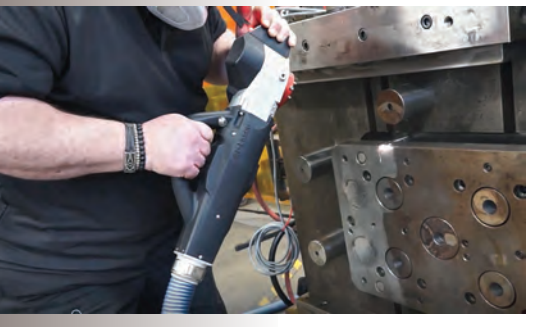
ware in operation today can be retrofitted to connect to a Connex 4.0 system," he added.

Introduced last year, the Tempro plus D100 temperature control unit from Wittmann Battenfeld belongs to the range of temperature controllers recommended for use as components of Wittmann 4.0 production cells. The company's gateway to Industry 4.0, Wittmann 4.0 enables the connection and use of injection molding machines, robots, and auxiliary equipment via the Unilog B8 controller. Capable of 9 kW of heat output and using a magnet-coupled stainless steel pump to ensure sufficient flow, the new controller can be fully integrated in the control system of a Wittmann Battenfeld injection molding machine. The pump's capacity is 0.5 kW, with a maximum flow rate of 40 litres per minute and a maximum pressure of 4.5 bars (65 psi).

When it comes to enabling smart, connected process cooling, these technologies have the sophistication to make Mr. Freeze's science lab look like a slightly colder version of an Easy-Bake Oven. **CPL**

RESOURCE LIST

ACS Group (New Berlin, Wis.); www.acscorporate.com; 262-641-8600
Auxiplast Inc. (Sainte-Julie, Que.); www.auxiplast.com; 450-922-0282
Equiplas (Toronto); 416-407-5456
Shaw & Christler Equipment Technologies (Vancouver, Wash.); www.shawequiptech.com; 800-528-8011
Advantage Engineering Inc. (Greenwood, Ind.); www.advantageengineering.com; 317-887-0729
Chillers Inc. (Newmarket, Ont.); www.chillersinc.com; 905-895-9667
Conair Group (Cranberry Township, Pa.); www.conairgroup.com; 724-584-5500
Dier International Plastics Inc. (Unionville, Ont.); www.dierinternational.com; 416-219-0509
Industries Laferriere (Mascouche, Que.); www.industrieslaferriere.ca; 450-477-8880
Turner Group Inc. (Seattle, Wash.); www.turnergroup.net; 206-769-3707
Delta T Systems (Richfield, Wis.); www.deltasys.com; 262-628-0331
Frigel North America (East Dundee, Ill.); www.frigel.com; 847-540-0160
Hamilton Plastic Systems Ltd. (Mississauga, Ont.); www.hamiltonplasticsystems.com; 905-890-0055
Piovan Canada Ltd. (Mississauga, Ont.); www.piovan.com; 905-629-8822
Thermal Care Inc. (Niles, Ill.); www.thermalcare.com; 847-966-2260
D Cube (Montreal); www.dcube.ca; 514-831-6623
Tantus Corp. (Pickering, Ont.); www.tantuscorp.com; 647-258-9657
Wittmann Battenfeld Canada Inc. (Richmond Hill, Ont.); www.wittmann-group.com; 905-887-5355



Top: Ed Gledhill (left) and LaserClean coworker John Mokedanz with the QF 500W industrial laser. Middle and bottom: the QF 500W in action.

LASER FOCUSED

LaserClean, a Southern Ontario startup that uses laser ablation for restoration jobs, doesn't want to sell you any equipment. They just really want to clean your molds and platens.

By Mark Stephen, editor

If you're one of those people who thinks instant gratification takes too long, you'd hate traditional methods for cleaning molds and platens, which are not only laboriously slow but also intrusive and potentially damaging to the materials that are being serviced.

Ed Gledhill gets it, which is why he founded LaserClean, a unique cleaning and restoration startup located in Ajax, Ont. that uses laser ablation – the process of removing layers of material from a solid metal by irradiating it with a laser beam – as an alternative to the chemicals and abrasive blasting systems currently in use for surface cleanings.

