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A large, bold, yellow text overlay on the left side of the page. The background of the entire page is a photograph of an industrial exhibition booth with various machinery and people.

*Take a Closer Look at New Technology  
You'll Find at the Show*

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PCR, Industrial Reclaim**

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These Purging Tips**

86 **Managing Melt  
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*By Jim Callari, Editorial Director*

Tips & Techniques



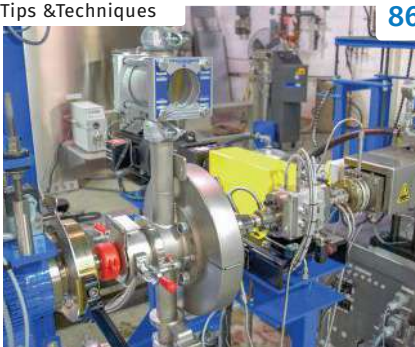
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*By Charlie Martin, Leistritz Extrusion USA*

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# Welcome to our NPE2024 Show Issue

Megatrends such as sustainability are the driving force behind a slew of new product introductions at the May show. Catch up on what's in store in Orlando right here.



**Jim Callari**  
Editorial Director

Many times on this page I have characterized the North American plastics processing market as mature. I have noted that changes in technologies over the past few decades have been more evolutionary than revolutionary. I have also maintained, at times in exasperated fashion, that processors in North America tend to be (perhaps too) conservative when it comes to embracing new technologies, certainly when compared to their European counterparts.

I'm not quite ready to back off on any of these viewpoints, especially the last one, but I think

processors who fill the halls at NPE2024, May 6-10, in Orlando, Florida will, well, be in for a show. Some of the things they see may be eye-popping. Throughout the show, for instance, Commercial Plastics Recycling, NPE2024's official recycler, will be working with machinery suppliers Conair, Weima and the Plastics Industry Association to collect and recycle 100% of the demonstration products produced on the show floor. That will be quite the accomplishment.

On the other hand, other developments on display may be more on the subtle side, such as machines of all kinds with a smaller footprint. In injection molding, Executive Editor Tony Deligio explains in a "megatrends" article that begins on page 42, "Machine suppliers at NPE2024 have slimmed down their machine fleets, promising molders more output from a smaller package. Innovations in drive and clamp technologies, as well as advances in the key components that make up the guts of injection molding machines, have enabled the machinery OEMs to cut footprints as much as 30% in some instances."

Addressing blow molding in that same article, Contributing Editor Matthew Naitove observes, "Among the 50+ displays of blow molding machinery, tooling and controls, expect to see numerous examples of "circular" technology — involving use of recycled and scrap materials. In extrusion blow molding (EBM), expect the

emphasis to be on three-layer coextrusion with the recycled layer in the center between two layers of virgin resin. In PET injection stretch-blow molding (ISBM), you may encounter two-layer sandwiches with a thin virgin inner layer and rPET on the outside. Some PET exhibits (including preform injection molding) may show off capabilities to mold rPET flake without repelletizing."


In extrusion, I note in the megatrends article that blown film machinery running on the show floor will be processing more readily recyclable polyolefins. There will also be plenty of talk at the booths of compounding machinery suppliers about best practices to run biopolymers and reclaim.

Developments in machinery and materials (check out Contributing Editor Lilli Sherman's Close-Up on page 10) don't happen in a vacuum. They happen in response to something the industry has to have, and chief among these "somethings" is sustainability.

Sustainability comes in many shapes, sizes and flavors. If you are using "greener" materials such as bioresins or postconsumer

reclaim, you can lay claim that your operation is more sustainable. If you are tapping into alternative energy sources, or making the ones you have more energy-efficient, you can lay claim that your operation is more sustainable. If you have taken steps to reduce scrap, you can lay claim that your operation is more sustainable. If you are consuming less material to produce product, you can lay claim that your operation is more sustainable. There are plenty of other examples, but I think you get the picture.

As you prepare your trip to Orlando, check out the more than 90 new products that we have covered in this issue on pages 44-77. Take particular note of those that promote sustainability in one variation or another.

And to think, when I first heard the word sustainability applied to our industry 20 years ago, I thought it was another passing fancy. 

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## 420 Stainless Steel Now Qualified With 3D Printing Technology

Mantle has announced the availability of 420 Stainless Steel for use with its TrueShape 3D printing technology for precision tooling. No hardware modifications or additional components will be required for use with the company's P-200 printer. The 420 Stainless Steel will be available in the second half of 2024 and will require only an over-the-air software update.

The TrueShape 3D technology, which incorporates fused deposition modeling and CNC machining, enables rapid toolmaking with reduced or even, in some cases, no postprocessing. The process begins with a metal paste, which is added in layers. Periodic drying and CNC steps build up the shape of the tool, which is ultimately transferred to an oven for sintering.

According to Mantle, the pursuit of the new material was driven by customer requests. TrueShape 3D was launched with P20 steel, with the later addition of harder H13 steel. The new material will offer similar hardness to the H13, adding superior corrosion resistance.

The availability of stainless is expected to be beneficial to customers in corrosive environments, such as manufacturing locations in tropical climates. Corrosion is particularly of concern with conformal



cooling channels, enabled by additive manufacturing technologies, which offer more efficient cooling than linear channels, thus enabling faster

cycle times. "Conformal cooling can lead to a better outcome from a molding perspective, but there's greater risk and perception of risk of those channels getting corroded or clogged if they rust over time," says Paul DiLaura, Mantle's chief commercial officer. "So having a stainless steel for conformal cooling is perceived as a real advantage."

At NPE 2024, Mantle plans to display examples of printed steel tooling from the Trueshape 3D technology, along with the metal paste the process begins with, setting up a stark comparison: from a mixture of metal particles, adhesive and solvent that is described as having the consistency of toothpaste, to a dense, heavy, stainless-steel tool ready for industrial injection molding.

## Polyplastics and Selex Motors Collaborate on Electric Two-Wheeler Battery Covers

Polyplastics has joined forces with Vietnamese electric motorcycle startup Selex Motors to develop battery pack covers produced with Duranex PBT. Playing a crucial role in EVs, battery covers provide safety and maintain the integrity of the battery pack. They are also key for the overall functionality and attractiveness of



electric two-wheelers, which ultimately contribute to the success of the EV market. Selex chose Polyplastics' advanced grade of Duranex PBT as it is specifically formulated and produced for this application to help the company improve the overall quality of its batteries.

Duranex PBT features flame retardancy, low warpage, and heat and moisture resistance. It has been certified by Underwriters Laboratory (UL) with a V-0 rating, indicating its high flame retardancy. Furthermore, battery covers made with Duranex have exceeded the demanding requirements of the TCNV (Vietnam National Standard System) and stringent international standards.

By integrating this PBT into its battery covers, Selex (which stands for Smart Electric Vehicles X, with the "X" signifying the future portfolio of electric vehicle models as well as the X factor) says it's setting a higher standard for performance and reliability, ultimately contributing to a greener, more efficient and safer EV future. Both companies say they adhere to the highest industry standards, ensuring that battery covers meet strict quality benchmarks.

## Composting Additive for PLA Added to FDA Inventory of Food Contact Substances

France-based Carbios recently announced that its Carbios Active composting additive for PLA bioplastics is now included in the U.S. FDA Inventory of Effective Food Contact Substances (FCS) with the Assigned Food

Contact Notification (FCN) 2325, effective since Feb. 29. With this milestone, Carbios Active can be used to make packaging materials that are sold in the U.S. and come into contact with food, including rigid and flexible packaging, and other applications.

Integrated directly into plastic conversion processes, Carbios Active enables the creation of a new generation of PLA that is 100% compostable, even at ambient temperature, without leaving toxic residues

or microplastics. PLA (which includes this unique enzymatic solution) is certified for industrial and home composting. Carbios Active was recently certified by the Biodegradable Products Institute (BPI), North America's leading authority on compostable products and packaging.

Food Contact Notification and BPI certification ensure the quality of Carbios Active, providing brand owners and industrial composters with a reliable solution for designing and marketing fully biodegradable packaging, aligning with circularity commitments.



## Advanced Biobased Materials Company Gets Support for Commercialization

Bioplastics startup PlantSwitch has raised its financial investment by \$8 million with participation of large institutional investment firm NexPoint Capital to proceed with its first commercial manufacturing facility in North Carolina and expand its team. The plant began producing material in December 2023. Expected to reach capacity in 2025, the 52,000 ft<sup>2</sup> facility will have a capacity of 10 million lbs/yr. The company developed what it calls a “revolutionary” bioplastic technology that converts cellulosic agricultural waste streams into a low-cost, compostable plastic resin alternative, with the aim of replacing conventional single-use plastics.

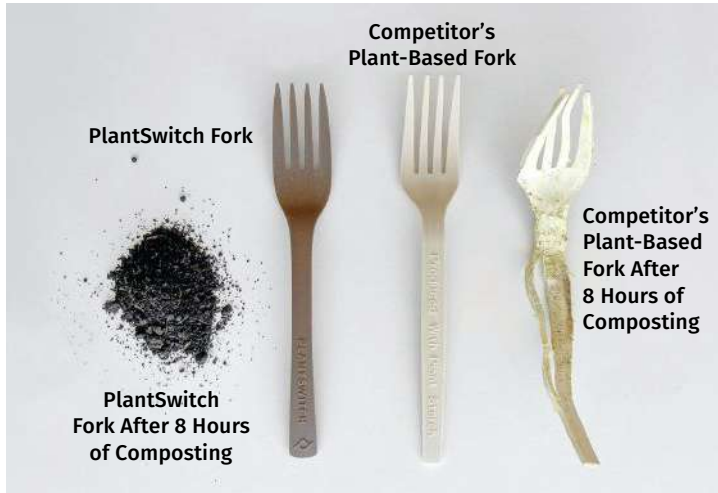
The company sees itself uniquely positioned to provide a compostable, cost-effective alternative to conventional plastic that is both sustainable and scalable. The company currently has 12 employees, primarily chemical engineers and polymer scientists who have made significant contributions to the field of sustainable materials.

PlantSwitch compounds have been

shown in labs to degrade like PHA, breaking down completely in countertop compost machines within eight hours and within three months in commercial compost conditions. The company says its compounds perform like PHA, which breaks down in more settings and ranks higher in performance than forerunner PLA, but they say they can make their compounds at lower cost. Field testing in commercial composting facilities is underway.

Meanwhile, the manufacturing process incorporates agricultural byproducts such as rice husks, wheat straw and other cellulose-rich products, which are blended with other biopolymers to lower the cost.

Says PlantSwitch CEO Dillon Baxter, “Major corporations have made commitments to lower their plastic consumption and the toxic waste it produces, but the proper infrastructure to deliver a viable alternative hasn’t existed. This \$8 million raise, in partnership with NexPoint, is being invested in building out this infrastructure, which will drive the alternative plastics market forward.”





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Plastics Technology 7

## Robotic Sorters With AI Technology Deployed in Fresno Recycling Center

Caglia Environmental, based in Fresno, California, announced improvements to recycling technology at its Cedar Avenue Recycling and Transfer Station (CARTS). The enhancement is made possible by funding from The Recycling Partnership's PET Recycling Coalition. Caglia Environmental was one of 12 businesses and organizations in North America to receive a PET Recycling Coalition grant.

The grant has enabled the installation of robotic sorters using RecycleOS from Everest Labs. RecycleOS software is designed to identify PET plastic and classify it into three specialized streams, which each robot efficiently sorts into three different bunkers. This process is unique as most facilities that accept PET collect and bale the three streams as one. The system has the ability to separate these plastics into PET bottles, thermoformed packaging and pigmented/opaque PET.

"Being at the forefront of separating PET into specialized streams is a proactive leap toward the bigger and broader recycling landscape that extended producer responsibility (EPR) will bring to California and the industry," says Adam Gendell, director of material advancement at The Recycling Partnership.

Caglia Environmental's new investments in EverestLabs solutions are expected to increase the efficiency of PET plastic recycling and ensure the purity of recycled materials, thereby enhancing their value and sustainability. The facility can now sort clear PET bottles, thermoformed products and pigmented/opaque PET into separate streams, significantly improving the recycling process and output quality. This retrofit represents the first time a material recovery facility (MRF) has consistently targeted each of these three product types as separate commodities and will serve as a benchmark for MRF's seeking to do this in the future.

"The Caglia team saw right away that RecycleOS-powered robotics and data dramatically improved their bottom line on their Last-Chance line," says JD Ambati, founder and CEO of EverestLabs.

## CJ Biomaterials PHA-Based Polybag Makes Same-Day Delivery More Sustainable

A new biodegradable polybag has been developed by CJ Biomaterials (U.S. office Woburn, Massachusetts) that is said to have properties similar to traditional PVC bags. According to the company, the bags will be used by South Korea-based health and beauty retailer CJ Olive Young, enabling a sustainable solution for the company's same-day delivery service. The polybag was manufactured by one of CJ Biomaterials' partner converters in Korea, Jo Eun Pack.

CJ Biomaterials researched how its PHA technology could be used to replace PVC, and it created a bag with properties that are similar to those of typical options. With the increased biocontent, bags that incorporate PHA are durable enough to carry heavy or sharp-edged items without tearing. They are said to have excellent opacity, preventing contents from being visible from the outside. The bags also have adhesive properties that enable shipping labels to be applied and easily remain in place, making it suitable for multiple applications where polybags are necessary.



According to Heidi Label, strategic marketing v.p., although PHA is marine degradable, the polybag is not as it is not 100% PHA based. "We cannot disclose the whole composition of this polybag, but what we can share is that compostable or biodegradable materials were used to make this polybag with PHA. CJ Biomaterials is trying to develop products that are more economical and functionally superior," Label says.

## Eastman Will Recycle Colored and Opaque PET Supplied by Rumpke

Rumpke, which provides waste management services in Ohio, Kentucky, Indiana and West Virginia, will supply colored and opaque PET products to Eastman. These products will be processed by Eastman using its molecular recycling technology.

Eastman is implementing processes to depolymerize PET using glycolysis and methanolysis. The resulting monomer can be used to make virgin-quality polyesters that can in turn be feedstock for a wide variety of packaging applications.

"This partnership creates a new market for colored and opaque waste that is not currently recycled today," says Jeff Snyder, Rumpke's director of recycling.

Colored and opaque PET is used across a range of consumer applications, including personal care and cosmetic packaging, detergent and soap packaging, and various dairy and food packaging. Historically, many of these applications have been unable to transition to fully circular packaging, in which packaging is recycled to produce the same type and format of packaging, because post-consumer waste is generally not sorted by color. Due to this limitation, mixed-color PET recyclate sells for significantly less than clear PET, which can be used in a wide range of applications and colors.

This announcement comes as Eastman is nearing the startup of the world's largest material-to-material molecular recycling facility at its Kingsport, Tennessee, site. Set to begin shipping its first products in the first quarter of 2024, the Kingsport plant is expected to recycle 110,000 metric tons of waste annually.



## Bollegraaf and Greyparrot Team Up in AI Vision Deal

Bollegraaf, a builder of recycling facilities, announced a strategic partnership with Greyparrot, an artificial intelligence (AI) waste analytics company. As part of the agreement, Bollegraaf will transfer its AI vision business to Greyparrot and also make a cash investment in Greyparrot, for a total value of \$12.8 million, while obtaining a noncontrolling stake in the company. It will also serve as a world-wide distributor and strategic partner for Greyparrot's Analyzer, which currently provides visibility into waste streams at recycling plants across 14 countries using AI camera systems.



As part of the deal, Greyparrot acquires Bollegraaf's vision-based computing intellectual property and AI development team. Greyparrot will also open its first office in mainland Europe, to be located in the Netherlands.

The companies aim to retrofit thousands of existing materials recovery facilities (MRFs) and plastics recovery facilities (PRFs) with AI sorting

capabilities, aiming to significantly boost recycling rates and quantify material emissions. Bollegraaf will provide the physical infrastructure, while Greyparrot adds the digital layer with its vision and analysis technology. According to Greyparrot, the Analyzer helped facilities analyze more than 25 billion waste objects in 2023, characterizing them into 70-plus categories in real time to reveal seven layers of data, including material type, financial value, brand and GHG emissions.

Waste characterization practices at MRFs are often time and labor intensive, and can only be done at intervals. According to Greyparrot, the Analyzer system gives 100% visibility into waste composition, and does so in real time, providing managers with immediate and actionable information on the waste stream.

## Modern Dispersions Expands Masterbatch Production

Modern Dispersions is in full operation with the first phase of a multifaceted manufacturing expansion at its new 168-acre site in Fitzgerald, Georgia, which expands its masterbatch capacity by 100 million lbs/yr. The new facility is across the street from the company's existing 400-million lbs/yr plant. Construction on the second phase, which includes another 100 million lbs/yr of capacity, is already underway and slated for startup in 2026.

Targeted to the North American market, the capacity expansion is in response to strong growth in injection molding and extrusion applications in a range of markets, including automotive, electronics packaging and construction. Key end-use applications include pipe and wire and cable.

The company's multimillion-dollar investment includes state-of-the-art compounding equipment, ancillary equipment and related infrastructure support. In addition to the manufacturing facility, the project features transportation improvements, including the installation of a new rail storage and switch yard to accommodate 200 rail cars.



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## NPE2024

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## Follow These Megatrends in Materials and Additives

Offerings range from recycled, biobased, biodegradable and monomaterial structures that enhance recyclability to additives that are more efficient, sustainable and safer to use.

“From a materials perspective, sustainable solutions are the name of the game,” says Susan Jackson, head of communications

and sustainability, BASF Performance Materials NA. In addition to seeing more recycled grades, biobased

By Lilli Manolis Sherman  
Contributing Editor

materials and biodegradable plastics, processors will also learn more about different plastics sorting technologies that now exist to make it easier to get plastics back into the value chain. “The key to increasing the rate of recycled materials lies in generating better sorted waste streams across the globe. This can only be achieved if the access barriers to plastic identification technology are lowered.”

Specifically addressing the polyolefins arena, Joel Morales, v.p. of polyolefins Americas for Chemical Market Analytics, says processors will see two new North American entrants that were not making pellets during the last NPE. Heartland Polymers, Alberta, Canada, with polypropylene and Shell Polymers in Monaca, Pennsylvania, with polyethylene, which together are adding nearly 4.9 billion lbs of new capacity to the region.

He says, “Processors are looking toward new entrants to improve the competitive environment in the North American market. While traditional virgin production for polyolefins has continued to grow in recent years, so has the availability of mechanical recycling and chemical recycling options. Processors will look to balance the demands of their customers to develop sustainable products, at the same time keeping in mind the competitive, abundant offerings of virgin materials.”

Expect to see materials that enable fully recyclable monomaterial film structures and materials that contain or enable the use of postconsumer recycled material, according to Doug Biela, NOVA Chemicals’ leader of polyethylene market management.

Companies that do not prioritize sustainability risk being left behind, say team members from Avient. The company is expanding its portfolio of sustainable solutions, including more bio, recycled and eco-conscious materials, additives, technologies and services for helping customers meet consumer demand and also meet new government regulations.



**BASF Plastics Additives is the “first additives” supplier to commercially launch ‘biomass balance’ additives, with its new BMB line of stabilizers. Source: BASF**

#### ADDITIVES COMPLEMENT MATERIALS TRENDS

The elimination of forever chemicals from the supply chain is among the major trends, says Jeroen Frederix, SI Group’s market development manager for circular economy. A key example is the industry’s search to replace per- and polyfluoroalkyl substances (PFAS) in PE films and other applications, which have been found to present potential health hazards and face increased regulations for their use. “Sustainability will be an overarching topic due to further progress both domestically and globally from a legislative perspective and increasing end-market pull for more circular and low-carbon solutions,” Frederix says.

NOVA’s Biela says, “The development of new fluorine-free polymer processing aids will continue to address pain points associated with first generation of such products.” He also notes that antioxidant suppliers continue to develop stabilization systems to facilitate and enhance mechanical recycling of PE.

In that spirit, sources from Ampacet note they are highlighting their PFAS-free processing aids, introduced in early 2023, and later that year launched a product line extension to include two globally compliant additives that are said to perform

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as well as fluoro-based processing aids in blown-film extrusion for multiple end-use applications and at the same LDR as most common Ampacet PPAs.

BASF's Plastics Additives team says that with their latest development in additives, processors will be able to increase recycled content in the final application, as well as mitigate challenges, such as melt-flow, gel formation or mechanical property deficiencies usually observed when processing recycled plastics. An additional trend is to address recycling challenges of packaging in the initial design phase, focusing on recyclability for which additives can play a key part, such as Irgaclear XT 386 clarifier for designing transparent recyclable packaging.



Look for materials that enable fully recyclable monomaterial film structures and materials that contain or enable the use of postconsumer recycled material, says NOVA's Biela. Source: NOVA Chemicals

### WHAT PROCESSORS SHOULD BE ASKING

Processors ought to ask about new and underway developments based on these key trends, say industry sources. The Avient team sources say that in order to be better equipped for the future and stand out from their competitors, processors should inquire about the entire product life cycle, from material selection to end-of-life considerations. This involves using materials and additives that can assist in incorporating more bio and recycled content, as well as using more eco-conscious ingredients.

For this, they should invest time and resources in learning about sustainable material and additive options, design, government regulations and all the various aspects of the manufacturing process that contribute to sustainable production.

Says BASF's Jackson, "We're working with customers on recycling and designing for sustainability. We have some cool tools — Utrasim, which is our proprietary computer-aided engineering program and 3DP expertise with our Forward AM business, which can assist with rapid prototyping in producing samples, for example." The company is also highlighting mechanically recycled plastic grades and advanced recycling grades that are

being used in automotive and consumer applications currently, but have opportunities for broader use. Also highlighted are education around topics such as the biomass balance approach, product carbon footprint and optimal sorting technology from BASF's subsidiary TrinamIX and how they support a circular economy.