OPPORTUNITY IDENTIFIED

An entrepreneur with a background in banking, Gledhill has years of experience in the commercial mobile cleaning industry as the long-time owner and operator of a conventional pressure washing company that serves the Toronto area. "I was looking to branch out, came across the laser ablation technology online and researched it, and saw a business opportunity when I discovered that there weren't any service technicians using this process for the plastics industry," he said. "I chose a handheld QF 500W industrial laser cleaning system manufactured by P-Laser – it's a fibre optic laser that has a much longer lifespan than other technologies such as a Yag laser, but is the same price. I received startup financing from BDC, drew up a business plan with a consultant, bought the laser, and opened the company last year."

With its short pulses of laser light that allow for high-precision cleaning while removing contaminates, impurities, and debris without waste, byproducts, off-gassing or vapours, laser ablation offers substantial benefits over traditional, contact mold and platen cleaning technologies such as dry-ice blasting, pressure washing, and media blasting, Gledhill said. "Cleaning with sodium hydroxide creates fumes and noxious gases, involves a lot of scrubbing with brushes, and compromises the surface by removing a microlayer," he said. "And dry-ice and media blasting both project particulates at a surface at a rapid rate of speed, with media blasting essentially cutting a small layer off the surface; they remove contaminates but can also etch or damage the underlying surface. And they both need containment barriers that have to be erected, and media blasting requires a lot of post-job cleanup."

By contrast, laser ablation is non-intrusive because it doesn't use any media, and leaves virtually nothing

All photos courtesy of LaserClean

behind but a clean surface. "The laser is adjusted to a desired wavelength and output power," Gledhill said. "The heat or energy of the beam is absorbed, which excites the electrons on the surface or substrate, causing contaminate to crimp or shrink and pop off the surface being cleaned; any waste can be removed immediately by a vacuum. We can service an entire surface or work on layers, and also target very specific areas. The laser cleans intricate, contoured, and textured materials and surfaces instantly."

Which translates into a lot less downtime for the customer. "We can clean molds and platens on a production machine, without having to remove them, 50 per cent faster than other cleaning methods, which saves both time and manpower," Gledhill said.

ROAD TRIPS

LaserClean has full, mobile delivery capabilities, which means the company can bring the laser beam cleaning technology directly to a customer's site. "In order for us to work on-site, a plant has to have the power supply we need – which typically they do – and a suitable air system," Gledhill said. "If we have these, we can go up and down a customer's production line as part of its scheduled preventive maintenance and clean three or four machines per day. We once cleaned six platens in five hours, when it had taken that customer a full day to clean a single platen with sodium hydroxide before. Having us work on-site is a good solution for cleaning molds and platens that are too heavy to ship." Processors with smaller, lighter molds – or that might be located beyond driving distance – can ship the molds and platens to LaserClean's Ajax office for cleaning.

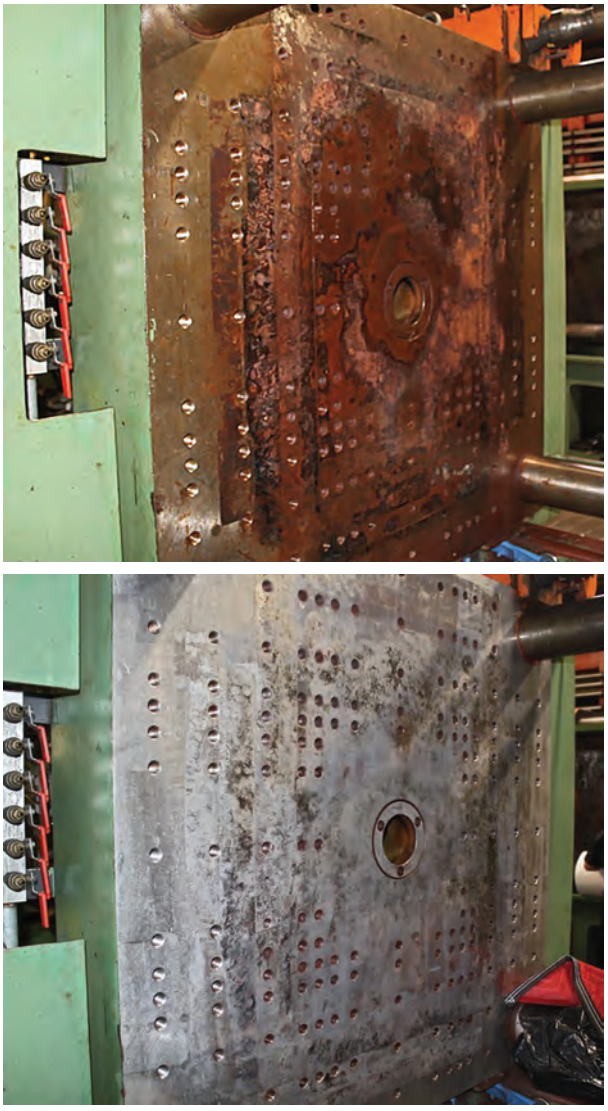
After less than a year in business, LaserClean is beginning to get noticed – and sometimes by plastics processors it wasn't expecting to reach yet. "Through Google searches and videos of our process that we've posted on our YouTube channel, we're now being discovered by the bigger companies that we couldn't have contacted on our own because we didn't have the connections," Gledhill said. "Almost half of the companies that have contacted us so far are plastic processors, including four automotive parts molders. Workers on the shop floor appreciate our laser ablation because they no longer have to deal with hazardous chemicals, and upper management sees the productivity – we get the molds back into production with a lot less downtime and without compromising the integrity of the molds."

LaserClean's status is probably also being boosted because of what it *doesn't* do, Gledhill said. "Most companies that deal with laser ablation are distributors looking to actually sell the lasers," he said. "We're not selling anything, we just want to clean equipment – that's all we do, and we're unique in that."

PROBLEM SOLVERS

LaserClean currently has a total of four employees, with most of its team on the road. And while it has one laser at present, that will probably change. "I can easily see us adding a second laser, so that one stays in our shop and one is taken on the road for in-house ablation," Gledhill said. "If and when we get a second laser, we'll definitely buy another QF 500W from P-Laser – it's the Cadillac of the industry."

As much as he gets a kick from the instant gratification of cleaning molds and platens with laser ablation, Gledhill – like all entrepreneurs – also enjoys identifying a market opportunity. "We're in the problem-solving business for companies that work with coatings and sensitive tooling and equipment and that don't want something abrasive hitting the metal and compromising it," Gledhill said. "Laser ablation is effective in a multitude of markets, but it *loves* to clean hardened mold steel, and is very effective with aluminum molds. Some processors might be comfortable with media blasting and other older cleaning methods, but that still doesn't make them effective. Laser ablation cleaning is something that every plastics processor will benefit from, and we're happy to provide it." CPL



A platen before (top) and after cleaning.

AUXILIARY EQUIPMENT

Gravimetric blenders for large-throughput applications

Tailored for large-throughput applications, the new *Maguire Weigh Scale Blender 1200* series from **Maguire Products Inc.** can achieve throughput of up to 4,500 pounds per hour and can be used in extrusion, high-volume injection and blow molding, and central blending applications.

The 1200 series can dispense 12 batch ingredients including pellets, powders, liquids, regrind, flake, wood flour, and talc filler. Each ingredient hopper has a dispensing device designed for a material in a specific form.

All 1200 series blenders can be fitted with up to six large-component slide gates to allow dispensing of major ingredients. The blenders can use a combination of large corner valves, four-inch vertical valves, two-inch vertical valves, auger feeders, and liquid colour pumps.

The Weigh Scale Blenders achieve accuracy down to plus or minus 0.1 per cent for every material, regardless of form.

Maguire Products Canada/Novatec Inc. (Vaughan, Ont.); www.maguire.com; 905-879-1100

INJECTION MOLDING

Servo-hydraulics use less energy than hydraulics, cost less than all-electrics

LS Mtron is offering the new *WIZ-TA* series of compact servo-hydraulic toggle presses, featuring seven machines with clamping forces ranging from 55 to 420 tons.

Targeting general purpose customers, the WIZ-TA is a cost-effective option to an all-electric machine. Additionally, the units have a high-performance servo-hydraulic motor and MACO controller, allowing them to reduce energy consumption and increase power savings by as much as 70 per cent compared to standard hydraulic machines. They also offer closed-loop pressure control, a centre press clamping system, and high repeatability.

The WIZ-TA presses are available with clamping forces of 55, 90, 140, 190, 240, 330, and 420 tons.

More than 25 machines are available in stock at the South Korea-based company's facility near Atlanta, Ga.