In addition to showcasing its Evercycle additives tailored to improve the quality of mechanically recycled plastics, SI Group is ready to discuss alternatives for PFAS, and new non-dust additive developments that increase PCR in polypropylene automotive compounds.

Say Ampacet sources, "We are constantly expanding our line of R3 Sustainable Solutions products. PET recycling has gained a lot of traction because of commitments that CPG companies have made



Sorting technologies, such as that offered by BASF subsidiary trinamIX, will be showcased at NPE 2024. Source: BASF

over the past few years. These products include compatibilizers, odor scavengers and antioxidants." Ampacet is also touting its new, "first of its kind" additive masterbatch technology for a range of thermoplastics that enable processors to create permanent lettering and designs in intricate detail on black and dark plastic surfaces.

Suited for adding permanent color logos, intricate designs, serial numbers, QR codes and bar codes for applications such as consumer electronics, automotive interiors, eyewear, housewares, appliances and accessories, ColorMark is available in FDA and NIR-sortable formulations, which offer sustainability benefits and could replace paper and labeling, thereby reducing plastics use.

The future is mainly about collaboration as the use of and need for recycled plastics has increased complexity significantly, says the BASF Plastics Additives team. "We are looking to address specific challenges such as viscosity, yellowing and also mitigation of impurities. In terms of our stabilizers solutions for virgin polymer systems, we are tailoring specific blends for addressing the need for less migration. Finally, as the first additive supplier, we recently launched 'biomass balanced' (BMB) certified antioxidant solutions to help processors improve their carbon footprint." PT





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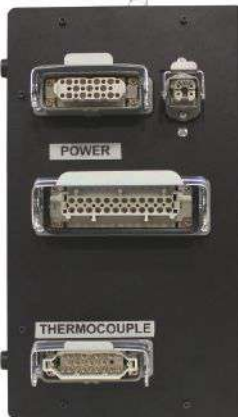


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## NPE2024

The Plastics Show

# Impacts of Auto's Switch to Sustainability

Of all the trends you'll see at NPE2024, this one is BIG. Not only is the auto industry transitioning to electrification but there are concerted efforts to modify the materials used, especially polymers, for interior applications.

If you look at the dashboard of a Tesla Model 3 the notable thing is something that *isn't* there. As in the array of buttons, knobs and

By Gary S. Vasilash  
Contributing Editor

switches that have historically been part of the HVAC and infotainment controls for a vehicle. All of those things are typically

injection molded. But they are gone. Manufacturing consultant Laurie Harbour, who specializes in automotive, points out that Tesla's elimination of these comparatively small components has a big impact on moldmakers and molders, especially given that other vehicle manufacturers are following Tesla's lead.

And there is another thing to notice about that Model 3 (or Model Y or other models) No leather. Well, there is what's referred to as "vegan leather." But it is actually a vinyl.

According to Mike Maddelein, vice president of Engineering, Americas, at Adient, one of the largest automotive seat manufacturers in the world, leather as a seat material, once considered to

be premium, is giving way — particularly as the industry transitions to electric vehicles — to vinyl and other plastic materials.

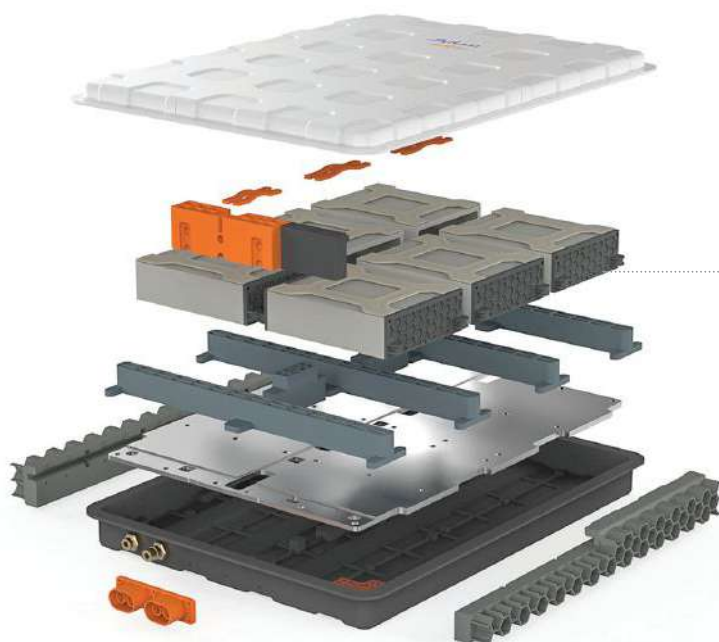
The reason? Sustainability. Maddelein says that both OEMs and customers are interested in sustainable materials in their vehicles.

### LOTS OF RECYCLED PLASTICS

While the attention in the auto industry seems to be all about lithium for batteries, there is a huge effort underway to use materials — many of which are polymers — that support sustainability.

Consider, for example, what General Motors said in its "2022 Sustainability Report" about its use of recycled plastic for its vehicles. It used recycled plastics in these applications:

- 12.6 million lbs — wheelhouse liners
- 4.5 million lbs — HVAC ducts
- 1.8 million lbs — center console
- 1.5 million lbs — interior door skin
- 1.3 million lbs — window support brackets
- 900,000 lbs — door trim
- 632,000 lbs — underbody shields
- 250,000 lbs — active grill shutters
- 245,000 lbs — hubcaps
- 210,000 lbs — horn housings
- 165,000 lbs — fans and fan shrouds ▶



Lithium-ion batteries (shown disassembled here) have two characteristics that plastic materials can help address — they are heavy and they can ignite (the electrolyte is flammable and the oxides within the battery materials provide a steady source of oxygen). Somasekhar Bobba, global technical manager, Mobility, SABIC's Specialties Business, says they've developed an array of thermoplastic resins, compounds and copolymers for EV battery applications. Its NORYL resins, for example, provide light weight, impact resistance and flame retardance. He cited the battery pack cover, side impact absorbers (overmolded onto the metal structure, but providing a 60% weight-save compared with multipart metal reinforcements), corner support plates for the bottom of the battery pack and the bottom of the battery pack itself. Source: SABIC



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Tesla has had multiple effects on auto manufacturing, including in the interior, where the traditional knobs and buttons have been eliminated, as in this Model 3. Source: Tesla



Because electric vehicles don't have engines under their hoods, many OEMs are making use of that space for front trunks, or "frunks," such as this Ford Mustang Mach-E. Its frunk is molded, in part, with recycled yogurt cups. Source: Ford Motor Co.

The point is: Although there is the elimination of some plastic components (Tesla and others got rid of those buttons because it was able to include the functionality in the center screen, which also has the benefits of simplifying inventory and reducing manufacturing complexity), there is also the increase in the use of plas-

tics — but not necessarily the virgin material that has long been characteristic of vehicle interiors.

***While the attention in the auto industry seems to be all about lithium for batteries, there is a huge effort underway to use materials — many of which are polymers — that support sustainability. (Visit the Sustainability Hub at NPE2024 May 6-12 in Orlando to stay on top of the trend.)***

#### EURO REGULATIONS

In fact, in Europe this past July, the European Parliament laid out its proposal for handling materials from end-of-life vehicles (ELVs), including plastics, as it calculates that the auto industry accounts for

10% of the overall consumption of the material in Europe. Its "preferred option is to set a medium level of ambition with target for recycled plastics content of 25% by 2030, of which 25% is from closed loop ELV treatment."

Although there are certainly efforts underway to use recycled plastics in vehicles, many of these plastics are sourced from things that didn't used to be cars or trucks (aka, ELVs).

#### AWARD-WINNING FRUNK

Consider, for example, the "frunk" (front trunk) insert developed for the Ford Mustang Mach-E electric vehicle, which received a

sustainability award from the Society of Plastics Engineers last fall. The frunk is described by Ford as being created from "recycled packaging including and weighing the approximate equivalent of 115 postconsumer-use yogurt cups." Of this application, Cynthia Williams, global director of sustainability, homologation and compliance at Ford, says, "Our aspiration is to use only recycled or renewable plastic content in our vehicles, and this innovation helps bring us closer to that goal."

Volvo is launching a new compact electric SUV, the EX30, which includes interior trim made from recycled plastic from old window frames and roller shutters. Customers can select seats covered with "Nordico," a textile that is based, in part, on recycled PET bottles.



The Volvo EV30 small-electric SUV is claimed by the company to be the most sustainable vehicle it has built. Materials for molding interior trim include recycled window frames. Source: Volvo

Or there's a wool blend that includes 70% recycled polyester. This use of recycled materials is something that Volvo is promoting, not hiding, describing the EX30 as having lowest carbon footprint of any Volvo made to date. And, like the aforementioned Teslas, the EX30 eliminates knobs and buttons, and provides a 12.3-inch screen through which adjustments can be made.

## KIA GOES DEEP

One automotive company that is really committed to the use of sustainable materials in its vehicles is Kia. Last fall, Kia's partner, The Ocean Cleanup, recovered 55 tons of plastics from the Pacific Ocean. Kia plans to use some of those materials in future models, which is in line with what it is doing at present.

The company has identified 10 "must-have sustainability items" that it will deploy in all of its vehicles going forward, starting with the award-winning, three-row electric SUV, the 2024 EV9. These are:

- **Bioplastics.** Based on various biomass materials (for example, vegetable oils, corn extract, sawdust, sugarcane). Used in interior trim.
- **Postconsumer material (PCM) plastic.** Recycled material. Used for EV9 door garnish.
- **Bio Polyurethane.** The leather alternative. Incorporates plant-based material.
- **Recycled PET.** Used for fabric applications. Going beyond other recycled PET materials, Kia is also using recycled yarn in the fabric. Overall, more than 70 recycled PET bottles are used in the EV9.
- **Recycled PET carpet.** The standard carpets in the EV9 are 100% recycled PET. A portion of the materials are from fishing nets captured by the Ocean Cleanup efforts.
- **Bio Polyurethane foam.** Used for the headrests.
- **Bio paint.** Made with rapeseed oil. Used on the door window switch panels.
- **BTX-free paint.** No benzene, toluene and xylene (BTX) is used in the formulation. Used for the interior trim (except for the aforementioned door window switch panels).
- **Recycled PET yarn.** Used for seat stitching.
- **Recycled PET felt.** Used for sound-attenuation applications in the interior.

Kia calculates that the components in the EV9 made from recycled plastic and biobased materials weigh approximately 34 kg.

And Kia is going even further in its pursuit of sustainable materials. Last fall, it revealed a concept vehicle, the Kia Concept EV3, which features a table in the cabin. It is fabricated with mycelium, about which Marilia Biill, head of CMF Design at Kia, says, "Mycelium, which comes from mushroom roots, combines excellent strength with an extremely soft surface. Developing grown materials, a process referred to as bio fabrication, is a major goal for Kia. Using Mycelium enables us to mimic the processes we see in nature and leverage it to design more sustainable solutions — the material can be grown in any shape you want using a mold."

That's right: growing substrate materials in a mold. [PT](#)



Part of the 55-ton haul of waste plastics recovered last fall from the Pacific Ocean by Kia partner Ocean Cleanup. Kia is committed to using materials like these for its vehicles as it works toward being carbon-neutral. Source: Kia

## RENAULT'S COMMITMENTS

Presumably, because of the current regulations as well as those that are likely to be enacted, other European OEMs are focusing efforts on the use of sustainable materials. For example, Renault just launched the Scenic E-Tech EV. About it, Cléa Martinet, vice president, Sustainability, Renault Group, says, "This is the first time we built in commitments relating to sustainability and decarbonization from cradle to grave, even from cradle to cradle."

So, for example, 80% of the dash structure is made of recycled polypropylene; 97% of the carpets and 99.5% of the headliner is produced with material made from recycled bottles — polyethylene terephthalate (PET).

And, while there may have been the case that the use of recycled polymers in vehicle applications that are visible to the consumer (after all, wheelhouse liners and HVAC ducts aren't the sort of things that people pay attention to) were suboptimal, Gilles Vidal, vice president of Design at Renault, noted, "Yes, electric vehicles can be desirable and sustainable at the same time. It's a noble approach to make a product that is useful, practical for daily life and on top of which is recyclable and sustainable."

# Digital Twin Creates New, Virtual Paths for Robots with Real-World Cycle-Time Impacts

Realtime Robotics seeks to get more robots involved in manufacturing by addressing the biggest current barrier: programming costs.

By **Tony Deligio**  
Executive Editor

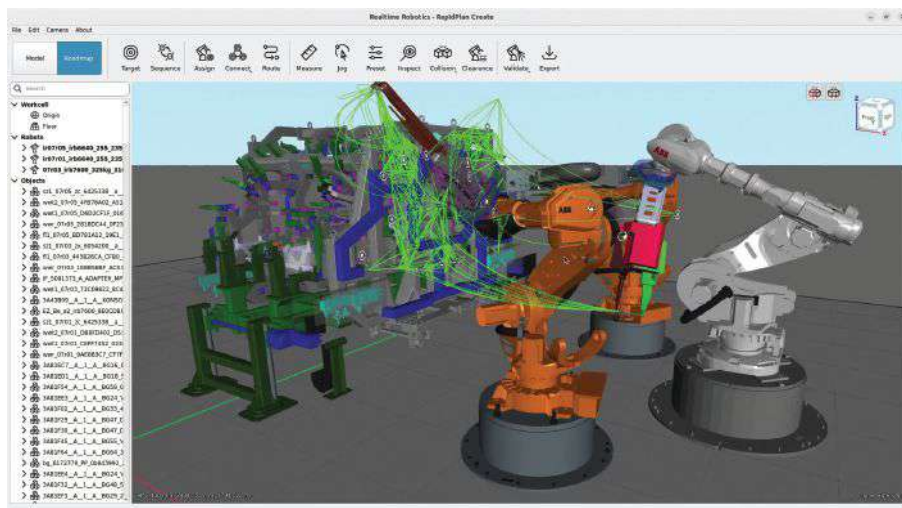
Realtime Robotics, Boston, Massachusetts, grew out of two professors trying to answer one question: Why aren't robots more prevalent? In a manufacturing market where labor remains scarce, why hasn't the adoption of automation accelerated?

"It turns out that the answer is the high programming cost," explains Alejandro Suarez, Realtime director of marketing. When the company broke down the life cycle cost of a robot, it determined that roughly 75% of that cost came in programming, with the rest being actual hardware, including the robot itself and end-of-arm-

company, Realtime Robotics. The company is based on their shared interest in greater automation adoption. To do so, it would deploy technology Sorin has developed which is capable of reducing overall programming time by rapidly assessing the various paths a robot can take.

Today, Realtime bills itself as a leader in providing manufacturers with collision-free motion planning and robot control. Over the past year, Realtime says it's taken that further and its new offering determines that collision-free path, optimizing automation that's already in the field or currently being designed. "We're taking our automated path planning, where you're figuring out what's the best path for a robot to take — what are the collision-free paths," Suarez says, "and then we optimize that so we're truly able to find the best path that's collision free, reducing the cycle time even for multiple robots."

At this stage, Suarez says the company essentially has two flavors of optimization. One is optimizing existing paths for a process that's very defined and limited in where it can travel. The second involves the customer knowing the starting point and destination — point A to point B — but giving users the freedom to say, "Get me there as quickly as possible."



Realtime Robotics creates a digital twin of a cell to quickly compute the best possible paths and sequences for automation. Source: Realtime Robotics

tooling (EOAT), as well as indirect costs like power and training.

Those professors — George Konidaris, who teaches computer science at Brown University, and Daniel Sorin, who's a professor in electrical and computer engineering at Duke University — continued their discussion and would go on to found a new

## AUTOMATED AUTOMOTIVE ASSEMBLY

As Volkswagen sought to revitalize its iconic minivan with the new electric-powered ID. Buzz, it turned to Realtime and its optimization-as-a-service product to determine the motion paths for its assembly and welding robots as it set up a new

production line. Realtime did so, using its proprietary technology to evaluate hundreds of thousands of possible paths, sequences and sequence allocations for the robots.

“What if you assign five weld spots to one robot and six to the other, or six to the first and five to the other?” Suarez says, “Based on where they are positioned, it can analyze and figure out the paths.” All these calculations are happening on a scale and at a speed that human minds do not work at.

“It’s really, really difficult for a human to think about all these different combinations and permutations for a single robot,” Suarez says. “Now, imagine you have six robots working in a shared space. This is very exciting because we finally were able to get computers to do the hard work. We’ve been able to create this to go through and find the absolute best solution.”

**“We’re taking our automated path planning, figuring out what’s the best path for a robot to take, what are the collision-free paths.”**

**OPTIMIZING EXISTING LINES**

The traditional optimization of an existing or “brownfield” site requires the shop and its systems integrator to identify a bottleneck and posit possible solutions, requiring a shutdown to test out those theoretical answers.

“It’s really a trial-and-error process and, typically for these projects, it’s the robotics expert that has 30 years of experience and all the scars from doing this that has a starting point for optimizing,” Suarez says. “They go in over a weekend and try to improve the paths, and maybe they get a little bit of improve-

ment, but not to the point where you need. So, it’s still a bottleneck — less of a bottleneck — but still a bottleneck.”

With Realtime’s robotics optimization, Suarez says the process is faster and more thorough, taking days or weeks instead of months. The company’s process starts by receiving existing CAD models and creating a digital twin of the existing robot program,

which it loads into its optimization software (it can also undertake a 3D scan of the line).

At this stage, Suarez says the company knows straightaway whether it can optimize the given automation process or not. “Right away we get a sense that, for example, we’ll be able to reduce the cycle time 1% to 5%. From there, the company then works with the end user to determine what are the parameters that can be changed and which ones are immutable. Next, Realtime works with the system integrator of choice ▶

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for the client, telling the integrator how the robots need to be programmed and sequenced. “They take that and deploy it on the actual robots,” Suarez says. “They make changes to the PLC or any changes that are required for the entire system.”

Finally, Realtime validates the results in actual production, taking into account things like communication delays between the robot and the PCL, which can be difficult to simulate. “It might be that instead of saving 5 seconds, we’re able to save 4.8 seconds,” Suarez says. “We’re able to do this whole thing in a single weekend shutdown, because we already figured out the answer in simulation.”

Realtime says its platform is robot agnostic, having successfully optimized with Fanuc, ABB, Kuka, Yaskawa and more with most early clients among major automotive OEMs. More recently, it has branched into other sectors and tasks, including mixed-case palletizing.

## OPTIMIZING MORE THAN CYCLE TIME

Beyond cycle time and optimization for raw speed, Realtime is also fielding additional requests from its customers to enhance other aspects of their automation. In Europe, in particular, concern over energy costs has led customers to ask Realtime to find paths and processes that reduce cycle time as much as possible, while also creating a path that maximizes energy efficiency. “Energy costs are so top-of-mind that customers are saying, ‘Well, you optimized for cycle time, while keeping that cycle time, can you

also reduce the energy consumption? Can you optimize for energy consumption?” Suarez says.

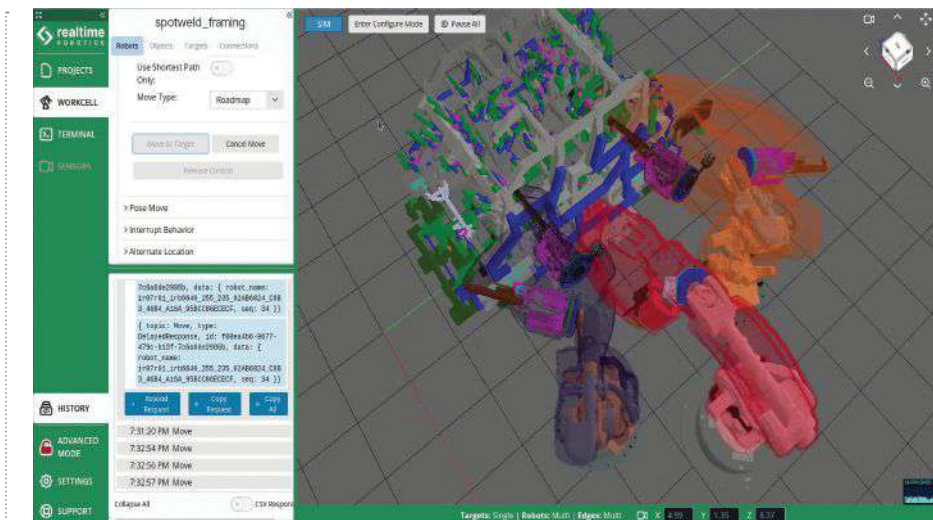
In addition, customers are also keenly aware of available floor space. “Customers say, ‘So you achieved my cycle time. The robots are using less energy. Can you save me some valuable floor space?’” Suarez says. In Japan, he notes, right behind cycle time, its clients’ chief concern isn’t

energy usage but real estate on the shop floor.

In plastics, where robots are often used to convert a manual process to an automated one, space is again a concern, with a new robot meant to occupy an area formally manned by a human. “What we’re able to do in a small space is figure out the optimal

solution,” Suarez says. “We figure out the paths for the robots, the interlocks, so you’re able to fit into your existing space quickly.”

Realtime is working on another function that Suarez believes will be of interest to plastics processors: AutoHoming. Typically, in a cell where a robot might be performing pick-and-place or other machine-tending functions, if there is an error where production is stopped, maintenance techs must often use the teach pendant to jog the robot back home because it was stopped suddenly and might not be sure how to return.



**Realtime Robotics can determine the possible paths, sequences for automation, weighing multiple factors like cycle time, energy efficiency and floor space utilization.**  
Source: Realtime Robotics

As a stopgap measure, some processors will write up code giving the robot take-me-home routines from places it’s likely to stop, which is an imperfect solution. “It’s very dependent on where the robot is,” Suarez says. “You have to find a collision-free path back. If you’re not able to program it, it requires a human with eyes, a brain and hands to say, ‘OK, here’s the way to get out of that spot of the machine.’”

Often, this requires the current part to be scrapped, because a new part is required to reload the proper sequence. With AutoHoming, Realtime knows where the robot is at all times and what the surrounding environment is. With the press of a button on the HMI, an operator can send the robot back home automatically and, if required, it can go back to its last position before the alarm and continue the process.

The company believes this function can eliminate another reason why customers shy away from using multiple robots in one cell. “Not only do you have to return one robot,” Suarez says, “but you have to return two or three, but if they were able to continue production once you fix the problem that would directly improve the bottom line.”

***“We figure out the paths for the robots, the interlocks, so you’re able to fit into your existing space quickly.”***



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# MATERIALS

## A Journey Into the World of Thermosets

There are many fundamental differences between thermosets and thermoplastics, from the way raw materials are furnished to the molder and the process in which parts are molded.

For much of my career as a processor, I was fortunate to work for a company that molded both thermoset and thermoplastic materials.



By Mike Sepe

The company was founded in 1941 and, for the first 10 years of its history, it ran parts primarily in phenolic, the original synthetic polymer and a material with a remarkable and underrated property profile. As a greater variety of thermoplastics emerged in the 1950s and early 1960s, much of the attention shifted to these new materials, and my company opened a second facility dedicated to running these materials.

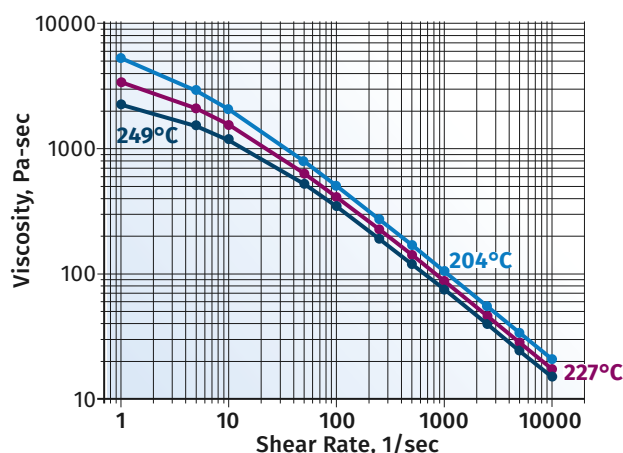
A walk through the two plants would reveal some fundamental differences in the way these two classes of materials are processed. Molding of thermoplastic materials is comparatively straightforward in that there is no difference between the chemistry of the raw material and that of the resulting molded part. The raw material delivered to the molding plant is chemically complete — a fully formed polymer of a desired molecular weight with the appropriate additives. If desired, certain fillers and colorants may be incorporated into the pelletized product.

The process then involves heating the material to an appropriate temperature so that a viscosity can be achieved that enables the mold cavity or cavities to be filled and packed, after which the material is allowed to cool before the mold is opened and the parts are ejected.

Sometimes this process is preceded by drying the raw material. If all goes well, the composition and molecular weight of the polymer in the raw material and the molded part will be comparable. In our facility, the process of choice was injection molding. But melt processing can also involve extrusion, blow molding and a variety of other approaches.

The thermoset plant looks very different. First, most of the presses, especially in the early days, were not injection molding machines. Instead, they were vertical platen systems without an injection unit — compression molding machines, where raw material is placed into the stationary bottom half of the mold and the closing of the mold then distributed the material into the cavity or cavities. Alternatively, the machines were hybrids

**FIG 1** Viscosity vs. Shear Rate Behavior for PP at Different Melt Temperatures



Shear rate is a function of flow rate and the size of the flow path, and higher shear rates produce a substantial reduction in melt viscosity, as depicted here.

that employed a “pot” that holds raw material that is then injected into a closed mold using a plunger, a process known as transfer molding. In addition, these raw materials were not pelletized. Instead, they were powders consolidated into pucks or they were soft, pliable materials, supplied in bulk or in sheet form.

A closer look reveals additional differences. For thermoplastic molding, the barrel that is used to deliver the material to the mold is heated and the mold is plumbed with water lines that remove the heat from the injected material and enable the solidification

of the polymer in the mold. In the thermoset plant, the raw material is kept at a relatively low temperature until it reaches the mold and the mold is heated to a very high temperature, usually with steam, hot oil or electric cartridges.

This difference in material handling is fundamental to the processing requirements for thermoset materials. ▶



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# Adapt-ability in mixing

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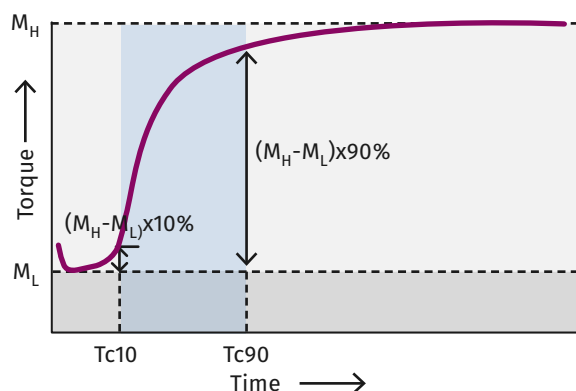


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The raw materials, as provided to the molder, consist of a low molecular weight prepolymer, the appropriate fillers and additives, and a catalyst that is designed to initiate a chemical reaction which crosslinks the material into the three-dimensional network that, once formed, cannot be remelted. These catalysts are activated by heat, therefore the exposure to elevated temperatures should not happen until the material reaches the heated mold. Therefore, the thermoset molding process includes a chemical reaction that changes the structure of the material while the part is being molded.

**FIG 2** Generalized Viscosity Development for a Thermoset Material



Here, the viscosity is measured in a torque rheometer in terms of the load on the instrument. The material enters the process as a low-viscosity thermoplastic and in the early stages of processing there is a small decline associated with mild heating of the material. However, as the elevated temperature of the mold initiates the crosslinking process, the viscosity increases rapidly. At some point, the viscosity rises to the gel point where the material will no longer flow (denoted as  $T_{c10}$ ).

### HOW THERMOSETS AND THERMOPLASTICS DIFFER

This difference in the behavior of thermosets and thermoplastics during processing is fundamental to the approach of managing process control for the two classes of materials, particularly as it relates to viscosity.

Thermoplastics follow the familiar rules of non-Newtonian fluids. Viscosity declines with increasing temperature once the material is in the molten state, and it is also influenced by the effects of the shear rate applied to the material. Shear rate is a function of flow rate and the size of the flow path, and higher shear rates produce a substantial reduction in melt viscosity, as shown in Figure 1. The viscosity remains relatively low for most of the mold-filling process and then, as solidification begins in the cavity, the viscosity will begin to increase. But ideally, most of the solidification process occurs after the mold cavity is full

and, once the cycle is complete, the polymer has simply returned to the state represented by the raw material.

The process of viscosity development is more complex in thermosets as shown in Figure 2. In this graph, the viscosity is measured in a torque rheometer in terms of the load on the instrument. The material enters the process as a low-viscosity thermoplastic and, in the early stages of processing, there is a small decline associated with mild heating of the material. However, as the elevated temperature of the mold initiates the crosslinking process, the viscosity increases rapidly. At some point, the viscosity rises to a point where the material will no longer flow. This is often referred to as the gel point, and is approximately indicated in Figure 2 by the point denoted as  $T_{c10}$ .

There are different methods for identifying this point quantitatively, but the practical significance of this event is that the mold cavity should be filled before this point is reached, because continued mold filling will be difficult, if not impossible, beyond this point regardless of how much pressure is applied to the material. The final viscosity of the properly crosslinked material can be 10 to 100 times higher than the viscosity of the material that entered the process.

Often, a crosslink density that constitutes 90% of what is theoretically achievable is considered to be a desirable condition that ensures good performance of the molded part and is indicated by the point identified as  $T_{c90}$ . The profile of this cure development is dependent upon both time and temperature. Higher temperatures will produce a lower minimum viscosity and a faster cure time.

If the cure time is shorter than the time required to fill the mold, this can result in impeded flow, poor weld line strength and cosmetic defects. While elevated viscosity is the cause for these defects in both thermoplastics and thermosets, the remedies can be very different. For thermoplastics, the premature development of an unmanageably high viscosity typically requires an increase in melt or mold temperature. In thermosets, the same strategy can simply make the problem worse by producing a more rapid increase in viscosity.

In our next installment, we will look more closely at the cure process and how it can be measured with tools that provide greater insight into the crosslinking process. [▶](#)

***This difference in material handling is fundamental to the processing requirements for thermoset materials.***

**ABOUT THE AUTHOR:** Mike Sepe is an independent, global materials and processing consultant whose company, Michael P. Sepe LLC, is based in Sedona, Arizona. He has more than 45 years of experience in the plastics industry and assists clients with material selection, designing for manufacturability, process optimization, troubleshooting and failure analysis. Contact: 928-203-0408 • [mike@thematerialanalyst.com](mailto:mike@thematerialanalyst.com).



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# INJECTION MOLDING

## The Fundamentals of Artificial Intelligence and Machine Learning, and Their Application to Injection Molding

As AI and ML continue to develop, they can eventually play a role in helping molders predict more accurately and, perhaps someday, model very closely to the actual process results.

There is a lot of buzz about Artificial Intelligence (AI) and Machine Learning (ML) these days, as seemingly everyone is



By Suhas Kulkarni

talking about and trying to use them in some form to make the systems better. Despite the current buzz, these techniques have been around for a very long time in some form or another.

Back in the early 1990s, when I had started my career as a process engineer in charge of sampling new molds and developing the molding processes, I found that our engineering team was doing repeti-

tive calculations and tasks. I had developed a method to calculate shrinkages before the mold was built based on the data I had on hand. I had a lot of data because we molded automotive parts and used the same grades of nylon and PBT for most parts. The formulas were built on some empirical background and knowledge. I used to call this project 'Experienced Molding.' As several industries started thinking along these lines and seeing the potential benefits, the terms AI and ML were born. The exponential increase in computing power has also helped the rise of these technologies.

AI gives computers the ability to think and reason like humans do and address problems logically. ML is a subset of AI. It enables computers to do their work without specifically writing a program to perform the task.

### SUPERVISED AND UNSUPERVISED LEARNING

Historically, cleverly written computer programs did all the work. Computers have been programmed by programmers to do complex calculations and to accurately predict results of scientific and engineering phenomena. Domain experts have contributed their knowledge gathered over years into algorithms that do the work. Machine Learning is the science that makes computers work for you without being specifically programmed to do so. Predictive models based on Machine Learning are now working in spheres of business, science,

entertainment and many more to deliver results with accuracy and efficacy that were never seen before. Machine Learning methods have evolved over the years. These methods are broadly classified into two categories: supervised learning and unsupervised learning.

Supervised learning provides labels, which means it provides data that includes potential causes as well as outcomes that go into learning. For example, a labeled data could be a data set that includes melt temperature, melt viscosity and injection speed — which are inputs or factors of the molding process — as well as the associated outputs or responses such as part dimensions and cosmetics. Examples of cosmetics would be the presence or absence of flash, sink or splay.

A supervised learning algorithm will observe and analyze the data set and figure out the underlying model which is related to the molding process inputs and their interactions with the outcome (such as part dimensions). The method described here is a regression method where you build a predictive model that predicts numerical values. Other supervised learning methods may aim at classification of outcomes. They could classify outcomes into acceptable parts and nonacceptable parts, or parts with sink marks or without.

Unsupervised learning does not use labels. The algorithms seek to find similarity in multiple attributes and cluster data points together using these attributes. Here, the effort is to find attributes that behave similarly and work upon them with a common strategy. For example, a clustering algorithm may find that youngsters in geographical regions with certain weather conditions are more interested in competitive sports. Sporting goods and dietary supplement advertisements are then focused more sharply on these regions.



Scan for more expert advice in injection molding.

### DEEP LEARNING

The last decade saw the dominance of the Deep Learning technology, which is a category of ML. It uses Artificial Neural Networks (ANN) to emulate the human brain. A human brain has millions of neurons that are connected together ►



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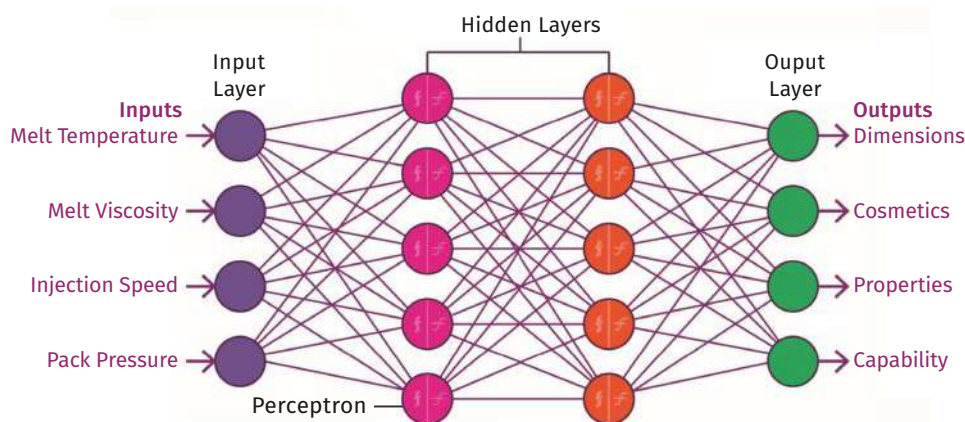
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through synapses. Each neuron takes in a piece of information and makes a tiny unit decision. The unit decisions put together result in the human response. The ANN equivalent of a neuron is a perceptron. A perceptron is a tiny computer program that performs a unit mathematical function (called activation function) that transforms input signals into outputs. (See Figure 1 below.)

In a fully connected network, perceptrons are arranged in layers, and each layer is fully connected to the next one. An ANN has an input layer that takes in the signal, which is then processed by the intermediate hidden layers that have mathematical activation functions, weights and biases. The Output layer produces the predicted results.

FIG 1

### Fundamentals of Machine Learning



In a fully connected network, perceptrons are arranged in layers, and each layer is fully connected to the next one. Source: FimmTech

A Neural Network is trained on individual processes by showing it a data set that contains predictors and label values. These are inputs and outputs. In the example we saw earlier, the predictors were melt temperature, melt viscosity and injection speed, while the label was the part dimension. The ANN learns by observing many thousand data points and fine-tuning itself. The ANN that is thus trained is now capable of predicting with a high degree of accuracy and speed.

Neural Networks have evolved into Convolutional Neural Networks (CNNs) that deal specifically with image processing that can be used to detect cosmetic defects in molded products.

Whether one is aware or not, everyone is already immersed in AI and ML. Take for example, Google Maps which can now predict the exact number of minutes it will take you to reach your destination. It can do so because it has 'learned' from all the times that other drivers journeyed on that route at all times of the day. It knows it will take more time in the morning, Monday through Friday, because of the traffic from people going to work.

It has that data for multiple years, and the predictions get better and better because it is collecting even more data every day

and using the feedback to modify the model on a continuous basis. Here some of the predictors are time of day, day of the week, traffic density and weather, while the labels are time of arrival, time it takes to reach the destination and the suggestions, if any, to present alternative routes. It is an intelligent system that no human needs to be involved with and is therefore called Artificial Intelligence.

Although we have begun to understand the science of injection molding to deeper levels in the last few years, there are still a lot of unknowns. For example, how does one calculate the tonnage required for a particular part before the mold is even designed? In the November 2023 issue of PT, I described the challenges in detail.

Similarly, predicting the other process parameters such as injection pressures, pack-and-hold pressures and cooling times are challenges. Simulation software has improved significantly, but we frequently hear, "The actual pressure is not what we see in simulation results," or something similar. This is where AI and ML can play a role and help molders predict more accurately and perhaps someday be able to come very close to the actual. All we need are the inputs from the past billions of molds built and the processes used

to mold parts with them. Of course, that is not possible, but a start can be made with what is on hand, and the data can be continuously fed as more and more molds come into the molding facility.

An initial effort was started by my company, FimmTech Inc., Carlsbad, California. A custom online portal was built on a test basis. The goal was to build a model for predicting the required tonnage for a given mold, and data from a few molds was used. The part projected area, part thickness, flow length from the gate, peak injection pressures and pack pressures were recorded for each mold. The pack pressure applies the pressure on the part projected area affecting the tonnage. The flow length is one of the factors for pressure drop and therefore affects the end-of-fill pressures, such that the thicker the part, the higher the required packing pressures. This is the theory we know, but we must consider the different interactions and interdependencies of the inputs on the outputs. This is where ML helps. A model was developed with limited data, and the program was able to closely predict and calculate the required tonnage for a mold that was in production. The tonnage was optimized earlier based on the Tonnage Study. ▶





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Figure 2 shows the input parameters for the software, and the related output after the calculations. This is a mockup example where the part projected area is 28 in<sup>2</sup>; the part thickness is 0.60 in. and the distance from the gate to the end of fill is 3.5 in. The peak pressure used by the machine was 12,350 psi with a packing pressure of 5,500 psi. With this information, the software predicted the tonnage to be 89.76 tons.

If we take the same part but with an increased part thickness of 0.80 in. versus 0.60 in., the peak pressure (11,550 psi)

was lower and the pack pressure (5,800 psi) was higher, with a predicted tonnage of 78.96.

Scientific molding deals with a lot of theory, all of which is relevant and important. Using AI and ML techniques, we get closer to the real predictions. The biggest hurdle is getting all the initial data from the part design, material, mold, machine and process. The richer the data, the better the prediction will be. The predictions do not have to be restricted to tonnage as shown in Figure 2. A complete molding process can be predicted if a part and mold are described to the program. Simulation programs do similar predictions, but those are based on established algorithms built on the theories of rheology, heat transfer, thermodynamics and related sciences. Simulation programs have become very powerful over the years and are now also beginning to incorporate AI and ML into their predictions. This is very good news for the molding industry because all these technologies will soon help us become a better and more efficient industry. <sup>PT</sup>

FIG 2



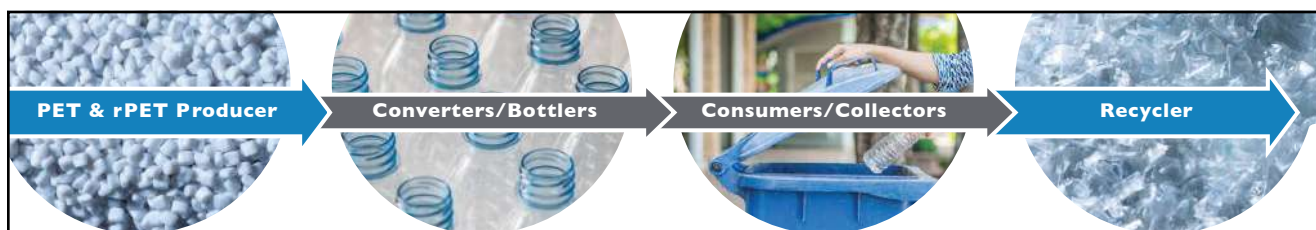
### FimmTech Tonnage Predictor

#### Enter Input Data

Projected Area (square inches)	Thickness (inches)
<input type="text" value="28.00"/>	<input type="text" value="0.60"/>
Flow Length (inches)	Peak Injection Pressure (psi)
<input type="text" value="3.50"/>	<input type="text" value="12,350"/>
Pack Pressure (psi)	
<input type="text" value="5,500"/>	
<b>Predicted Tonnages (tons)</b>	<input type="text" value="89.76"/>

Input parameters for the software and the respective outputs after calculations. Source: FimmTech

**ABOUT THE AUTHOR:** Suhas Kulkarni is the founder and president of Fimmtech, San Diego, an injection molding service-oriented firm focusing on scientific molding. Fimmtech has developed several custom tools that help molders develop robust processes, and its seminars have trained hundreds of individuals. Kulkarni is an author of the best-selling book, *Robust Process Development and Scientific Molding*, published by Hanser Publications. Contact: 760-525-9053; suhas@fimmtech.com; fimmtech.com.



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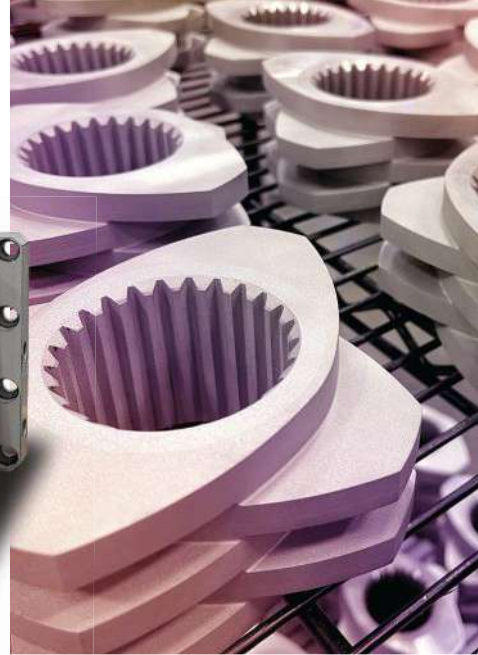
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# EXTRUSION

## The Role Barrel Temperatures Play in Melting

You need to understand the basics of how plastic melts in an extruder to properly set your process and troubleshoot any issues. Hint: It's not about the barrel temperature settings.



By Jim Frankland

If you don't understand how a screw melts plastic, it will be hard to resolve many daily processing problems in extrusion. For

example, I was recently asked by a large processor to help them determine the ideal barrel temperature settings for each of eight different HDPEs from eight different suppliers so they could process each of them with similar results.

Interestingly, this inquiry was from a successful processing company that's been in business for many years. They were looking to improve their purchasing

leverage with a seamless effect on manufacturing efficiency part quality. They thought they could achieve those objectives by maintaining a constant melt temperature.