LS Mtron (Norcross, Ga.); www.lsmtron.com; 770-674-7446
Plastics Machinery Inc. (Newmarket, Ont.); www.pmiplastics.com; 905-895-5054

Smart metering and mixing for reaction injection molding

Part of an upgrade and relaunch of all of **KraussMaffei Corp.**'s PU metering equipment, the *RimStar Smart* is a new model for reaction injection molding of PU components that fills a gap between the capabilities of the company's EcoStar Compact and standard RimStar lines.

The RimStar Smart features a Siemens TP 700 control panel and volume flow meters. Those components give users the option of closed-loop control of the pour rate at shot time. The machine has a radio-frequency identification (RFID) interface for recognizing molds. A pentane kit is optional, extending the range of materials the RimStar Smart can process.

The closed-loop control capability and RFID interface make the machine well-suited for producing high-quality PU components in modern, Industry 4.0 factories.

Krauss-Maffei Corp. (Florence, Ky.); www.kraussmaffei.com; 859-283-0200

EXTRUSION

New crosshead features single-point concentricity adjustment

A new single-point concentricity *extrusion crosshead* from **Guill Tool & Engineering Co. Inc.** uses micro-fine adjustment screws for precision concentricity adjustments that reach 0.008 inches or finer per revolution, and is well-suited for the extrusion of thin-walled jacketing and precision ID/OD tubing.

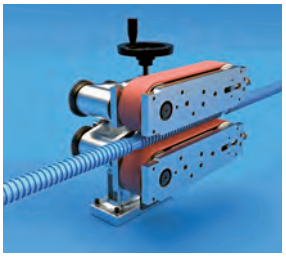
Features of the single-point crosshead include a patented cam-lock deflector for quick changeovers, with a residence time of one minute at 0.5 pounds per hour material flow;

optimized usage with extruders measuring 0.50 and 0.75 inches; and a max die ID of 0.250 inches.

Additionally, the Guill single-point crosshead offers great flexibility to its users. It not only accepts both vacuum and micro-air accessories, but is also well-suited for pressure and sleeving applications. Fluoropolymer designs are available on request.

Guill Tool & Engineering Co. Inc. (West Warwick, R.I.); www.guill.com; 401-828-7600

Caterpillar pullers are ideal for tubing, profiles



For pliable materials like tubing, extruded profiles, foams, soft extruded materials like weather stripping, and more, **Versa Pullers** is now offering *caterpillar pullers* designed to provide uniform pressure over the entire traction length, exerting greater pulling force without product deformation.

A wide variety of belt materials are available including sponge, gum rubber, silicone, neoprene, urethane, and nitrile, some of which are FDA-approved. Various durometer ratings are available to suit application requirements. Additional options include left-to-right configuration, and OSHA guarding package.

All Versa pullers are equipped with a hand-wheel or optional pneumatic operation of the belt booms along a constant centreline. The pneumatic option provides control of the pressure applied to the product being pulled, and makes repeatable setup almost instantaneous.

Versa Pullers (Elkhart, Ind.); www.versamachinery.com; 574-266-0780

BLOW MOLDING

Inspection system checks individual features

The smallest of **Intravis Inc.**'s inspection technologies, the new *IntraOne* uses a single camera to check for particular individual features on bottles, preforms, containers, and closures.

Enhanced inspection flexibility allows the IntraOne to check for the presence and accuracy of laser engravings on the inner top plate of standard beverage caps, and spot con-

tamination and defects involving colours and contours.

And with a colour camera that comes as standard equipment, the IntraOne has a trigger-based photographing module that allows users to specify the time interval for snapping pictures – for example, triggering the camera based on the speed of the conveyor on which products are traveling.

Intravis Inc. (Norcross, Ga.);
www.intravis.de; 770-662-5458

RECYCLING

Reusable melt filters offer more filtration area

Nordson Corp.'s new *BKG FlexDisc* melt filters, which offer from two to 4.5 times more filtration area for increased efficiency, can be used with piston-activated screen changers for bottle-to-bottle PET recycling, PET fibre recycling, and battery separator film applications.

The filters are reusable and can be retrofitted onto existing systems, allowing users to reach throughput goals without investing in a larger screen changer.

The new FlexDisc can handle pressure differentials up to 1,900 psi. The improved filtration also reduces the need for backflushing.

Additionally, superior filtration results are possible due to filtration finenesses between five and 40 μm.

Nordson Canada Ltd. (Markham, Ont.);
www.nordsonpolymerprocessing.com; 800-463-3200

ROBOTS & AUTOMATION

Flexible, versatile system for injection molded packaging

New from **Muller Technology Colorado** (formerly CBW Automation), the *M-Line* robot is an integrated robotic and

automation system designed to deliver significantly greater flexibility and versatility for production of injection molded packaging.

The M-Line, which can accommodate multiple mold types/pitches and multiple cavitation (single to 48-cavity), consists of three models for various injection machine sizes, and features a low-cost and highly flexible end-of-arm tooling (EOAT) which can be changed out quickly.

The automation system is built on one frame and designed for a small footprint with no assembly required. The M-Line is motorized (no pneumatics), reducing the system's energy and air consumption; and provides an extended period of accumulation time on the conveyor (up to one hour), reducing the number of packers needed.

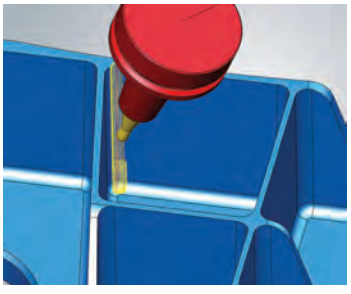
Additionally, 95 per cent of replacement parts are available in stock and ready for one-day delivery.

Muller Technology Colorado (Ft. Collins, Colo.); www.muller-technology.com; 970-229-9500

SOFTWARE

CAD/CAM suite offers enhancements for additive manufacturing

Open Mind Technologies AG has now introduced *hyperMILL 2020.1*, a new version of its CAD/CAM software suite that increases ease-of-use and overall programming performance, and includes key new additive manufacturing strategies.



The powerful Additive Manufacturing process in the software supports 3D printing/additive processes and provides efficient hybrid processing with simultaneous additive manufacturing and subtractive machining on one machine tool. hyperMILL's Additive Manufacturing technology offers flexible strategies for additive material applications, including filling strategies for both planes and free-form shapes, and in 2D and 3D sections.

Also, two new user-friendly functions are now available in 3D profile finishing: automatic face extension, which eliminates the need to modify the milling faces in the CAD system beforehand; and free tool geometry, which enables the use of any tool type for highly detailed programming and collision control.

Open Mind Technologies USA Inc. (Needham, Mass.); www.openmind-tech.com; 888-516-1232

MATERIALS

New TPVs for corner mold automotive seals

DuPont Co.'s transportation and industrial unit and ExxonMobil Chemical's specialty elastomers business have developed new TPVs for automotive corner mold seals.

The two companies replaced traditional organic slip additives with DuPont's engineered silicone-based additives to develop the next-generation *Santoprene* TPV.

Compared to its previous grades, the new TPV material offers improved bonding to EDPM rubber substrates, and a lower coefficient of friction (COF) for the easy opening and closing of doors and windows.

The Santoprene TPV B260 family of products also delivers improved flow properties, abrasion resistance, and ultraviolet (UV) light stability.

DuPont Canada (Mississauga, Ont.); www.dupont.ca; 905-816-3300

advertising index

Making cut sheet thermoforming more cost-efficient

By James Waddell, Plastic Concepts & Innovations LLC

There are two major types of thermoforming: continuous (aka roll-fed) forming and cut sheet (CS) forming. Roll-fed thermoforming is associated with high-speed, high production rate products such as cups, packaging, and food containers. CS forming is associated with larger, heavier gauged products such as medical devices, dunnage, and auto and truck interior components. This is a brief overview on how to make the CS forming process more cost-efficient.

There are a lot of variables involved in CS forming, and maximizing them can save time and material with your part production. It all starts with the initial determination of how the part will be formed. Formers need to evaluate how to best utilize the sag of the material and what other material distribution techniques should be used in the forming process. Will it be a positive mold or a negative mold? A positive mold is used when the critical dimensions are on the inside of the part; a positive mold on the top platen allows the sag to assist in better material distribution. A negative mold is used when the critical dimensions are on the outside of the part, so using a pre-stretch technique to get maximum material distribution can reduce the overall gauge of the sheet. Billow-forming is a technique used with negative molds to pre-stretch the material and, with the use of a plug assist, can allow the former to downsize the gauge and still meet the part specification. Less materials means lower cost.