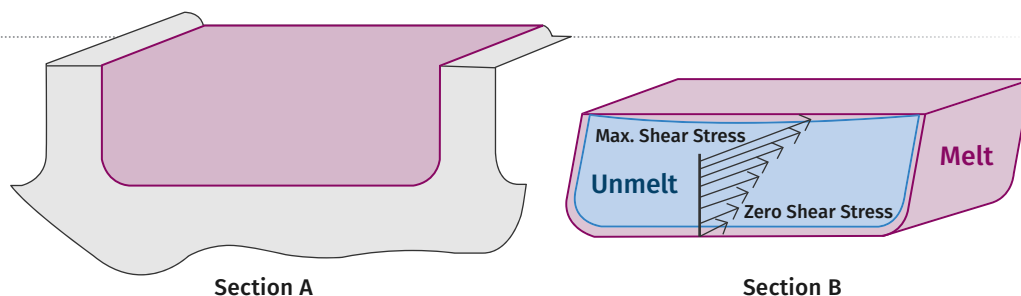
What they didn't realize was that the process to make HDPEs has many variables and uses many different chemicals besides ethylene. Naturally, the different processes and variety of chemicals used have some effect on the polymer and resultant processing results. The slightest variation in any of the chemicals, either in amount or purity, for either process can change the molecular weight, its distribution and uniformity.

waxes, antioxidants, stabilizers and more that are added that can also vary the processability of the polymer. Also, any variation to the final specifications is often overcome by postprocess blending. Therefore, to expect to be able to process many different HDPEs at the same melt temperature is highly unlikely.

A classic illustration of this is when you see a processor running HDPE with all the zones set for full cooling (for example, no barrel heating) and still producing a complete melt—usable melt temperature. And my own experience is typical of HDPE processing. So where is the heat coming from if not from the barrel heaters?

This particular processor believed most of the heat came from the barrel heaters. Actually, the barrel heaters are primarily for startup and have minimal effect on melting and the resultant melt temperature with the exception of very small extruders (less than 1 inch). Melting is controlled by the screw rotating in the barrel which creates shear stress in the contained polymer. The polymer sticks against both the heated screw and barrel surfaces. As the

**Melting is controlled by the screw rotating in the barrel which creates shear stress in the contained polymer.**



Section A shows a screw channel filled with unmelted polymer. Section B shows the polymer in the channel before any screw rotation, then the effect of shear stress. Source: J. Frankland

There are also many possible variations within the process, with literally dozens of temperature and pressure settings through the polymerization step, as well as things that vary widely, such as catalyst removal. Additionally, there are various additives such as

screw rotates relative to the barrel, the polymer between them is stretched or "sheared."

The energy to rotate the screw comes from the screw drive. The torque of the screw drive is converted to thermal energy (heat) from the shear stress exerted on the polymer,

which shows up as the melt temperature accounting for almost all the heating during processing. The shear stress is maximum at the barrel wall and near zero at the screw root. As the melt forms at the barrel inner surface, a well understood melting pattern develops

which we will not discuss here. For reference, I recommend *Engineering Principles of Plasticating Extrusion*, by Zehev Tadmor and Imrich Klein. I studied extensively with Klein in the late 60s and still refer to many of his concepts and calculations.

In the accompanying figure, Section A shows the screw channel filled with polymer. Section B shows a cross section of just the polymer in the channel and the shear stress applied to the polymer due to screw rotation with the maximum shear stress at the barrel wall and the minimum at the screw root diameter. The shear stress at the barrel wall is directly proportional to the relative motion of the barrel to the screw.

If barrel heating supplied most of the energy for melting, you would be able to start up almost immediately after turning on the barrel heaters. However, it typically takes several hours for the polymer in the screw to be sufficiently heated or melted to start screw rotation. That's because polymers are excellent insulators and do not conduct heat readily, while the barrel heats quickly due to the high thermal conductivity of steel. Shear heating is much more effective for melting because it utilizes the polymer's own viscosity to accomplish the energy conversion. Therefore, the amount of melting is mainly a function

of the screw design, polymer viscosity, polymer-specific heat and other parameters such as crystallinity. As a result, to change the melting rate, the screw design must be changed.

Screw design determines the melting rate and eventual melt temperature at any specific discharge pressure and screw speed for a given polymer. Rather than the barrel heaters being used to

adjust melt temperature, the head pressure is usually a much more efficient way to adjust melt temperature. An adjustable flow restriction valve after the extruder enables a change in head pressure or a resistance to the screw output and is a much more effective device than barrel heat for changing the melt temperature. By raising or lowering the head pressure, the output of the screw at the same screw speed is altered, changing the torque of the screw

drive and the resultant heat transfer to the polymer. Alternatively, to change the melting and melt temperature, the screw design must be changed, everything else remaining the same. [PT](#)

***If barrel heating supplied most of the energy for melting, you would be able to start up almost immediately after turning on the barrel heaters.***

**ABOUT THE AUTHOR:** Jim Frankland is a mechanical engineer who has been involved in all types of extrusion processing for more than 40 years. He is now president of Frankland Plastics Consulting LLC. Contact: [jim.frankland@comcast.net](mailto:jim.frankland@comcast.net) or 724-651-9196.

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# COMPOUNDING

PART 5

## How to Configure Your Twin-Screw Extruder for Mixing

Understand the differences between distributive and dispersive mixing, and how you can promote one or the other in your screw design.



By Kenneth Russell

The two main types of mixing in compounding are dispersion and distribution. Quite often, new engineers and nontechnical professionals confuse these terms. We will claim we need to improve dispersion when we really want an additive to be uniformly distributed throughout the polymer matrix. Or we will design the screw with distributive mixing elements, but the material tends to agglomerate and needs to be dispersed before it can be distributed.

Let's explore these types of mixing and how we can promote one type over the other.

When material is fed into the twin-screw extruder, the material falls onto the feed screws as it drops from the feeder(s). For this discussion, we will assume that each material is separate and independent as if being fed individually. In reality, materials may be fed separately via individual feeders or the material might be pre-blended into a single batch.

that ingredient are grouped together. We can assume that the white area in the box is the molten polymer matrix. The diagram implies the material is agglomerated into larger particles which have to be broken down and then spread throughout the polymer.

- Dispersion is the action of breaking larger particles into smaller particles until they are at their ultimate minimum particle size. Dispersion is required to break apart cohesive materials that tend to agglomerate.
- Distribution is uniformly mixing the particles throughout the polymer matrix.
- In a twin-screw extruder, these two mechanisms mostly occur simultaneously but can be tailored to favor one or the other as required.

A material can be distributed but not dispersed. This is shown on the left-hand side of Figure 1. The particles are distributed evenly throughout the polymer but still remain as large agglomerates. This can create uneven concentrations of the additive throughout the material. For a colorant, the part may look blotchy and nonuniform.

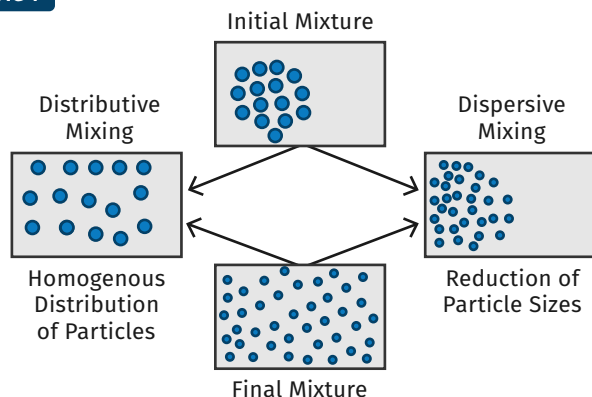
A material can also be dispersed but not distributed. The right-hand side of Figure 1 shows the particles have been reduced to their ultimate, minimal size. But they are concentrated in one area of the polymer. This may be due to surging within the extruder, uneven or inconsistent feeding of the additives or a bad premix that is not being distributed by extruder screws.

Of course, we need both dispersive and distributive mixing to produce an homogenous compound as shown in the diagram. Designing the screw with the proper mixing elements provides the correct amount of shear forces to ensure that dispersion and distribution are both utilized when appropriate.

### WHEN DISPERSION IS NEEDED

For many compounding operations, dispersion is often not required. Many additives and fillers are already supplied as free-flowing, distinct individual particles. They primarily need to be distributed throughout the polymer to be fully incorporated. ►

FIG 1



Both distributive and dispersive mixing are needed to produce an homogenous compound. Source: K. Russell

Figure 1 shows how one specific ingredient can be mixed during compounding. Raw materials are fed as the initial mixture. In the diagram, one particular ingredient is shown where large particles of

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Dispersion is required for materials that tend to stick together in clumps or agglomerates.

Carbon black is one of the best examples of a cohesive material that has a high affinity to agglomerate. Individual particles of carbon black are fused together during the combustion reaction to form aggregates. These aggregates are the primary particle of carbon black and are the smallest size that carbon black can be broken down to during compounding. Carbon black aggregates are held together by weak forces to form agglomerates. The agglomerates must be dispersed within the polymer to produce a compound that fully and uniformly develops the desired black color.

smearing the materials as it forms a furrow through the material. Shear forces here are quite high which promotes dispersion.

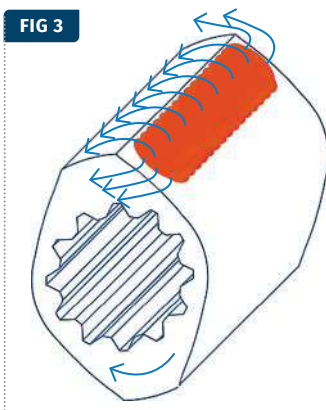
As the disc width narrows, the polymer flows around the disc as shown in Figure 4. The narrow discs of a kneading block slice through the polymer in a scissoring action. This action promotes distributive mixing by essentially stirring the polymer and additives. The melt is divided by one disc and then covered over by another.

Therefore, the first consideration in screw design regarding mixing is the width of the disc. If dispersion is required, then wide discs are beneficial. If the material only needs to be distributed throughout the polymer matrix, then the narrow discs are preferred.

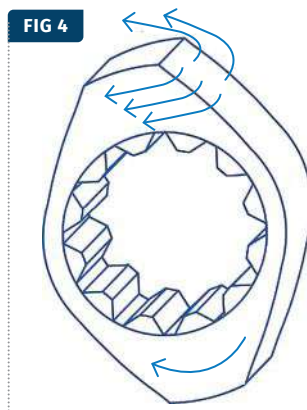
## MIXING IN TWIN-SCREW EXTRUDERS



Typical neutral kneading block. Source: ENTEK



Dispersive kneading disk. Source: Leistritz



Distributive kneading disk. Source: Leistritz

## STAGGER ANGLE

The stagger angle is the next consideration when it comes to mixing. The shallower the stagger angle, the more the polymer is conveyed downstream in the extruder. As the stagger angle increases, the forward motion in that area of the screw decreases, causing the polymer to back up. As material is held back, the work on the polymer increases because the

primary elements that are used in a twin-screw extruder for mixing are the kneading blocks. Kneading blocks impart shear forces onto the materials being compounded to mix these materials via dispersion, distribution and homogenization.

Figure 2 shows a typical kneading block. The three key attributes of the kneading block with regard to mixing are the length of the element, the number of discs and the stagger angle of the discs relative to each other. In the picture shown here, the kneading block is 60-mm long and there are 6 discs. Each disc, therefore, is 10-mm wide. If the kneading block was shorter, say 30 mm long, then each disc would only be 5-mm wide. Of course, if the kneading block were twice as long, then each disc would be proportionately that much wider, assuming the number of discs is constant.

The width of the disc has a direct impact on the shear forces that are imparted to the polymer. Figures 3 and 4 each show an individual disc from a kneading block. The wide disc in Figure 3 forms a pool of molten polymer in front of the disc as it rotates around the screw shaft. The disc plows through the polymer,

forward motion of the compound per screw revolution decreases, thereby enabling more intense mixing.

When the stagger angle reaches 90 degrees, the material does not move at all due to the rotation of the screws. A 90-degree kneading block is a neutrally conveying element. The forward movement that does occur is due to material being forced from upstream elements that pushes the compound along the extruder.

### Understanding Stagger Angle

	30°	45°	60°	90°	-60°	-45°	-30°
	Least Severe			Neutral			Most Severe
	Forward Conveying			None			Reverse Conveying

Reverse pumping elements (aka left-handed elements) pump the material upstream in the extruder against the forward motion within the overall extruder. This balance between the upstream forward conveying elements and the neutral or reverse conveying elements causes the mixing section to be highly filled with material. In contrast, a mixing section that consists of only forward conveying kneading blocks — maybe all 45-degree angle kneading



blocks — would have minimal material in this section as it would be pushed out as quickly as it arrived.

It may be tempting to trend toward strong mixing in all cases. Then you can be assured that everything is dispersed and distributed fully. This would be a mistake.

### HOW MUCH MIXING IS THE RIGHT AMOUNT?

The more intense the mixing, the more work that is imparted to the compound. Melt temperature will increase significantly as the amount of work is increased.

- Wider discs generate higher shear forces, which leads to increased melt temperatures.
- A more restrictive mixing section (many reverse or neutral kneading blocks) will cause the compound to be worked more, which again leads to higher melt temperatures.
- A restrictive mixing section must also be designed to ensure there is sufficient forward motion so the rate is not impeded.
- Likewise, too gentle of a mixing section could result in uneven mixing and poor quality product.

FIG 5



More Dispersive



More Distributive

Mixing sections from two screw designs. The top screw is more intense, resulting in a more dispersive characteristic. Source: K. Russell

Mixing sections from two screw designs are shown in Figure 5. The top screw is more intense, resulting in a more dispersive characteristic. This mixing section uses wider discs, a larger stagger angle for two of the kneading blocks followed by a neutral

kneading block and a reverse kneading block. A design such as this would likely be used with a high loading of a difficult-to-mix pigment or filler. The bottom design only shows forward conveying kneading blocks followed by a single neutral kneading block. The idea here is to gently stir the additive into the polymer with minimal restrictions. A design such as this might be used when mixing fiberglass or glass beads.

One point to note regarding the “end” of the mixing section. As I mentioned in earlier articles, screw design is a combination of science and art. Every screw designer will approach a design in a different way. I prefer to end the majority of my mixing sections (>90%) with either a neutral kneading block, a reverse kneading block or even a reverse conveying element (the most severe pumping element). The purpose for this is to ensure the degree of fill in the mixing section is such that the mixing is reasonably efficient.

Some designers will put in a distributive mixing section that consists of all conveying elements. While this design is intended to gently stir the mixture, my experience has shown that the relatively empty mixing section is inefficient at best. Also, as a result of the low degree of fill in this mixing section, these kneading blocks tend to “whip” the polymer like a beater. This whipping action actually can increase the melt temperature and damage the aspect ratio of certain additives such as fibers.

Mixing sections seem to work more efficiently and more gently when they have a higher degree of fill. This must be balanced against a severe reverse flow that can overwork the material. Balance is the key. <sup>PT</sup>

**ABOUT THE AUTHOR:** Kenneth W. Russell has more than 35 years' experience working with polymer processing and resin companies. He has expertise in polyolefin polymerization, polymer compounding, reactive extrusion, and film and sheet extrusion. In 2014, he started Optimized Compounds LLC, providing consulting services in reactive extrusion, polymer compounding, product development, process optimization and scale-up with clients worldwide. In 2021, he joined GEM Plastics, a manufacturer of HDPE sheet, providing process engineering, operator and technician training, and materials expertise. Contact: [kwrcmpounding@gmail.com](mailto:kwrcmpounding@gmail.com).

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# TOOLING

PART 4

## How To Design Three-Plate Molds

There are many things to consider, and paying attention to the details can help avoid machine downtime and higher maintenance costs — and keep the customer happy.

As I mentioned in Part 3 of this series, the parting line between the runner stripper plate and the injection clamp plate cannot start to open until the opening between the runner stripper plate and the A-plate is fully open. Otherwise, the runner may not have enough room to fall freely out of the mold. It's not common for the runner stripper plate to advance prematurely, but from time to time it might. Therefore, some method should be incorporated to prevent that from happening.



By Jim Fattori

On small- to medium-sized molds, friction pullers, roller pullers, slide retainers and plate retainers (as shown in Figure 1) work well for preventing the runner stripper plate from advancing prematurely. Note: Friction pullers are available in many different types and designs. The one shown in Figure 1 is my proprietary design.

For larger molds, die springs are frequently used to retain the runner stripper plate, as shown in Figure 2. At least two or four retainers are required to achieve sufficient holding force, as well as preventing the plate from cocking when it advances.

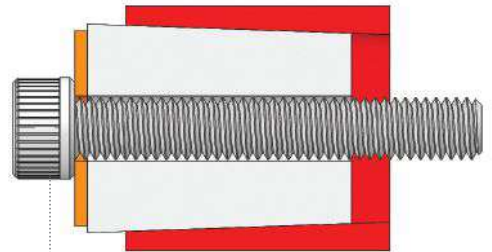
**Sucker pins should protrude beyond the face of the runner stripper plate.**

### SUCKER OR PULLER PINS

The function of a sucker pin in a three-plate mold is similar to a sucker or sprue puller pin in a two-plate mold. In a three-plate mold, the sucker pins pull the runner, and the runner drops out of the back of the floating A-plate and retains them on the runner stripper plate until the stripper plate extends forward.

There are several methods and variations on how to install a sucker pin, as shown in Figure 3. The first, labeled A, is strictly a sucker pin riding in a round through-hole in the runner stripper plate. The pin is held in place with a set screw impinging on the head. This method is very common — probably because it is the cheapest. In my opinion, this design should only be used for low- to medium-volume molds.

The second method, labeled B, is the same as method A, but is retained with a core pin retainer. The advantage of the



A



B



C



D

FIG 1

Various plate retention devices.  
Source (All Images): J. Fattori



Scan for more expert advice in tooling.

retainer is, when properly installed, it enables the pin to float sideways a little. In the event of any misalignment from thermal expansion, bushing wear or machining errors, it reduces the amount of wear on the pin's through-hole.

The third method, labeled C, is the same as method B, but with a plate behind the pin instead of a retainer. This plate can also be machined to enable the pin to float. The advantage of a plate is that it can retain several sucker pins, thereby reducing the amount of machining required.

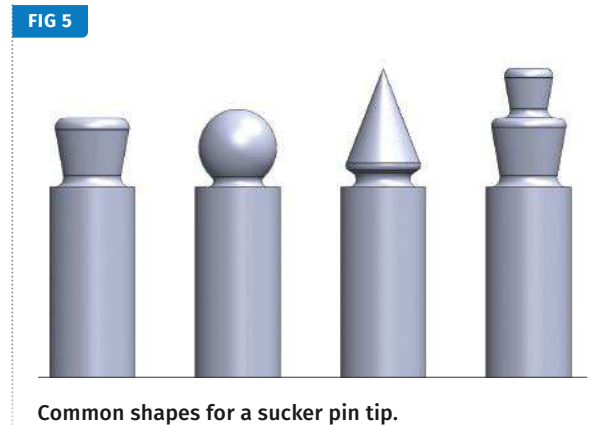
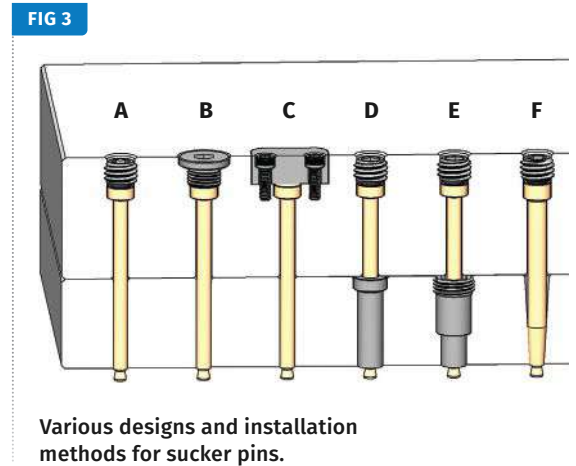
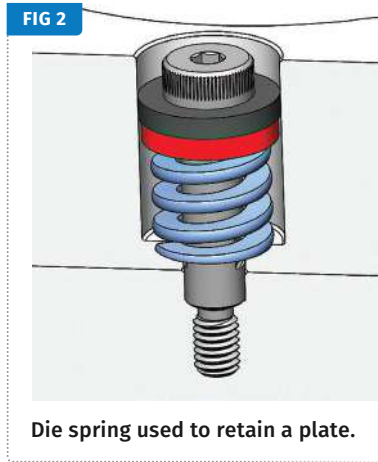
The fourth method, labeled D, is a sucker pin riding in a hardened bushing — typically a drill bushing. A hardened bushing virtually eliminates any wear in the bore. The bushing needs to be retained with a screw, retaining ring or some other method. A press fit is usually not desirable because it can come loose over time.

The fifth method, labeled E, is similar to method D, except that the sucker pin is riding in a patented sucker pin bushing which has a threaded head. The advantage of this method is that the threaded head secures the bushing in place. The sixth method, labeled F, is a tapered sucker pin seated in a tapered hole in the runner stripper plate. When properly fitted, this design eliminates the possibility of any down-flash because there is zero clearance between the pin and the bore hole.

If, over time, you get wear in the bore hole in designs A, B or C, you can repair it with an oversize core pin. If you get wear in designs D or E, you can replace the pin or bushing. If you get wear in design F, you can resurface the tapered hole and advance the core pin. Methods D, E and F add a little cost to the mold, but they extend the life of the pin and reduce the risk of down-flash as shown in Figure 4. Keep in mind that you can use various combinations of these sucker pin designs, as well as their installation and retention methods.

The contour at the tip of a sucker pin can have various shapes, as shown in Figure 5. The shape of the first two pins on the left are the most common. The third pin with the conical tip is designed to reduce material flow disruption of the melt stream, which can be critical with heavily filled and viscous resins. The pin on the far right was designed to reduce some of the mass at the intersection of the runner and a large diameter runner drop in order to reduce the cycle time, as shown in Figure 6.

Sucker pins should protrude beyond the face of the runner stripper plate by 0.002 inch to 0.020 inch, as shown in Figure 7.

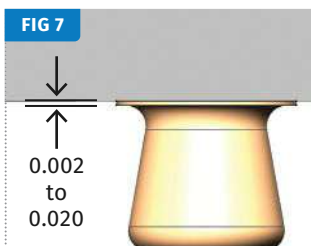


If a pin is even slightly below the surface of the runner stripper plate, it can cause the runner to hang up in the mold.

One trick that I have seen is the addition of a 30-degree or smaller chamfer around the bore hole of the sucker pin, as shown in Figure 8. The idea is that the chamfered area will solidify quickly and reduce the chance of down-flash into the bore hole. In a way, this chamfer acts as a runner flash trap, ▶



A cored-out runner drop.



Sucker pin protrusion.



Chamfered edge around a sucker pin bore hole.



Flake formed from an aggressive undercut.

which I discussed in Part 3 of this series. The chamfer also makes the length of the sucker pin less critical, and the 30-degree angle ensures the runner will not hang up in the stripper plate.

The amount of undercut required to pull a runner drop out of an A-plate depends on a several factors, but the primary ones are material type, cycle time and cooling. The softer the material, the larger the undercut is required. The material can be soft due to its inherent hardness, such as with olefin or elastomeric materials. It can also be soft if the mold opens before the runner has time to completely solidify.

Conversely, the material can be very rigid if it contains a filler, such as glass or mineral, or if the cycle time is excessively long.

Rigid runners with aggressive undercuts can cause flakes which can hob both the runner stripper plate and the A-plate, as shown in Figure 9. My suggestion is to initially be aggressive with the amount of undercut, because if you encounter tearing or flaking during the first mold sampling, it is steel-safe to make it less aggressive. **PT**

**ABOUT THE AUTHOR:** Jim Fattori is a third-generation injection molder with more than 40 years of experience in engineering and project management for custom and captive molders. He is the founder of Injection Mold Consulting LLC, an international consulting company. Contact [Jim@InjectionMoldConsulting.com](mailto:Jim@InjectionMoldConsulting.com); [InjectionMoldConsulting.com](http://InjectionMoldConsulting.com).

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## Processing Megatrends Drive New Product Developments at NPE2024

It's all about sustainability and the circular economy, and it will be on display in Orlando across all the major processes. But there will be plenty to see in automation, AI and machine learning as well.

NPE2024: the Plastics Show, could just as easily have been tagged NPE2024: the Plastics Sustainability Show. Across the spectrum of processes, attendees walking the floors of the Orange County Convention Center (OCC) in Orlando, Florida, May 6-10, will bear witness to new products that reflect the industry's need to be part of the circular economy.

### Staff Report

On the pages that follow this intro, you will notice technology introductions that consume less energy, take up less space, run more environmentally conscious materials, and then some.

While we preview the three major processes here, sustainability is also making its mark on the development of new materials (see Close-Up p. 12) and in the way OEMs and brand owners are thinking about plastics (see Close-Up p. 14).

All that said, there will also be plenty to see in automation, artificial intelligence/machine learning and more.

### INJECTION MOLDING: SHOP FLOOR, ENERGY AND CARBON FOOTPRINTS IN FOCUS

After a six-year hiatus, NPE is back and, as always, injection machines will have a huge presence in Orlando, even if their actual individual footprints are smaller.

Conscious of their customers' increasing need to maximize productivity, as well as the knock-on benefits that running smaller can

have from an energy and carbon output perspective, injection molding machine suppliers at NPE2024 have slimmed down their machine fleets, promising molders more output from a smaller package.

Innovations in drive and clamp technologies, as well as advances in the key components that make up the guts of injection molding machines, have enabled the machinery OEMs to cut footprints as much as 30% in some instances.

In addition to being more compact, many of the presses in the OCC will be more self-sufficient, applying algorithms and controls with incredibly fast response times to set up, adjust and help maintain consistent processes. These features, as well as the ubiquity of automation on the machines in Orlando, are a nod to the ongoing labor shortage plaguing manufacturing in general and plastics processing specifically.

Most of the machines at the show will be at the heart of a self-contained manufacturing cell. A statistic often cited by machine makers is the percent of machines sold with automation in a package, a percentage that is only increasing as molders seek customized manufacturing solutions for specific parts and programs.

While automation will be ever-present in the injection aisles, what will likely be nearly completely absent from the show floor are fully hydraulic molding machines. Many of the leading OEMs are highlighting fully electric and/or hybrid machines in Orlando,

and even where there are hydraulics in play, most use servo-driven pumps. Because of this, many machine makers at the show will lead off with their fleets' energy savings when molders come to kick the tires on a new press.

In addition to a smaller utility bill, more energy-efficient hybrid and all-electric machines serve the increasingly important sustainability goals of molders and their customers. To that end, multiple machine suppliers will also be showcasing systems for running reclaimed and biobased materials at the show, whether it's regrind, postconsumer recycled plastic or bioresins. Increasingly, machine makers have specific packages available to meet the challenges posed by these nontraditional plastics, and those options will be on display at NPE2024.

## EXTRUSION & COMPOUNDING: BIG ON SUSTAINABILITY

In extrusion, the drive to boost recyclability will be evident in the two blown film lines that will be operating during the show. Both Macchi and Bandera will be running all-polyolefin multi-layer blown film lines, reflecting a shift away from complex multimaterial structures that wreak havoc with the recycling stream, should they even get there.

Comments John Christiano, director of technology at Davis-Standard, "Sustainability is a central theme, reflecting the broader global focus on environmentally conscious practices. The plastics machinery industry will play a significant role in the transition toward renewable energy sources of solar and wind as the global infrastructure moves toward further electrification. Operations will expect to embrace sustainable energy sources in production processes to reduce its environmental impact."

Curiously, though, while processors are running with higher loadings of PCR, those who are running PFAs-free materials — a big trend in processing aids — are seeing scrap rates increase, which defeats the purpose. Both Hosokawa Alpine American and Windmoeller & Hoelscher (W&H) point out that PFAs-free materials tend to build up on the die and create melt fracture and other undesirable effects. Alpine President Dave Nunes says this will likely result in machine builders developing new die lip coatings that mitigate these issues. W&H says it's exploring alternatives to make running these materials less problematic.

Christiano adds, "The challenge of single-use plastics will necessitate practical solutions, with advancements in mechanical and chemical recycling standing out as crucial components toward achieving a circular economy for plastic materials. Biomaterials are anticipated to play a significant role in addressing the issue of single-use plastics, offering sustainable alternatives that align

with the growing demand for eco-friendly practices. Moreover, the industry will grapple with the demand for breakthroughs in energy efficiencies, aligning with the overarching trend toward green technologies and environmentally responsible practices."

Automation is another trend to track in extrusion. Notes Nunes, "The more automation, the better to minimize the need for labor that is getting harder and harder to find and maintain."

Andrew Wheeler, W&H's president, notes that his company has developed several automation systems for film processors that shorten product changeovers and format adjustments. Wheeler says its automation solution also helps the operators by guiding them through processes and ultimately shortening their learning curve, which addresses the ongoing difficulty in finding and keeping them.

*There's a big push to modify the twin screw design to accommodate bioplastic formulations.*

The trends are running down a similar path in compounding. KraussMaffei will be upcycling a blood tube on a twin-screw compounder at its booth, with the pelletized, colored material being delivered to an injection molding machine for an overmolding application.

And biopolymers will play a key role in future compounded formulations. Notes Charlie Martin, president of Leistritz Extrusion, "Although bioplastics represent less than 1% of current plastic

products used today, it's increasing by double digits each year, so there's a big push to modify the twin-screw design to accommodate these new formulations. Bioplastic materials tend to be heat and shear sensitive as compared with traditional plastics, and generally need to be compounded with modifiers, fillers, additives and other polymers based upon the required functionality of the final product. Elevated melt temperatures and high shear stresses must be managed in the twin-screw extrusion process section to minimize molecular-weight loss and maintain mechanical properties. Compounders are visiting NPE to learn more about what's needed to accomplish these goals."

Megan Dyer, process engineer at ENTEK Manufacturing, agrees: "Trends in compounding include a continued increase in the development of bioresins. We expect to see a large number of all types of companies, from startups to large resin suppliers, who will be looking for answers to their questions about best ways to process their formulations. Twin-screw extruders, from lab-sized machines to high-output systems, as well as wear parts like screws and barrels, are all important pieces in the successful development and commercialization of these materials."

## BLOW MOLDING GOES CIRCULAR

In keeping with a primary theme of the show, sustainability is sure to be emphasized in many, if not most, blow molding exhibits. Among ►

the 50-plus displays of blow molding machinery, tooling and controls, expect to see numerous examples of “circular” technology — involving use of recycled and scrap materials. In extrusion blow molding (EBM), expect the emphasis to be on three-layer coextrusion with the recycled layer in the center between two layers of virgin resin. In PET injection stretch-blow molding (ISBM), you may encounter two-layer sandwiches with a thin virgin inner layer and rPET on the outside. Some PET exhibits (including preform injection molding) may show off capabilities to mold rPET flake without repelletizing.

To help navigate the many recycle-related blow molding exhibits, two experts in the EBM field offer some advice: Says Gary Carr, v.p. of sales for Bekum America, “Ask what the OEMs are doing to make their machines more adaptable to multilayer molding with PCR (postconsumer recycle). What are they doing to make the technology more readily available, more retrofittable?”

Adds Jens Schlüter, president of W. Müller USA, “Everyone will be showing PCR use in blow molding, so what have the OEMs done to make PCR easier to use? There are many challenges to using PCR. How are they dealing with them?”

Here are some hints of what to look for: retrofitability of coex capability (as mentioned above), screw designs and controls that can adjust for wider viscosity ranges in PCR, user-friendly screen changers to catch contaminants in PCR and regrind, materials-handling systems adapted to the wider range of particle geometries in PCR, improved flash containment in machine designs to facilitate closed-loop reclamation. In extruders for PCR, some suppliers now advocate larger units that operate at lower rpm to treat PCR more gently because it has already experienced at least one heat history.

Another key contributor to sustainability in processing is energy efficiency, which lowers the “carbon footprint” of plants and products. Both Carr and Schlüter agree that all-electric EBM machines have finally gained acceptance in the U.S., well after that occurred in Europe and South America. According to Carr, all-electrics and electric hybrids comprise close to half of EBM shuttle machine sales nowadays. What’s driving this trend is not only energy savings versus hydraulics, but also much greater precision and repeatability — leading to faster startups and recovery from production interruptions — as well as oil-free cleanliness.


So expect a slew of new electric machines — and hybrids — reinforced by the influx of several suppliers from Europe and Asia that are new to the U.S. market. You’re also apt to see increased electrification in industrial machines, reflected in new electric accumulator heads and clamping mechanisms. As a benchmark on energy use, some makers of both packaging and industrial machines claim their units can meet the highest category of energy efficiency — Class 10 under Euromap 46.1, or less than 0.29 kWh/kg of resin processed.

Energy efficiency can be accomplished in other ways, too. For example, a new barrel-heating/cooling system uses air cooling and aluminum heating tapes instead of ceramic heaters. Schlüter sees a trend toward smaller extruders that run at higher rpm, offering lower investment cost and smaller machine footprint. And look out for recent developments in smaller extruder diameters with higher L/Ds to permit increased output with smaller electric motors.

A third leg of the sustainability platform in blow molding is lightweighting. In ISBM, the OEMs have taken an active role in developing bottle designs and tooling to shave weight from PET bottles. In EBM, advances in coextrusion with a foamed center layer show potential for weight saving.

#### **OTHER TRENDS TO LOOK FOR IN BLOW MOLDING EXHIBITS AT NPE2024:**

- “Digitalization” or “Industry 4.0-ready” machines. More suppliers will be offering remote service capability — possibly with the aid of “smart glasses” or virtual-reality devices that enable remote OEM service personnel to see exactly what the customer is seeing. In addition, online “dashboards” enable molders to quickly assess machine status and OEE throughout a plant (or multiple plants) from any internet-enabled device. And automatic data collection from machines is enabling predictive maintenance to minimize downtime.
- Increasing focus on automation in bottle takeout, replacing traditional “blow and drop.” With increasing shortages of labor, robots or cobots may take up the slack.
- In ISBM, the trends have been increasing productivity and a proliferating variety of new PET container designs — with integrated or add-on handles, deep-groove grips, larger sizes, stackability, multimaterial structures and thin collapsible bladders. There have also been advances in bottle quality monitoring and using gauging data to automatically adjust ISBM machine controls.
- Quick mold change is another productivity enhancer. Look for new designs, including ones with magnetic mold clamping.
- For larger and industrial parts, accumulator heads are increasingly challenged by continuous extrusion, which is said to be easier to control. Also in this field, coex barrier designs are replacing fluorination under pressure from environmental agencies.

Keeping all this in mind, when you enter a hardware supplier’s booth, besides asking, “What’s new?” Schlüter recommends some additional questions: “What are you doing to simplify the blow molding process? What are you doing to reduce downtime? What are you doing to add troubleshooting, service and training capabilities?” 



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INJECTION MOLDING

## Slimmer All-Electric Press



A thinner version of Engel's all-electric, e-mac injection molding machine will debut at NPE2024, providing molders with width reduction of up to 16%. At the show, an e-mac 1565/310 will mold a bottle tray from a single-cavity mold supplied by Haidlmair. Engel says despite the thinner profile, the slim e-mac offers the same mold space as standard versions and the ability to accommodate large molds like the bottle tray. Equipped with a recycling package consisting of a highly abrasion- and corrosion-resistant screw as well as a melt filter, the e-mac will mold the trays at the show from regrind.

A hybrid Engel e-speed 610/90 designed for high-speed packaging applications will run a 4+4 family stack mold producing tamper-evident food containers and lids. Applying in-mold labeling (IML) and two significantly different part sizes, the machine's hybrid design enables high injection pressures and speeds with very short injection strokes.

In a demonstration of quick mold changes, an 80-ton tiebarless hydraulic victory 330/85 will apply a Stäubli QMC quick-clamping system. The two molds to be swapped in and out are from Roembke Mfg. & Design and will mold salad tongs and a fruit bowl, respectively, from Shell HDPE. Using RFID for mold identification, the machine automatically adopts the correct process parameters for the new mold upon switching — without operator intervention.

Two-component diagnostics cartridges will be molded in cleanroom conditions on an all-electric e-motion 440H/160TWP combi M with a horizontal rotary table running a dual-face cube mold from Hack Formenbau.

Engel will showcase micromolding of LSR valves weighing just 0.001 g. Partnering with ACH Solution, a tiebarless all-electric Engel e-motion 50/30 TL with a micro-injection unit molds the LSR valves from a 32-cavity tool. A viper 12-linear robot working with an optical testing unit by ACH Solution, ensures precise handling and inspection of the microcomponents.

INJECTION MOLDING

## Midtonnage Hybrid With Compact Footprint

Milacron's injection molding plans include a new universal injection molding platform, progressive co-injection technology, in-mold foil decorations, IIoT and more.

The show will serve as the global launch of its new M-Series machine line, which it says features the largest clamp stroke available as standard in a midtonnage machine range with a compact footprint.

A two-platen machine design — ranging in clamp force from 500 to 1,250 tons — the M-Series has increased the maximum mold weight carrying capabilities, offering capacity from 15,400 to 51,800 lbs. Milacron says the machines have improved dry cycle times and supported strain rods, with tie bar spacing from 36.2 × 36.2 inches up to 61 × 47.2 inches. Maximum daylight range is from 72.8 inches up to 102.4 inches.

INJECTION MOLDING

## All-Electric Press Gets U.S. Debut

Saying the machine and the market are of "great strategic importance," Arburg will premiere its Allrounder 720 E Golden Electric at NPE2024, noting this is the first global launch of a new machine outside of Germany. The all-electric machine with 310 tons of clamp force will be among 13 exhibits for Arburg, with seven of those in its own booth. In a release, Gerhard Böhm, managing director of sales and aftersales at Arburg, says the fact that the company is premiering the new Golden Electric at NPE2024 "reflects the great importance of the American market for Arburg."

Featuring servo-electrically driven injection/metering and mold opening/closing, the Golden series is positioned by Arburg to provide an outstanding price/performance ratio. The Allrounder 720 E Golden Electric will supplant the 570 E as the largest model in the line.

Arburg says the Allrounder 720 E Golden Electric's design has been optimized, resulting in a significantly smaller footprint compared to other machines in its class. At NPE2024, an Allrounder 720 E Golden Electric will run a 24-cavity mold to produce razor covers, with a Multilift V 30 linear robot system removing parts.

In addition to the new Allrounder 720 E Golden Electric, Arburg's machine exhibits at its own booth and those of partners will include an in-mold labeling (IML) process designed specifically for medical technology displayed on a cleanroom-designed electric Allrounder 520 A production cell molding labeled centrifuge tubes.

For the first time in the U.S., an Allrounder Cube 1800 machine will be presented, using an integrated 6-axis robot to produce two-component medical closures fully automatically. Positioned as an energy-efficient alternative to thermoforming, an Allrounder 720 A Ultimate electric packaging machine will mold IML round cups with a wall thickness of 0.015 inch using injection compression molding at an injection pressure of just 23,000 psi.



## EXTRUSION

## Novel Cooling System, Energy Efficient Extruders for Blown Film

Hosokawa Alpine American is highlighting some of its latest advancements in blown film extrusion. These include what's believed to be the first U.S. showcase of the VarDAR Upper Cooling Air Ring.

The VarDAR is a variable-diameter, dual-directional-flow air ring which is tower mounted, providing cooling above the frost

line to permit processors with a shorter-than-desirable nip height to improve productivity. The VarDAR air ring is typically mounted above the main calibration basket and the oscillating thickness gauge, if so equipped. It generates an even curtain of cooling air that flows both in a downward and upward direction onto the film surface. The VarDAR ring uses multiple curved "blades" that ensure an even curtain of air surrounds the bubble around its total circumference.

Alpine will also be featuring its well-established X-Die and its Select extruder line, which is said to be flexible enough to run LLDPE, mLLDPE, PCR (postconsumer recycle) and bioplastics. A new screw and barrel design is said to permit energy savings up to 30% along with significantly lower melt temperatures and much higher throughput.



## EXTRUSION

## Cutting-Edge Measurement and Control Devices for Extrusion

Sikora will be showcasing a range of cutting-edge equipment designed to meet the high standards of the hose, tube and pipe extrusion industries. These include:

**Centerwave:** This utilizes millimeter wave technology to measure wall thickness, outer diameter (OD), inner diameter (ID), inner profile and ovality of pipe, regardless of plastic type and temperature. The system records measurements as frequently as the operator needs, providing a comprehensive view of the product from the inside.

**Purity Concept Systems:** The Purity Concept V eliminates operator eyestrain by employing an optical camera to analyze colored and clear plastic plates, flakes and pellets, detecting contaminated material in 30 seconds or less. This system offers reliable optical lab tests with automatic analysis and provides test reports for quality assurance. The Purity Concept X detects metal on the surface and imbedded inside pellets and samples.

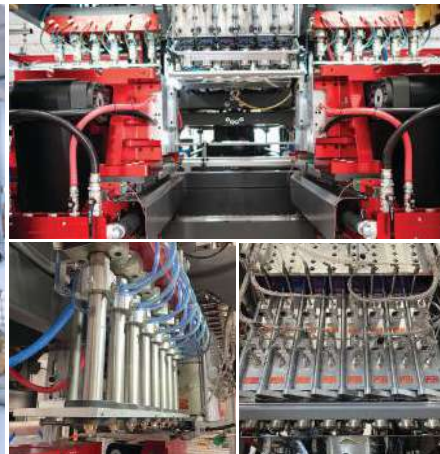
**X-Ray 6000:** This measuring device ensures continuous quality control in hose, tube and pipe extrusion lines. These systems provide accurate and reliable readings for diameter, wall thickness, concentricity and ovality, enabling the checking and maintenance of required product specifications.

**Laser Series:** Sikora's diameter gauges in the Laser Series stand out for their simplicity with no moving parts, making them easy to maintain. These gauges are well suited for quality measurement with seamless integration into the production process.

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INJECTION MOLDING

## In-Booth Mold-Cleaning Demonstrations

iD Additives will conduct live demonstrations of the Eco-Pro 360 Mold Cleaning System at its booth. A preventive maintenance cleaning system for injection molds, heat exchangers and chill rolls, the Eco-Pro 360 features a pump and filter combination unit that removes, protects and helps prevent rust and limescale within the cooling passages and water lines in the mold. The built-in filter function enables it to remain at peak performance for optimal reusability.

In addition to the Eco-Pro 360 display, iD Additives will show chemical foaming agents for a wide variety of plastics processing applications, as well as purging compounds

for color changes, resin changes and startup/shutdown maintenance for injection molding, extrusion and blow molding, including its Quickshots single-dose purging compounds. The Eco-Pro Cool EX water-maintenance systems for optimizing closed-loop water systems will also be featured.



INJECTION MOLDING

## Next-Generation Servo-Hydraulic and Electric Injection Molding Machines Launch

Absolute Haitian will present the fifth generation of the Haitian servo-hydraulic and Zhafr electric injection molding machines at NPE2024.

Absolute Haitian says the Generation 5 machines offer up to 20% more energy savings, decreased machine footprint and improved cycle times. Specifically, an electric screw drive for the screw-rotate function is now standard on the servo-hydraulic series with screw diameters up to 120 mm. Moving to a servomotor here as standard reduces overall energy usage by at least 20%, according to Haitian, while also improving processing stability.

Generation 5 machines are also said to provide increased plasticizing rates for reduced cycle times and a smaller machine footprint. Absolute Haitian says the smaller footprint is the result of an optimized frame structure, with the weight of the machines also reduced thanks to a new platen design. The lower platen weight results in faster movements with a reduction of 20% in dry-cycle times.