If you use plug assists, make sure the plug material will do the work. Trying to shortcut on plugs will lead to more expense and wasted time trying to correct the material distribution. Syntactic foam plugs are expensive, but will save you wasted material and give you better material distribution.

Heat distribution is another critical factor. Can the equipment provide adequate energy distribution over the sheet to allow the material to flow properly into or onto the mold? And are the heaters clean? Dust buildup will hamper heater efficiencies. If material has fallen on the heater, the heater(s) should be replaced. If you do replace a heater, make sure you put it on the perimeter of the oven because it will be more efficient than the older heaters. That's because heaters lose their initial efficiencies and level out. A new heater will be more efficient and can cause a hot spot in your zoning.

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TOOL TIPS

Proper mold materials will help save material and wasted shots. Tools such as epoxy or even wood (mahogany) will work for small runs, but the accuracy of meeting the part dimension will vary from shot to shot. Your processing time will also be longer. Ceramic tools are a step up and can be used for longer runs. The ceramic material doesn't absorb heat as fast as wood or epoxy and dissipates heat better from the material.

The best tools are temperature-controlled and allow the material to form over the tool with better material distribution. Your processing time and your part dimensions will be better. Your water-cooled temperature controller for the tool should be checked periodically for scale buildup. When water goes through cooling tubes, it moves in a linear fashion and forms a barrier layer that prevents the best heat from transfer. If the water is aerated or agitated in some fashion, the heat transfer is more efficient and your overall process will improve.

Last but not least, make sure you have adequate vacuum to form the parts satisfactorily. Compensating for poor vacuum with more heat is not cost-effective. Longer cycle times will result and you can degrade materials until they're too brittle. Anything less than 20hg of vacuum may result in poor part definition.

This has been a short compilation of tips on how to make your process more efficient. There are many more opportunities to improve your process. Knowing your materials, understanding the forming process, having your equipment in good condition, and training your operators are the keys to more profitable forming. **CPL**

James Waddell has over 39 years of manufacturing and consulting experience in the plastics industry. The founding partner and key management principal of Plastic Concepts & Innovations LLC in Mount Pleasant, S.C., he is also a senior member of Society of Plastic Engineers (SPE) and has been a member of the national board of directors for the Thermoforming Division of the SPE for the past 30 years. Visit www.plasticoncepts.com for more information.

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PPE supplies both types 13X and 4A molecular sieve desiccant in two bead sizes. Due to the various designs of desiccant plastic material dryers, you must replace your bed material with the same type and size that was supplied with your dryer.

Molecular sieve desiccant type 13X has a 12% higher moisture absorption capacity and a larger pore size than type 4A. The larger pores allow it to absorb moisture faster and also absorb larger molecules of moisture as well. Depending on the quantity and type of molecules present, these could react on the surface of the 13X during regeneration and not come off, thus reducing its capacity to function over time. Type 13X is more subject to contamination which in time renders it ineffective.

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		MS4A4-110	110 lbs.	~~$322.00~~	$289.00	~~$306.00~~	$275.00
		MS4A4-300	300 lbs.	~~$835.00~~	$751.00	~~$795.00~~	$715.00
1/16" Size varies .055 to .093 dia.	8 x 12	MS4A8-030	30 lbs.	~~$92.75~~	$83.50	~~$88.00~~	$79.00
		MS4A8-110	110 lbs.	~~$322.00~~	$289.00	~~$306.00~~	$275.00
		MS4A8-300	300 lbs.	~~$835.00~~	$751.00	~~$795.00~~	$715.00

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				1 CONTAINER		2 OR MORE	
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		MS13X4-110	110 lbs.	~~$357.00~~	$321.00	~~$340.00~~	$306.00
		MS13X4-275	275 lbs.	~~$845.00~~	$760.00	~~$805.00~~	$724.00
1/16" Size varies .055 to .093 dia.	8 x 12	MS13X8-025	25 lbs.	~~$85.75~~	$77.00	~~$81.00~~	$73.00
		MS13X8-110	110 lbs.	~~$357.00~~	$321.00	~~$340.00~~	$306.00
		MS13X8-275	275 lbs.	~~$845.00~~	$760.00	~~$805.00~~	$724.00

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