Absolute Haitian says the newly improved OPC-UA standard KEBA control interface applies AI algorithms and sensor technology to improve

energy management, accuracy, consistency, diagnostics and assistance.

The 214-ton Zhafr Zeres will mold a medical IV filter from ABS using an 8-by-8 cavity stack mold in an 18-second cycle. The parts, with weights of 1.5 and 2.2 g, will be removed by a Haitian Hilectro top-entry robot. The 101-ton Zhafr Venus 5 all-electric will mold 3.2 g syringe barrels from Tritan copolyester with a 4-cavity tool and an 18-sec. cycle. The 315-ton Haitian Mars 5 servo-hydraulic will mold a consumer storage



container in PP from a single cavity in a 50-sec. cycle, with the parts removed by a Haitian Hilectro top-entry robot.

Finally, the 731-ton Haitian Jupiter 5 servo-hydraulic two-platen machine will mold PC/ABS automotive exterior panel from a 2-cavity mold in a 60-sec. cycle with part removal by a Haitian Hilectro robot.



INJECTION MOLDING

## Specialized Machine, Tool Achieve Record Levels of Cap Molding

Netstal will run a production system from its customer, Alltrista, at NPE2024 to highlight the process capability of its CAP-Line injection molding machines designed for cap and closure production. The 450-ton machine will mold 26-mm water closures from a 128-cavity tool in a cycle time of 1.9 sec. Preconfigured for closure applications, the CAP-Line exhibition machine is based on Netstal's Elios platform. The CAP-Line 4500's all-electric clamping unit has a dry cycle time of 1.4 sec., which enables cycle times under 2 sec.

The optimized barrier screw enables a smaller injection unit to be used, and Netstal says the new design ensures a higher plasticizing performance and more melt homogenization. Optional optimizations include the four-key Smart Operation control panel and adaptive system-pressure reduction for additional energy savings.

The complete system running in the Netstal booth uses a 128-cavity mold from z-moulds and Intravis post-mold handling and inspection equipment that are identical to production systems used by Alltrista. An innovative design enabled z-moulds to fabricate a mold that it says is as small and light as a 96-cavity mold.

Compared to previous 128-cavity molds, z-moulds says its tool fits into a machine with a smaller column distance and, because less mass is moved, cycle time can be reduced. The full production system is also more compact, taking up just 540 ft<sup>2</sup>. With this system, Alltrista can produce more than 3.1 billion closures annually from only two lines.

From a power-consumption standpoint, the smaller, more efficient machine with 128-cavity mold consumes around 12% less electricity than competitive presses operating with only 96 cavities. Alltrista further boosted the sustainability of the system by reducing the closure's weight by roughly 25%, compared to the previous industry benchmark.

## RECYCLING

## Shredder Handles Bulky Materials and Facilitates Maintenance

WEIMA will be displaying its W5.22 shredder at NPE2024 in Orlando. The shredder features a 500-mm rotor and a 2.2 × 2 meter opening for feeding bulky materials. Drive power can be from 90 to 280 kW. The shredder can handle various materials, from plastics and wood to paper and textiles. According to WEIMA, the design is adaptable to diverse manufacturing and recycling processes.

The W5.22 offers design features that facilitate maintenance including an inspection access flap, providing access to the cutting chamber. The W5.22 also features a lift-up screen to provide rotor access. With safety measures in place, the push of a button enables access to the screen and rotor for cleanup and knife rotations, which are essential for machine care and precision cutting.

With a diameter of 500 mm and a length of up to 2,200 mm, the VF rotor of the WKS series can handle large purge and other bulky infeed materials. WEIMA's F-rotor, with its specialized knife arrangement, is able to shred flexible

materials like fibers and films. To safeguard against extreme conditions and contaminated material streams, the optional Vautid wear guard is recommended for added rotor protection.



## RECYCLING

## Recycling Machines Devolatilize and Decontaminate

Gneuss will be showing a complete Omni Recycling Machine, featuring a Multi Rotation System MRS 130 extruder, a water ring pump vacuum system, a fully automatic melt filtration system RSF Genius 150 and an online viscometer VIS. This machine is designed for the processing of up to 2,200 lbs/hr of undried and uncrystallized polyester (PET) reclaim.

The Omni offers flexibility and a compact design. The fully automated control of vacuum, extruder, dosing, degassing dwell time and filter exchange ensures quality of the end product while enabling the operator to use lower cost input materials. Energy used in the extrusion process is designed to be used in the next process step, reducing gas and electricity consumption. The MRS extruder is based on conventional single-screw technology, but is equipped with a multiple screw section for devolatilization. It enables efficient decontamination of the polymer melt, while achieving the requirements for direct food contact standards. In addition, the MRS extruder's vacuum system enables the processing of R-PET directly into end products without pre-drying.

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# DUKANE

INJECTION MOLDING

## Magnetic Mold Clamping Amplifies Quick Mold Changes

Stäubli Corp. presents the QMC123, released in 2023, as an advanced magnetic mold clamping technology option, distinctive by its magnetic holding force measurement and analysis. It is adapted to the full range of machines and molds. There will be demonstrations of the QMC123 at Stäubli's booth.

In the new system, the amount of holding force that can be generated can be customized to the mold and its condition. Specifically for mold builders, Stäubli's IMAG-Editor software is available to calculate the expected magnetic holding force that can be generated with each mold (based on CAD data) during the mold design phase, reducing potential machine downtime and issues during production.



Offering a high level of safety, Stäubli says that its magnetic mold clamping system anticipates malfunctions, not only protecting employees and equipment but also improving mold quality, increasing productivity and providing cost savings. For

example, its interactive control panel enables validation of safety points during mold changing operations. Via IMAG, the operator is alerted if the mold clamping system is damaged or insufficient with regard to the force exerted on the mold.

In addition to these displays, there will be Stäubli's range of quick mold change solutions, including monocouplings, a mold loading vehicle, automatic multiconnection system, a robot with an automatic toolchanger and more.

INJECTION MOLDING

## Movable Tempering Stamp

### Can Eliminate Surface Defects

Incoe says Heat-Inject Technology enables a part's surface quality and cavity filling to be optimized via localized mold temperature control with targeted heat pulses. In addition to reducing knit lines that form around holes and openings on a part, Incoe says Heat-Inject can also improve melt flow through cold runner fan gates or thin-wall sections of the cavity. An add-on module for Incoe's unitized manifold systems, Heat-Inject features simple design and implementation, eliminating larger mold modifications and the higher costs associated with alternative solutions to such surface defects. It also features low power

consumption — only 220V AC/30-amp power input is required.

Based on the patent-pending Z-system from Incoe partner Hotset, Heat-Inject is not an additional heater, but a movable tempering stamp, with a heated tip that introduces a heat pulse by briefly pressing against the rear wall of the cavity. With this technology, weld lines and flow lines are technically still there, but they're no longer visible on the surface.

At the show, Incoe will feature a hot runner and mold equipped with Heat-Inject, as well as the company's Flight Attendant technology, running on an all-electric LS Mtron LSG-240.

DRYING

## 'Simple' Units Feature State-of-the-Art Controls

Motan's Swift series sCompact dryers come with integrated conveying and are billed as multifunctional and flexible. The dryers are available in three versions and equipped with one drying bin sized 80, 150 or 250 liters, and up to three sConvey hopper loaders for conveying to the drying bin and two processing machines.

The sCompact has a unique feature and can control an additive dosing unit. The dryer is also offered with standard advanced features such as dewpoint control and dry-air conveying function with line purging. Operation is through the integrated 7-inch full color touch display. The complete drying bin is fully insulated.



TEMPERATURE CONTROL

## Packaged Chillers, Central Chillers, New Controller for TCUs

Sterling is unveiling a series of new products for temperature control at NPE2024. These include packaged chillers, central chillers and a new control interface for its TCUs.



**GPL Packaged Chillers:** Sterling has completely redesigned its line of packaged chillers with significant improvements for processors. The GPL packaged chillers are available with two refrigerant choices — R-410A or R-454B. R-454B is a "Low GWP" (Global Warming Potential) refrigerant that meets new environmental requirements of 12 U.S. states which went into effect Jan. 1, 2024. The GPL has a controller with a new color touchscreen for simple operator use. The new product design enables much easier access to components for regular maintenance. The GPL has a wide variety of option choices, but also has many items now included as standard, such as an audio/visual alarm. The new GPL is available as both air- and water-cooled models for 5- to 60-ton cooling needs.

**New GPL Small-Packaged Chillers:** These GPL chillers (photo) use R-513A refrigerant. The R-513A is a "Low GWP" refrigerant which meets new environmental regulations. This refrigerant is also classified as nontoxic and nonflammable, similar to the R-134A and R-410A it replaces. The units use an air-cooled system and have many features included as standard such as an audio/visual alarm. The new GPL chillers are available in 1-, 2- and 3-ton cooling capacities.

**New LHE Central Chillers:** Like the new GPL packaged chillers, the LHE central chiller offers customers two refrigerant options — R-410A or R-454B. The LHE continues to offer the central chiller's key benefits of high efficiency and modular expandability. The LHE is available in 20- to 60-ton cooling sizes.

**New Touchscreen Controller for TCUs:** The new Sterling TS-5 controller has a 5-inch touchscreen that enables easy TCU control by machine operators. The controller is available with the TC130/TC131 series. The TS-5 includes USB data logging, standard ethernet and many communications options. Plus, OPC UA / Euromap 82.1 capabilities are now included as standard in the new TS-5.

## TOOLING

## Compact Collapsible Core Features Independent Movements

DME's DURA collapsible core offers new options for a wide range of undercut and threaded applications. DME says the two-piece design enables each segment to open and close independently, ensuring there is virtually no stress on either segment, while enhancing the product's durability. The DURA is compact in size and features a straight driver pin, which improves cooling capabilities.

DME says this element ensures the core remains at an optimal temperature, cycle after cycle, enhancing its performance and life span.

In terms of customization capabilities, the DURA core is designed with eight, 10, 12 or 16 segmentations so that whether a small-scale project or a large multicavity application is required, the DURA core can be tailored to the specific application.

For a turnkey application, DME has also developed a special mold base to incorporate the DURA core along with a 4-plate, control-latch lock system to sequence the plates at the correct distance and timing. This standard DURA core mold base eliminates the need for an ejector housing or plate, resulting in an overall shorter stack height.



## INJECTION MOLDING

## Online Versions of Process Development Course and Software Launch

FimmTech Inc. — founded by injection molding consultant, trainer and *Plastics Technology* contributor Suhas Kulkarni — will launch online versions of its Nautilus process development software as well as its Scientific Molding and Design of Experiments (DOE) process development course at NPE2024. It is also releasing the third edition of his book, "Robust Process Development and Scientific Molding," as well as research on the use of artificial intelligence and machine learning to determine machine tonnage.

Kulkarni and FimmTech have trained employees at hundreds of companies globally using his flagship process development course on Scientific Molding and Design of Experiments (DOE). At the show, the company will launch an online version of that instructional seminar, which will include a complete certification program. In addition, a web version of FimmTech's complete process development software, Nautilus, will be released. Kulkarni says the web version will ensure seamless access without the hassle of installations or upgrades, giving users the most-up-to-date features immediately.

In addition, a third edition of his "Robust Process Development and Scientific Molding" book will now be available. Kulkarni notes that the third edition features an all-new chapter on melt preparation in addition to several new enriched sections in each chapter. Existing figures were updated and several new figures were added for better comprehension of the subject. Finally, as part of an R&D project, FimmTech will also detail experiments with AI and ML technologies to build a tonnage predictor based on existing processes and designs.

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# PROJECT-R

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EXTRUSION

## Extruders, Die Heads Plus a Cobot Demo

Milacron is debuting a new extruder, as well as new die heads for pipe. It will also demonstrate why cobots are not just for molding applications.

On the extruder side, its SG (for single grooved) 75-mm single-screw machine now features insulated shrouds to reduce heat loss versus a previous noninsulated design. The shroud design provides easier maintenance of the heaters and blowers than the previous design. The machine's controller has a 21-in. high-definition screen. The touchscreen works like modern smart phones with minimal use buttons. The controller is capable of full line integration.

There are two new die heads on display. The PH die heads have been flow modeled to ensure the head design is optimized for flow to optimize wall control and minimize color changeovers. A range of polyolefin pipe sizes can be made from a single head. The PH is currently available for pipe sizes ranges from ½-in. to 48 in. and outputs up to 2.2 tons/hr.

Milacron's MPH die head family is designed specifically to produce PVC pipe. Features include quick tip changes and easy-to-change dies that reduce the time it takes to change over the die to a different pipe size. It is currently available for pipe sizes ranging from ½-in. to 30 in. and outputs up to 2 tons/hr.

A newly upgraded Genca D3030 die head includes features that are operator friendly, such as an easy-adjust die centering feature, a patent-pending design for the application of stripes, and an optimized flow design for balance wall control.

Milacron is also featuring a cobot robot cell, utilizing a Fanuc CRX-10iA/L series unit to simulate how such a machine can be used to automate production of a PVC pipe line. This operating cell is without guarding panels due to the collaborative robot safeties built into the CRX Series Robot Line.

INJECTION MOLDING

## Plug-and-Play Modular Hot Runner Controller

Spark Industries, which acquired the assets Fast Heat in December 2020, will unveil the MOD24 patent-pending modular hot runner controller at NPE2024. Users can daisy chain up to eight 24-zone capacity cabinets with any number of six-zone modules inside for up to 192 zones of temperature control with a single Fast Heat, Pulse HMI.

The display can be cabinet mounted in multiple configurations, as well as remote mounted or integrated with a molding machine controller. The cabinets measure 12 × 16 × 20 inches, and the system is Industry 4.0 enabled with OPC-UA, Modbus TCP/IP and 4-Channel I/O communication protocols. Micro-USB recipe transfer is possible, operating on Fast Heat control technology. Spark says the MOD24 reduces peak kW demand by up to 67%, with an auto bakeout, even soak and soft soak time. Automatic or manual zone slaving is also possible.



SOFTWARE

## Plant-Monitoring Software Has Expanded Capabilities

MiVue, a division of the ACS Group, has expanded the capabilities of its plant monitoring software for plastics processors. New features and modules include:

- Job Report Module for lot tracking and quality accountability.
- Material Usage Module to track manufacturing material assets and cost.
- Preventive Maintenance Module

- Accumeter Continuous Loss in Weight Blenders
- BD Gravimetric Batch Blenders
- VacTrac Plus Conveying Systems
- T50 Central Granulators
- LHE Central Chillers
- GPL Portable Chillers
- Temperature Control Units
- GH Extrusion Control Hopper
- GH-F Gravimetric Additive Feeders



ensures unique maintenance schedules are followed for each machine type.

- Overall layout and control improvement based on customer input.

The monitoring software can collect information for a wide range of auxiliary equipment, including:

MiVue digital manufacturing connection kits offer plant managers more insight into their equipment by providing a wealth of robust production data, including material usage. Data-driven understanding of their processes improves plastic processors' uptime, reduces costs, and improves service and maintenance operations. MiVue's cellular router connects injection molding and extrusion machines with auxiliary equipment through secure and encrypted data transmission. Featuring powerful analytics and cloud-based data storage, MiVue software can be used on any web-enabled device. Users receive text and email alerts to keep processes running smoothly.

INJECTION MOLDING



## Moldmaker Showcases Molding Equipment for LSR, Injection Molds

M.R. Mold & Engineering specializes in tight-tolerance, complex geometry, liquid silicone rubber (LSR) and plastic injection molds. It has a proprietary line of molding products which include valve-gated cold runner systems, a pneumatic stuffer box, a universal base and a one-drop universal base, which has been designed for prototyping. M.R. Mold also offers customers end-of-arm tooling, robotics and vacuum seals.

The company is showcasing its abilities with four partners at NPE2024. Milacron, is running a four-cavity fully automatic LSR umbrella valve mold with a four-drop cold runner. Shibaura is showcasing a four-cavity, fully automatic LSR duckbill valve mold with a four-drop cold runner. Sumitomo Demag is running a 16-cavity, fully automatic piston mold with an eight-drop valve gate cold runner. And Zeiger Industries is running a fully automated, four-cavity electrical connector using 30% glass fiber-reinforced nylon 66.



## INJECTION MOLDING

### 3D Printed Hot Runner Nozzles, Pressure Pads Provide Reliable Temperature Handling

Witosa GmbH is set to make its U.S. debut at NPE by showcasing its Monolith hot runner nozzles and Energy Blocker printed pieces at the DMS Diemould Supply booth.



Since its launch in Germany in 2021, the Monolith nozzle has helped to advance the hot runner industry in Europe and East Asia. The one-piece, additively manufactured hot runner nozzle offers reductions in production time and costs, and improvements in product quality, garnering interest from market leaders in the plastics processing industry, according to the company.

Featuring a distinctive honeycomb structure, the Monolith nozzle provides optimal insulation and a more uniform temperature profile compared to traditional multipart nozzles. This design flexibility enables precise customization to meet customer specifications, especially

for technically demanding plastics. The Monolith hot runner nozzle product portfolio includes individual nozzles to system nozzles with open gating or valve gates in nozzle diameters of 11, 16, 20, 22, 24 and 28 as well as freely selectable nozzle lengths.

Witosa also introduces the Energy Blocker, additively manufactured pressure pads made of hardened steel that reduce heat dissipation from the manifold system into the mold, decreasing energy consumption by up to 52% compared to conventional systems with titanium pressure pads. The Energy Blocker's hardened steel is said to make it significantly more pressure resistant than conventional titanium backing plates.

Thanks to its thermal insulation, users can also reduce the necessary cooling capacity of their mold while still ensuring the required heat dissipation. Its contact surface with the tool remains unchanged in size compared to conventional pressure pieces, resulting in increased tool rigidity and easier grinding, if required. The hexagonal structure, already familiar via the Monolith hot runner nozzles, gives the Energy Blocker a high degree of rigidity. This innovation also contributes to reducing the carbon footprint of the production process.

## BLOW MOLDING

### Higher Stretch-Blow Productivity for PET and HDPE

In four operating machine exhibits, Aoki Technical Laboratory is highlighting productivity improvements in single-stage, stretch-blow molding for narrow- and wide-neck PET containers, as well as a lightweight bottle design for popular HDPE pill packers.

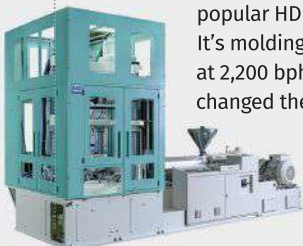
First, Aoki is introducing its new standard model with even greater performance than its previous flagship model AL-500LL-50S. The new AL-500LL-60S (pictured) is molding 125-ml cylinder bottles in PET at 5,400 bph.

A second exhibit features the same machine producing a lightweight bottle that Aoki developed for the increasingly popular HDPE packer market. It's molding 225-ml bottles at 2,200 bph. Third, Aoki

changed the structure of its AL-1000NL-300 two-row machine to a simpler one-row design

that enables this AL-1000-200 model to mold containers with a body diameter exceeding 100 mm. The previous model could not mold more than two cavities with a neck diameter of 120 mm or more, but the new version can mold up to four cavities with that neck diameter, depending on product size. At the show, it's producing 1 L PET round jars at 2,800 bph.

Another single-row machine is making its debut at a global trade show. The AL-1000-60 can mold up to 20 containers; its dry cycle is 34% shorter than Aoki's earlier two-row AL-500N-60; and the simpler mechanism enables mold-change time to be cut by 36%. Moreover, the company's latest high-speed molding technology is said to enable a single machine to deliver the same productivity as two of the earlier models. The new version is molding 100-ml round PET bottles at 10,900 bph.



## MATERIALS

### PIR/PCR Recycling Content and Biobased TPEs for Range of Applications

Kraiburg TPE is launching a line of TPE compounds incorporating postindustrial and/or postconsumer recycled materials (PIR, PCR), and a new line of biobased TPE compounds, tailored for consumer goods, industrial and automotive applications.

- **RC/UV/AM series compounds** are designed for automotive exterior applications with adhesion to PP and feature a PIR content of 30-50%. They are suitable for UV-resistance applications and are available in black as well as various hardness options ranging from 65 to 90 Shore A.

- **RC/FG/AM series compounds** are designed for automotive interior applications with adhesion to PP. They offer PIR content of up to 40% (depending on the desired hardness) to meet the requirements of OEMs and their suppliers while supporting carbon footprint reduction and fulfilling emissions, fogging and odor requirements. They are available in different hardness options ranging from 65 to 85 Shore A.

- **RC/PCR/AM series compounds** are available with PCR content of up to 44% and for applications in the consumer and industrial market, offering multiple usage possibilities for applications requiring adhesion to PP. They come in a wide range of potential hardness options, from 40 to 90 Shore A, and are available in gray, with the possibility to be colored in several ways.

- The **Thermolast R range** includes a new line of products derived from renewable raw materials. These biobased TPEs can reduce carbon footprint by up to 50% compared to conventional nonrenewable alternatives. Kraiburg TPE is focusing on biobased TPEs sourced from non-food raw materials, including use of agricultural byproducts or nonedible waste from food production. The series includes compounds with adhesion to PP, ABS/PC and nylon within a hardness range between 30 and 85 Shore A. Individual compounds have a bio-content of over 60%.

EXTRUSION

## Coiling System Features Automated Spool Removal

Reel Power Industrial is introducing an Automatic Cut and Transfer system (ACT-26) for coiling and spooling up to 1,000 ft/min. The ACT-26 can accommodate different coil sizes and configurations, providing flexibility to meet diverse production needs.

At NPE2024, the ACT-26 system will be showcased with a Yaskawa HC20DTP collaborative robot (cobot), demonstrating automated spool removal. This 6-axis HC20DTP cobot enables operation with or in close proximity to humans. Precision hand guiding facilitates

easy programming for fast implementation of the cobot system, while a pinchless design featuring Power and Force Limiting (PFL) technology, constantly monitors force to quickly react to contact. Through-arm utilities hide cabling, including a Category 6 Ethernet cable. An IP67 rating enables use in harsh environments.

The ACT systems are said to offer quick return of investment when

replacing manual machines with improved safety and one operator to run multiple lines. It can coil materials quickly and consistently, reducing production time and increasing output, and is designed to coil materials with precise measurements, resulting in consistent coil dimensions and minimizing material waste. This accuracy is crucial in industries where precise coil dimensions are required for downstream processes or product quality.



BLENDED

## Gravimetric Batch Blender Gets Series of Upgrades

Moretto has made significant improvements to the DGM Gravix line of gravimetric batch blenders to bolster their performance and ensure their reliability.

The hopper design has been completely renewed to guarantee a regular granule flow, ensuring a constant dosing accuracy. This feature translates into greater operational reliability and the ability to maintain very high standards of accuracy, Moretto says.

In addition, the mixing system has been further improved to optimize the uniform distribution of colorant and additives. This includes the recent introduction of the DGM 20 version in the range specifically designed for microdosing. This model is well suited for medical applications, where precision and reliability are key requirements to meet the high standards demanded.

The electrical cabinet has also been redesigned to enhance the ergonomics, engineering and accessibility of control devices. Positioned strategically at the rear, it provides convenient access to all essential machine components, including electronics, weighing cells and pneumatics.

The user interface has been upgraded with the introduction of a 7-inch touch view, with a bigger size versus the previous version and featuring a simpler, more intuitive user experience. It enables operators to effortlessly maintain control over operations.

The new pivoting arm delivers substantial ergonomic improvements, enhancing operator comfort and optimizing space utilization, particularly during processing phases.

INJECTION MOLDING

## Hot Runner Temperature and Mold Motion Controllers Debut

All new for hot runner supplier Mold-Masters at NPE2024 are the TempMaster M4 hot runner temperature controller and the M-Ax mold motion controller. The TempMaster M4 features Mold-Masters' new HR-Connect technology, which replaces conventional mold thermocouple and power cables with a single lightweight cable connecting the mold to the control head unit. The TempMaster M4 also features the Mold Direct Mount design. A Mold-Masters spokesperson told *Plastics Technology* that the predecessor M3 control utilized TC-Connect technology, which eliminated just the conventional thermocouple cables. The new HR-Connect eliminates conventional thermocouple and power cables.

The next-generation M-Ax mold motion controller features preprogrammed mode functions as well as energy and torque monitoring. M-Ax can control a variety of functions, including valve gates, core pulls, rotary tables and spin stacks, as well as coining, index, stripper and ejector plates. Supporting rotary or linear movements, the control has up to 64 programmable inputs and outputs.

Additional products featured at the show will include the company's E-Multi product line of auxiliary injection units, which now includes the E-Multi mini. The E-Multi is available in shot ranges from 0.26 to 42 oz., and can run a range of materials, from PCR and bioresin to LSR.



BLOW MOLDING

## Compact Screen Changers for Processing PCR

W. Müller USA is introducing a new generation of screen changers for its blow molding extruders. W. Müller considers melt filtration to be essential to controlled extrusion — and never more so than when processing postconsumer recycle (PCR). The new screen changers can be retrofitted and do not require any special safety measures because they do not have their own drive. They can be operated manually or with a power tool, such as a cordless screwdriver. These screen changers are designed to be particularly space-saving because they are integrated into the connection piece between the extruder and extrusion head. The extruder length is not significantly extended, the company says. In addition, the screen changer can be installed in any orientation, including vertical extruders.

According to Jens Schlueter, W. Müller USA president, "Traditionally, there are no screen changers for vertical extruders. We are one of the very few suppliers on the market. Normally, the changers are too long to install vertically without risking the stability of the extruder."



## INJECTION MOLDING

## Components, Controls Designed to Boost Injection Molding, Streamline Operations

PCS Company is introducing several new products, the Airtect Plastic Leak Alarm system and the MCS hot runner temperature control systems.

MCS hot runner temperature control systems use the latest technology to precisely accelerate temperature control. Universally effective for the control of all standard hot runner systems, as well as for demanding high-performance applications, it features fast control response, improved intuitive operation and simplified controller functions.



In addition, integrated interfaces optimize communication between the controller and injection molding machine, enabling faster error detection, analysis and feedback to reduce cost and downtime. Standard controller range is 6-120 zones. Molders can conveniently access data and control systems on-site or remotely, as needed.

Airtect's Plastic Leak Alarm systems (photo) provide 24-hour protection for hot runner systems or IMM injection nozzles. Users receive instant feedback from the direct protected area in the form of an alarm and/or the suspension of production, helping minimize damage and downtime. These systems are available in a variety of options depending on the customer's needs. System accessories and spare parts are also available from the PCS Company.

Another highlight is PCS' new 0.750 inch. integrally heated sprue bushings, which help shorten cycle times without compromising part quality.

## BLOW MOLDING

## Sensor-Based PET Stretch-Blowing Controls and Bottle QC Instruments

Advances in automated stretch-blow molder control, precision bottle measurement and laboratory automation are being highlighted by Agr International at NPE2024. The focal point of the booth is one of its newest systems, Process Pilot+ (introduced at K 2022), an enhanced version of its Process Pilot automated management system for two-stage stretch-blow molders. It is said it can correct process drift as much as 40% faster and enable startups to reach on-spec bottle production up to 65% faster. Agr's newest handheld QC device for bottles or flat sheets is the ThicknessPen, a dual-mode unit (also introduced at K 2022). One measurement mode is magnetic, the other is capacitance based.



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INJECTION MOLDING

## IMM Cells Display Communications, Energy Measurement and Energy Recovery

Wittmann will utilize five injection molding machine work cells in a new red color to showcase its latest molding, robotic and auxiliary technologies. Every cell will feature the company's 4.0 Technologies. In addition, every machine in the booth will relay energy usage via Wittmann's proprietary IMAGOxt software. Energy will be recovered in all the SmartPower and EcoPower molding machines, thanks to kinetic energy recovery system (KERS) technology. A large-tonnage MacroPower servo-hydraulic machine with an electric metering motor will mold a sunroof bezel from Axiom, applying hybrid-grade recycled content PP from TotalEnergies and running regrind from the



process. The new Feedmax Clean with dust/fines separation will convey material from the G-Max XL granulator to the G34 Blender, removing dust during conveying, which is managed from the M8 central conveying controller. The press will apply Wittmann HiQ Flow to account for any changes in resin viscosity. There will also be two freestanding robot cells, both showcasing the new Control Room, which will debut at NPE2024. Wittmann says the Control Room can be used to view and control several Wittmann auxiliary products within its work cell, operating on the R9 robot pendant as well as a PC.

In addition, the new Sonic 131 robot will show off its acceleration and speed via demos, while a WX142 Robot is being used to demonstrate the latest Quick New Teach Program generator.

EXTRUSION

## Sensors Measure Moisture in PVB Films, Pellets

MoistTech utilizes near-infrared (NIR) sensor technology that enables non-contact measurement of the moisture content of polyvinyl butyral (PVB) pellets or film. Said to be insensitive to material variations such as particle size, material height and color, the sensors provide a continuous, reliable reading with zero drift and no maintenance. There is a one-time calibration with a non-drift optical design

which enables operational personnel to make immediate line adjustments based on real-time measurements.



MoistTech can measure moisture levels in PVB to ppm levels, enabling manufacturers to accurately control and monitor the process. Glass manufacturers see excessive moisture in PVB when laminating the product. The IR3000 can measure the raw film prior to use in production and more interestingly after the glass has been completed. By physically passing the laminated product through the NIR sensor, moisture can be instantly and accurately determined.

The online sensors can be installed into any hopper, silo, material line, belt or screw conveyor, and the moisture results are displayed onto an external display or PC.

INJECTION MOLDING

## Mold Solutions Target Safety, Storage and Productivity

Globeius is exhibiting a range of molding solutions targeting the transport, storage and performance of injection molds.

Globeius is presenting its range of GT Cranes that are designed specifically for the injection molding industry. With a focus on making mold transport through the plant and mold changes simple and safe, the GT Cranes make a single-man operation possible.

They have up to 55,000-lb capacity and a horizontal, vertical, angled and rotating boom arm dexterity. Adjustable speed simplifies the placement of the mold in the injection molding machine, while the use of a remote control enables one operator to perform tasks that are usually done by several people. In addition, the overloading system is designed to block the operator from performing potentially unsafe activities. Customers will also find Rack Storage injection molding racking and storage solutions at the Globeius booth.



BLOW MOLDING



## Large Recip-Screw Machine Boasts Numerous Upgrades

Although it was first introduced at NPE2018, there's a lot new to see on the RS-90 reciprocating-screw blow molder displayed by Rocheleau Tool & Die Co. This 90-ton machine is capable of six-cavity gallon production or up to 14 cavities of smaller items. With a 90-mm extruder, it can put out 750 lbs/hr of HDPE. The extruder has a VFD electric drive and other movements are hydraulic. This is the company's largest machine, targeting HDPE and PP dairy, consumer and industrial containers.

Clamp side-shift is a new option on the RS-90, which enables molding containers with off-center necks while maintaining even wall distribution. The machine can be automated inline with a VT-3 deflash automation package, which has been modified for this show to enable impact trimming of larger containers like 35# and 2.5-gal F-style bottles.

The machine on display features new process monitor controls and options for simplifying diagnostics with easy-to-use help screens, digital operator manuals, live alarm diagnostic checks and preventive maintenance through the operator terminal or a smartphone.

## INJECTION MOLDING

## Compounding and Injection Molding Combined in Circularity Display

KraussMaffei will mold single-use medical blood vials and then, through a series of processes, convert them into durable, long-life bottle openers. An all-electric PX 251-1400 will mold medical blood vials from a 32-cavity mold using ExxonMobil PP 9074 MED material. After shredding, these vials serve as base material for the upcycling process carried out on the ZE 28 BluePower twin-screw extruder. The resulting compound is fed to an all-electric PX 81-180, which will utilize the company's APCplus dynamic control to account for viscosity fluctuations in the recycled blood-vial resin and mold bottle openers. Elsewhere, KraussMaffei's Direct Compounding Injection Molding (DCIM) process will produce reusable crates from three different recycled materials. The GX 1100-4300 DCIM system features a single-screw extruder in a piggyback position on top of the molding machine.



The company will also showcase a MuCell screw with 30% higher plasticizing performance. The HPS-Physical Foaming screw has a longer three-zone area, which can be universally used for all plastics, including those with and without fiber reinforcement. A PX 121-180 SilcoSet will mold LSR headlight lenses with the help of the APCplus software. ACH Solution supplied the 2-cavity mold and its Servoshot 2G electro-pneumatic valve-gate system, which has needle valve control down to 2 µm. KraussMaffei will also highlight its partnership with the National Institute for Aviation Research (NIAR) at Wichita State University at NPE2024. TIME Bicycles, working with Fraunhofer and Clemson, will highlight its introduction of High-Pressure Resin Transfer Molding (HP-RTM) to cycling, displaying the first U.S.-produced HP-RTM bicycle. Visitors can register to win the bike.

## BLENDING



## Blenders Now Come with Brushless Motors

Plastrac has switched from brush-type motors to brushless models that are said to be packed with advantages and are much smaller in size. The new motors have no wearing parts, so virtually no maintenance is needed. Plastrac's new brushless motors rely on a drive circuit with smart control that monitors the disc system bearing load. In addition, temperature sensing inside the feeder detects abnormal process conditions. The compact control unit is located on the blender and has a remote operator interface with a single short cable connecting the control unit to the feeder unit. Increased performance is where Plastrac says the new brushless motors really shine, however. They are 30% more efficient than their brush-type predecessors. Speed over range actually enables increases of up to 20% in feeder capacity.



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## Advanced Inspection of Bottles and Labels

Among four new inspection systems from Intravis are two for blow molders that capture defects in bottles and labels. Label-Watcher 360° is new for 100% inspection of self-adhesive labels on randomly oriented bottles. This compact, standalone unit can be integrated into the production line at any point after the labeling machine. It provides full 360-degree inspection and also reads 1D/2D codes. The unit is designed to keep up with even the fastest labelers — up to 10 parts/sec.

It's designed especially for nonoriented products; special features accommodate different rotational positions. A new illumination concept is said to ensure the entire label is uniformly illuminated, so that defects can be reliably detected even at the label edges; and reflections are prevented, avoiding false rejects. A setup wizard enables fast setup of new products by any operator and eliminates the need for time-consuming image collection of different rotational positions.

The system uses six cameras. For oriented objects, one camera can inspect the neck opening for diameter and ovality, and check the sealing surface for nicks and scratches.

Also on display is a redesigned SpotWatcher bottle inspection system with a new, more modular and more aesthetic design. It performs material defect inspection — checking the blank bottle sidewall for dark pinholes, burners and contamination — as well as color inspection (streak detection), contour inspection (flashes, webbing, handle folds) and opening inspection (diameter, ovality and excess material inside the neck). Cloud storage provides data security. Optional features include reject-rate monitoring.

## INJECTION MOLDING

### Stack Mold System Combines Fast Injection With High Process Repeatability

Oerlikon HRSflow has developed a patent-pending compact stack mold system that targets thin-wall packaging applications. It is equipped with nozzles from the company's new Xd series, engineered to withstand high filling pressures. The stack mold system fits a maximum plate thickness of 220 mm. It is designed for fast injection and cycle times via a stable process with high part-to-part weight consistency.

The stack mold's design, with a plug-n-play system, enables a simplified assembly. It also offers fast and friendly maintenance, avoiding long and costly production line stoppage. The mold was also conceived to easily process PCR and sustainable compounds.

## AUXILIARY EQUIPMENT

### More Efficient, Precise Blending and Drying Solutions

Advanced Blending Solutions (ABS) is showcasing a range of innovations at NPE2024 that are said to optimize performance, increase efficiency and empower processors to achieve new levels of control and accuracy. These include:

- **New Extruder-Mounted Simplicity Blender:** Offering the same trusted features and performance as its legacy Simplicity Blenders, this new model brings increased stability for extrusion applications. A lower center of gravity and more balanced weight distribution — coupled with optional doors — are said to provide the best solution for extruder-mounted blending.
- **New Modular Magnet Drawer:** This versatile design streamlines the blending process, reducing lead times and offering increased customer options. New high-strength magnets boast a 75% increase in power over previous versions, and high-temperature options expand capabilities by 300°F.
- **New Common Material Line Check Valve:** Fabricated entirely from stainless steel with FDA-approved wear surfaces, this valve replaces legacy gum rubber options, ensuring superior hygiene and performance.
- **New Blender Work Lights With Smart Status:** Providing real-time feedback during setup, calibration and operation, these intelligent work lights empower operators with valuable process insights.
- **New Vacuum Relief Valve (VRV):** ABS' VRVs are said to deliver unparalleled precision and control over process air, optimizing pump performance and minimizing noise levels. Their unique design eliminates binding issues for reliable operation and venting, and the compact footprint fits seamlessly into tight spaces within pump assemblies.
- **New CK Series Dryer Hoppers:** Featuring a one-piece design, these hoppers eliminate potential leak points and improve material flow. Enhanced door design, stainless steel construction and increased thermal insulation further elevate performance and aesthetics. The modular CK framework simplifies installation and offers numerous bolt-on accessories for ultimate customization.
- **TD Series Dryer Improvements:** ABS has implemented numerous panel and code updates, enhancing user experience and control. Upgraded regen heater boxes and standard regen power-saving features optimize energy efficiency and process stability.
- **New Color Analyzer:** Scheduled for release at NPE2024, this versatile tool enables precise color measurement from samples or directly on production lines, empowering data-driven color control.
- **New S2 Blender Chassis:** New oval design enables reduced overall blender footprint and improved maintenance access.
- **New Inline Trim and Roll Repelletizer — "The Piranha":** The compact and energy-efficient Piranha can tackle both inline trim, and trim and roll applications. Its improved screw geometry ensures precise melt temperature control, minimizing bridging risks with its enlarged feed entry. The innovative air pelletizing system guarantees consistent, high-quality pellets, while the large collector chamber facilitates efficient cooling and transportation.

Maintaining the Piranha is said to be effortless: easy-access cleaning minimizes downtime, and the no-setup design with minimal maintenance needs maximizes operator convenience. A new dicer cassette and knife blade system are said to ensure consistent pellet size.

## BLOW MOLDING

## Higher Productivity, Energy Savings for Packaging, Industrial Parts

Among at least six new hardware introductions at the show, Bekum America is highlighting two machines in particular. One is the EBLOW 407D, its first U.S.-built all-electric shuttle. It incorporates mostly domestic components — including the patented C-frame E-Twin Toggle and the seven or more servo motors plus actuators — making availability of spare parts simpler and more reliable.

This midsize, double-sided model is a “four-cavity gallon machine,” having a 15-metric-ton clamp, 520-mm stroke and 500-mm maximum mold width. It’s running (for the first time in public) EPET handleware (2 L, two cavities) to demonstrate that electric machines can handle such a tough application as hard-to-trim EPET.

The second main highlight is a brand-new industrial machine, the XBLOW 200. Though not physically present, a video of it in action and a 500-L tank produced on this 200-metric ton machine are on hand. The XBLOW series (announced at K 2022) features a new clamp design with two diagonal tie bars and rapid movements via a long-stroke toggle (servohydraulic or electric) paired with a servohydraulic short-stroke cylinder.

A brand new continuous-extrusion head, model BKW400-3, is for producing drums and industrial containers up to 250 L on the XBLOW 100 machine. The new spiral-mandrel design is said to provide improved parison concentricity and layer uniformity in tri-layer coextrusion, as well as faster color changes. This head can be part of a three-layer retrofit package for upgrading monolayer machines (at lower cost than buying a whole new machine).



## BLOW MOLDING

## High-Output Drum Machine Boasts Fast Cooling and Color Change

It’s not on view, but Graham Engineering is talking up a new high-output drum machine that uses shell-mold cooling for an estimated 15-20% shorter cycle time. The S40 6060 Drum Machine also boasts a proprietary head design that’s said to permit one-hour color changes.

This machine has a 40-lb accumulator head, a 150-mm extruder capable of 2,200 lb/hr, 60 × 60 in. roll-out press, and adjustable extruder platform to move the head up and down to enable a mold shim change while in the machine. This enables the bottom blow assembly to remain fixed. Also provided is a PWDS wall-thickness distribution system.



# WHAT YOU MAY NOT EXPECT

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FEEDING

## Volumetric Unit Offers Consistent, Accurate Masterbatch Dosing



The sCOLOR V, part of Motan's swift series of products, is a volumetric additive dosing unit that is said to offer excellent mixing quality and reliable, accurate and consistent additive feeding. The unit is compact and designed to be directly mounted on the feedthroat of the processing machine.

Synchronous dosing is said to provide excellent recipe accuracy, resulting in greater transparency and traceability for quality assurance of the end products. As with all swift products, the unit is controlled via a 7-inch full color touch display.

BLOW MOLDING

## Stretching the Boundaries of Large PET Containers

Cypet Technologies, a Cyprus-based builder of one-stage injection stretch-blow molding (ISBM) machines, is showing the latest achievements in large PET products made on its equipment. These include new sizes and styles of handled and stackable PET containers, including novel



interlocking products.

A novel PET agricultural application in Mexico is a 434-mm-long tube, 40-mm wide, with a pointed tip in the unstretched

base, which enables it to be driven into the soil to serve as a support for growing crops. Molded in 16 cavities, it requires tight tolerances for the base to interlock with the neck of an identical part, so that five parts can be connected end to end to make a structure that extends 2 meters above the ground. Cypet's first 60-L stackable industrial container with twin integral handles is a new entry in a market where the typical size for such a container is 20 L, according to Cypet.

EXTRUSION

## Gamut of Solutions for Measurement of Pipe, Tubing, Other Extrusions

iNOEX LLC is displaying its portfolio of high-precision measurement and control technology for the extrusion industry. This includes measurement solutions for pipe, tube, cable, film and profile extrusion applications as well as data management software for the visualization of extrusion line processes and quality control data.

As the exclusive partner for local sales and service of the ASCONA promex product line in North America, iNOEX will also feature at its booth the ASCONA promex BASIC FAST system. The plug-and-play solution captures and measures all profile dimensions in production and lab environments. Products on display include:

- **WARP CP 1200:** This is a radar-based noncontact inline measurement for corrugated pipe. It provides wall thickness distribution, diameter, eccentricity and ovality measurement, and features automatic sensor centering.
- **WARP portable:** This mobile radar-based handheld device generates wall thickness measurement with immediate results and is specifically designed for medium and large pipes.
- **iXRAY:** A high-precision wall thickness and diameter measurement, this

features state-of-the-art X-ray components combined with the latest sensor technology, and provides three-axis measurement.

- **AUREX ERS 125:** An ultrasonic wall thickness measurement for single and multilayer pipes, this offers 100% inspection length-wise and along the circumference based on active/passive measurement. Up to 96 sensors are used for measurement.
- **SAVEOMAT DOS:** Offering continuous and highly accurate gravimetric weighing and level monitoring of solid and liquid materials, this unit is suited for complex recipes and special applications (with up to seven components). It provides constant mass throughput with raw material savings of up to 5%.
- **iDM 4.0:** Retrofittable for all iNOEX systems and a wide range of equipment (upon consultation). Local data storage safeguards sensitive quality control and process data. Software is easily scalable (integration of new lines or equipment, cross-plant evaluations, new user groups)
- **promex BASIC FAST:** A plug-and-play system with digital camera and a telecentric lens achieves 100% profile measurement at a cycle time of 3-5 sec. Data logging of all measurement results enables historical analysis.

BLOW MOLDING

## New Dual-Head Accumulator Machines, Electric Clamp Options

Industrial blow molding machine specialist ST Blowmoulding of Italy will showcase its latest developments in accumulator-head and continuous-extrusion technologies. At center stage is its new line of dual-head accumulator machines with new controls, optimized material usage and what is said to be "the lowest energy consumption in the market and the highest possible OEE (Overall Equipment Efficiency)." The upper platform of a dual-head machine will be on display.

Also new are energy-saving electric clamping units (introduced at K 2022), optional on dual-head and other machines. These are paired with the company's adiabatic extruders for high energy efficiency. The company says its large machines exceed the top level of energy efficiency under Euromap 46.1: class 10 or <0.1 kWh/lb of material processed.

In continuous-extrusion technology, ST is presenting new concepts for high-output molding of L-ring drums and IBCs. The company also offers multilayer technologies for both continuous-extrusion and accumulator-head machines. For accumulators, a new design of the flow channels is said to significantly improve the balance of the layers, suitable for two or three layers, as well as the ability to provide an additional outer coating layer with a separate accumulator chamber.





## TOOLING

## Mold Tracking, Simplified Cooling Line Coupling and More

Hasco's multicoupling system now features new U.S. (ZI) and French (FRA) systems that are available as open or closed versions with valves. The company also now offers the clean-break multicoupling system exclusively as an HT version with flat-sealing front surfaces to prevent cooling fluid leaking during decoupling.

Enabling the central connection of several cooling circuits in a single step, Hasco says setup can be carried out with only one lever, while eliminating the risk of mixing up the different cooling circuits and hoses.

The temperature resistance of the multicouplings can be increased to 180°C with water applications, with the full range offering 60 products, each with three model series. Plates are available with six, 12 and 20 connections. Couplings can be replaced without dismantling the hoses, and the modular structure enables individual configuration as well as integration into existing systems.



INJECTION MOLDING

## New Hybrid, All-Electric and Vertical Injection Molding Machines

LS Mtron's 10 machines and 13,500-ft<sup>2</sup> NPE2024 booth — triple the space it occupied in 2018 — will feature multiple new injection molding machines spanning an array of markets and process technologies. The company will also have machines at the booths of show partners Yushin and Incoe. Targeting the electric vehicle (EV) battery market, the company's LSG-VL vertical series features an 18-inch multitouch Keba controller and is available in clamping forces from 30 to 660 tons.

At the show, a 170-ton LSG-V machine will mold an EV component. LS Mtron says the LSG-V series enables energy savings of 65-70% because of its servo-pump system. The larger Keba controller features cycle analysis, unit conversion and a memo function that enables users to associate data with a specific mold. The Keba controller will also be demonstrated on LS Mtron's ONE series of hybrid machines.

In Orlando, a ONE-1400 will mold the rear door side trim for a Hyundai vehicle. LS Mtron says benefits of the ONE series include a no-lubrication sliding bushing for 40% improvement on tiebar "drooping" or sag, and a quick barrel-change system, with optional one-touch tiebar separation.

LS Mtron will also demonstrate its sandwich injection molding via its Piggyback Multi Component (PMC) technology, molding surface layers from virgin material with recycled resin in the core.

Additional new machine lines include the all-electric LSG-E, ranging in clamp force from 35 to 950 tons, with plans for a new 1,500-ton model to be introduced in 2024.

Featuring high-stiffness platens with a five-point toggle design for high-speed clamping and high-intensity injection, LS Mtron says the LSG-E is well suited for precision applications. Features include a 13-27% increase in injection volume and injection speed of 300 mm/sec.

Hasco's Mold Track System offers precise indoor localization technology for injection molds. Key to the product's accuracy are ultrabroadband radio modules and the intelligent software platform, which result in location accuracy to within a few centimeters.



In hot runners, Hasco's Streamrunner Shadowfree line (photo), which feature 3D-printed manifolds, eliminates 'shadow formations' behind valve pins or areas of poor flow where material can collect and degrade. In traditional systems, areas of poor flow in the hot runner can cause flow disruptions around the valve pin. Streamrunner Shadowfree divides the material flow into streamlined channels, reuniting them where the valve pin enters the melt channel. Hasco says testing has demonstrated the ability to achieve rapid black-to-white material transitions in just 25 cycles. In addition to eliminating dead spots, Hasco says the Streamrunner Shadowfree provides gentle material flow and a marked reduction in pressure losses, as well as smoother processing of heat-sensitive resins.

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# IN SPECT MORE







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MAINTENANCE

## Dry-Ice Cleaning Systems on Display

Cold Jet is exhibiting and will operate four new machines at NPE2024 for cleaning screws and tooling with dry ice.

First, the new 2024 PCS60 is an automation-ready, 3-mm, pellet-based system that enables plastics processors to selectively control 28 different pellet sizes (from 3 mm down to 0.3 mm particles) via the HMI. Its ability to internally cut 3-mm pellets down to 0.3-mm particles makes the PCS60 a two-in-one machine. The ability to adjust (and store in memory) particle size through the digital HMI adapts the cleaning aggression to a variety of tooling and/or part substrates.

Next, the Ice Rocket PLT with analog controls is a lower priced 3-mm pellet solution with the capability to reduce the dry ice particle size via a fragmenting nozzle.

Also debuting at NPE2024 is the smart i3MicroClean2 (photo) which utilizes 5 x 5 x 10-inch blocks of dry ice and can accept 3-mm pellets. The machine shaves the dry ice and delivers 0.3-mm particles for cleaning. This machine has a digital HMI

with the ability to store various blasting recipes to accommodate numerous types of tooling. Its ability to clean molds as well as deflashing and/or deburring parts make it a popular choice. The HMI also interfaces with Cold Jet CONNECT for monitoring the cleaning process. New enhancements and accessories permit the machine to be operated in rugged environments. At the show, booth attendees can register to win a \$40,000 newly designed i3 MicroClean 2.

The new PE80 pelletizer is a small dry ice production machine. This low-volume, one-button-push-to-start production machine was just introduced for those who wish to manufacture on-site their own dry ice instead of purchasing dry ice from local gas companies. Processors can make their own dry ice, on-demand when needed from portable LCO<sub>2</sub> dewars or refillable LCO<sub>2</sub> microbulk tanks.

Cold Jet's CJ CONNECT monitoring system brings Industry 4.0 principles to the maintenance function. The rise of data-driven decisions in smart manufacturing facilities led Cold Jet to develop a process management system. Users can remotely monitor their cleaning operations, and schedule and report their cleaning times and costs. The company is also able to remotely troubleshoot and assist in servicing any maintenance needs.



INJECTION MOLDING

## LSR Cold Deck Applies Valve Gating

Mastip Inc. introduces the latest updates to its Aquilo liquid silicone rubber (LSR) systems and looks forward to sharing its experiences with recently completed projects for the medical industry.

Mastip's LSR solution features a "cold deck" design that includes cooling channels in the mold plates, manifolds and nozzles. This design ensures the mixed material remains in its uncured condition before entering the heated cavity plates.

Additionally, the use of valve gating technology improves balance between cavities and from shot to shot, eliminating material curing in the gate between cycles. Sequential timing of the valve gates is the key component that ensures cavities are kept balanced.

Mastip's dedicated CR04 and CR06 LSR nozzles are designed with cooling channels extending toward the valve gate nut, ensuring a consistent thermal profile along the nozzle. This design enables optimal control of the valve gate nut temperature which Mastip says is critical in consistently producing high-quality LSR parts.

The consistent thermal profile along the nozzle also ensures that LSR flows smoothly and uniformly into the part, resulting in a high-quality gate and improved part quality overall. This is especially important in industries where precision and quality are critical, such as medical device manufacturing.



TEMPERATURE CONTROL

## Press-Side TCUs and Full-Plant Adiabatic Coolers

Frigel's RSY Microgel Syncro will be officially launched in North America with a reported productivity increase of up to 50%. The 3PR 4.0 control system, which provides real-time control of the entire Frigel central-cooling system, debuts. Other upgraded models include the Microgel RSM/RSD Series which ranges up to 194°F (90°C).

The Microgel Syncro machine-side TCU enables cycle-time reductions up to 40% by synchronizing with the molding process and not requiring any tool or process modifications. The Ecodry 4DK Series is an expansion of the line of closed-loop adiabatic fluid coolers with enclosed chambers and patented booster cooling technologies. Designed for flexible configuration of modular adiabatic solutions for small to large plastic factories, the 4DK takes advantage of some of the technological advances Frigel introduced in the LDK range.

In controls, the 3PR 4.0 platform provides complete control of Frigel central cooling systems from a single control point. New to North America, the MiND 2.0 platform, provides customers with a supervision and maintenance tool for all Frigel equipment and accessories that is available locally and remotely through a user-friendly webpage.

Frigel North America — which is the exclusive sales, parts and service distributor in North America for HB-Therm TCUs — introduces the new Thermo-6 product line at NPE. Equipped with standard VFD, seal-free, reversible, stainless steel pumps, the Thermo-6 has an all new noncontact heater design with lifetime warranties, 8 to 16 kW heating capacities and a new cabinet design. Standard features include ultrasonic flow meters, new 7-inch touchscreen HMIs, e-cockpit via Bluetooth and Wi-Fi, ethernet connections and several interface protocols.



## BLENDING

## Blender Targets Hard-to-Handle Materials

Movacolor has added the 20-recycling series to its MBS blender range, specifically targeting plastics processors working with recycled material in their production processes. This blender is capable of processing hard-to-handle materials such as PCR, flakes and certain regrinds.

The material hopper oscillators ensure optimal flow of the material while the isolated upper body filters vibrations to ensure high dosing accuracy. Optionally, the material hoppers can be equipped with bridge breakers to prevent material blocking or bridging. Like the regular Movacolor 20-series, this blender is characterized by its intuitive controller, robust design, and absence of mechanical parts and cables in the material hoppers. This enables easy accessibility for cleaning, material changes and other routine tasks.

The MBS Blender 20-recycling series (photo) can be upgraded to an MHBS Hybrid blending system for optimal control over critical or expensive additives. This hybrid system combines gravimetric blending and dosing in one integrated system.

Movacolor is also taking the wraps off the MDS Volumetric Feeder, developed for plastics manufacturers that require a high-performing dosing unit at a cost-effective price. The unit has a new intuitive touchscreen in combination with the latest control software technology, which Movacolor says make it unique.

Thanks to an intuitive design, this dosing solution enables a swift 60-second cleaning and material change through a discharge valve and easy motor, hopper and dosing tool release. As a result, downtime and changeover time can be minimized.



## ADDITIVES

## UV Blocker for Clear Film Packaging

A newly developed UV barrier solution is said to ensure that clear packaging films offer a high blocking effect against UV radiation in the wavelength range from 200 nm to 380 nm, even at low thickness. Developed by Israel's Tosaf, UV9389PE EU additive masterbatch is said to efficiently protect foods from discoloration, and vitamin and flavor loss as a result of the degrading effects of artificial light to which they are exposed during storage, shipping and on the shelf. As such, the new UV blocker contributes to the prevention of food waste due to premature spoilage.

Unlike conventional mineral-based products of this type, the optical properties and, in particular, the transparency of films finished with UV9389PE EU are almost completely retained. Further advantages are the high efficiency even at very low dosages as well as the minimal influences on the behavior during production and further processing of the films, including printing and lamination. The range of applications extends beyond foodstuffs to other industrial film applications where the protection of sensitive goods from UV radiation is required.



## INJECTION MOLDING

## Mold Monitor Adds Wireless Connectivity

The new Bluetooth capabilities offered by Progressive's Cve Monitor — RT, the ProFile v4 platform, and ProFile mobile applications for iOS and Android — enable users to run Cve OnDemand reports while a mold is in production or sitting idle in the press.

Progressive Components' Cve OnDemand reporting software is provided free of charge with the purchase of a Cve Monitor and, when connected, OnDemand generates comprehensive, historical service records for the tool. Progressive says this upgrade makes it easier for users to wirelessly access their tools' current and historical performance and maintenance data, including key metrics, preventive maintenance, work orders and location tracking. Cloud-based file-sharing capabilities enhance data sharing and transparency. A part of the ProFile System, Cve OnDemand enables users to have entry-level access to a scalable system.



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**GENERAL POLYMERS**  
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INJECTION MOLDING

## Hybrid Press Runs Larger Tools at Lower Tonnages

Nissei says its hybrid FWX Series offers the potential for space-saving and press downsizing.

Available from 309 to 1439 tons, with a 309-ton FWX760III-130B version in Orlando, the FWX line was developed under the concept of “2-Class Larger Mold, 2-Class Smaller Machine,” meaning the design can enable a mold to run on lower tonnage — up to two tonnages less than would normally be expected, particularly if applying Nissei’s N-Sapli low-pressure technology.

In terms of potential footprint reduction, Nissei says using one less tonnage cuts floor space by 15%, while dropping two tonnages equals 30% floor space savings. The downsizing



is enabled, in part, by the FWX Series using a compound-type clamping unit. Nissei says this design consists of a high-speed cylinder, high-pressure clamping cylinder and half-nut mechanism.

At the show, a 309-ton FWX760III-130B will mold PP texture plates from a 2-cavity mold, utilizing roughly 220 tons of clamp force, thanks to N-Sapli, where processing would normally require 661 tons. Injection pressure will be 17,405 psi.

Nissei will also feature a new tonnage vertical hybrid press — a 331-ton TWX300RIII36V — which also utilizes the compound, direct-pressure clamp.

The TWX’s clamping mechanism enables a lower mold-mounting height of 40 inches, as well as an overall lower machine height, for improved worker ergonomics. The machine will mold a water tank and its lid from a family mold, with warpage eliminated via low-pressure molding.

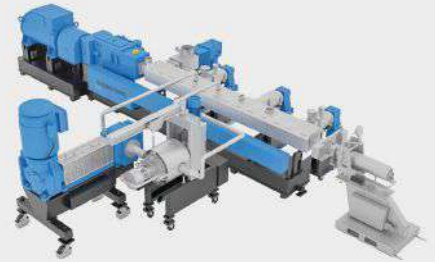
COMPOUNDING

## Twin-Screw Compounder Reduces Energy Consumption in Recycling

For recycling of postconsumer recyclate (PCR) or any highly contaminated polymer, Coperion has developed the ZSK FilCo filtration compounder. The system enables filtration and compounding in a single production step, avoiding the need for the additional energy requirement of a second melt step.

The ZSK FilCo makes it possible to melt, filter, compound and pelletize recyclate in a single production system. Waste plastic is fed into the ZSK extruder in the form of regrind, fiber pellets, film flakes or agglomerate, and is melted, homogenized and devolatilized there, together with all its components. Next, the melt is fed through an integrated filter that removes contaminants. Reintroduction into the ZSK extruder process section follows, where reinforcing materials such as glass, wood and carbon fibers, or fillers such as talc, CaCO<sub>3</sub> or ground PEX, are added, after which the recompound is pelletized.

The ZSK FilCo’s space requirement is comparatively low. All product streams are added gravimetrically to the process with no fluctuations. The recyclate needs to be melted only once. According to Coperion, the ZSK FilCo consistently achieves a higher product quality than multipart systems that have been typically used for this recycling process.



Energy consumption and emissions for the extrusion process are markedly reduced. Thanks to the twin-screw extruder’s high mechanical energy input, the melting process is more energy efficient when compared to that of a single-screw extruder. In addition, the second melting process for compounding is completely eliminated in the ZSK FilCo solution, and pelletizing of the intermediate compounds is also omitted.

“The ZSK FilCo is one more result of our targeted efforts to optimize the recycling of plastics and to further increase the sustainability of the overall process. The ZSK FilCo’s excellent energy economy and the high-end product quality that it achieves are important benefits that will once again make PCR and polymer recycling a bit more attractive for many companies,” says Marina Matta, team leader process technology recycling at Coperion.

MATERIALS

## “Dual Action” Purging Compound Accelerates Color Changes

A new specialty “dual action” purging compound being highlighted by the Shuman Plastics’ Dyna-Purge Division is said to accelerate color changes for stack molds, high-cavitation molds, automated continuous molding environments and select extrusion applications, and further extends the company’s proprietary “3X technology.”

Dyna-Purge L is engineered for fast color or resin changes in demanding manufacturing environments best served through a lower viscosity product. This compound’s dynamic action is designed to work efficiently on the process boundary layers as well as expanding into negative flow and stagnation zones in the system. The L grade’s formulation is said to be safe and effective for removal of resin, color, carbon, additives and impurities without the introduction of abrasives or chemicals. The L grade’s “moldability” makes it essential for automated or closed environments.

The L grade was refined through rigorous field trials under actual processing conditions in order to earn commercial approval. This purging compound has been shown to be effective with all types of thermoplastics, and safely processed in the temperature range of 290-625°F (143-329°C). Like other Dyna-Purge products, L grade is also heat stable and suitable for shutdowns, startups, preventive maintenance and prior to manual cleaning. The amount of purge typically required is one to two times barrel capacity, though the actual amount may vary dependent upon age and condition of process equipment. Sample quantities are available at no charge.



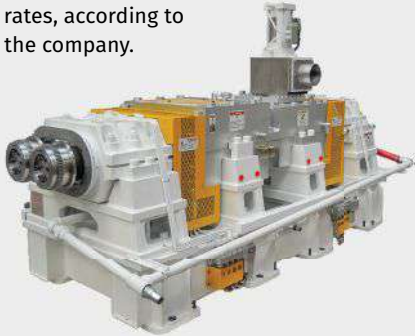
## RECYCLING

## Continuous Mixer for Mechanical and Chemical Recycling Applications

Farrel Pomini will display a product for both mechanical and chemical recycling systems, the Farrel Continuous Mixer.

The mechanical recycling system features include a large feed hopper for ingestion of irregularly shaped material, crammer options for low bulk density feeding, hard surface coatings for maximum wear, a grooved mixer feed section and a vent capture system.

Mechanical recycling on the Farrel Continuous Mixer is achieved with similar energy efficiencies of other applications at nominal production rates, according to the company.



As a complete recycling solution, the Farrel Continuous Mixer also serves as the primary stage of the chemical recycling process of pyrolysis to heat and melt plastic or rubber. Farrel Pomini is a partner with WF Recycle Tech, which has a patented pyrolysis system for recycling end-of-life tires.

In addition, a presentation will be given showcasing Farrel Pomini's role in a pyrolysis process for plastics developed by Lummus Technology. The process takes streams of different postindustrial and postconsumer waste to sort, shred, clean and prepare for a downstream conversion reactor for pyrolysis. The Farrel Continuous Mixer is utilized to melt the feedstock resin and homogenize it under specific temperature and pressure parameters.

Farrel Pomini will also be highlighting capabilities in biodegradable plastics and recycled compounding at NPE. The Farrel Continuous Mixer's low process temperature, short residence time and efficient rotor shear are useful for processing temperature-sensitive or prior heat-history applications.

## BLOW MOLDING

## All-Electric Shuttle and Stretch-Blow Machines

Meccanoplastica of Italy is highlighting its MIPE 4P all-electric, four-cavity, linear two-stage stretch-blow machine for PET bottles up to 2-2.5 L.

Introduced in 2019, it's designed especially for unconventional bottle shapes; preferential heating is optional. The machine at the show has a demonstration mold for a 750-ml trigger-spray bottle and can produce up to 1,400 bph per cavity.

Also on display, running only dry cycle, is an all-electric shuttle, model HE480D, introduced in 2018. It has a 12-metric-ton clamp, 480-mm carriage stroke and 90-mm extruder.



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EXTRUSION

## High-Speed Puller/Cutter for Tubing, Profiles

Versa Machinery is featuring servo-powered High-Speed Cutter/Puller Systems capable of feeding, measuring and then cutting extruded materials to exact lengths at up to 3,000 cuts/min. (up to 6,000 cuts/min. with a two-knife option). With exclusive Adaptive Cutting Technology software, these robust machines provide a broad range of cutting capabilities.

The systems' software makes the necessary calculations to determine the best cutting mode for each application. An operator simply enters the line speed and cut length through an easy-to-use panel view interface and the ACT software does the rest. Complete systems include a servo-controlled cutter, a servo controlled pinch roller or caterpillar feeder, with integral cut length and batch controls. Length counter adjustable from 0.001 in. to 999.999 in. Versa high-speed cutter/puller systems accurately cut plastic and rubber tubing, shapes and profiles to 3-in. in diameter (OD).

Material is gripped by a pair of rollers or caterpillar belts and pushed through closely spaced bushings for precision cutting by a high-speed, razor-sharp knife. The servo-controlled feeder provides precise control of the line speed. The feeder servo is electronically linked to the cutter servo to provide accurate control of cut lengths.

Three modes of operation provide the flexibility for cutting a wide variety of extruded products. Bushings are available in sizes to match the diameter of the material being cut. One set of bored bushings or two sets of blank bushings are provided with each machine.



INJECTION MOLDING

## Updated Control, Cooling Water Distribution, Electromechanical Ejector and Injection

Boy Machines Inc. (BMI), the sister company of the German machine manufacturer Dr. Boy GmbH & Co. KG, will mark its 50<sup>th</sup> anniversary at NPE2024. Dr. Boy GmbH & Co. KG was established in 1968 by Max Schiffer with the introduction of the Boy 15. Six years later in 1974, the U.S. subsidiary was created.



Boy will bring stateside some developments it has previously showcased in Germany at the K and Fakuma shows. New to North America is the Procan Alpha 6 control system, featuring a 16:9 screen format, which will gradually replace the Procan Alpha 4.

Boy will also highlight its new cooling water distribution system, which it developed in-house and will become standard on its machines in the future. Here, cooling water is tracked via digital flow metering. With

this system, the set flow rate and return water temperature are digitally monitored, recorded and displayed on the machine's controller.

New to the North American market is an electromechanical ejector, which Boy detailed at Fakuma 2021, enabling eject motion independent of hydraulics. The electromechanical variant offers two operating modes; movement can be coupled with Boy Handling LR5 gripper hand or it can be synchronized with the opening stroke of the mold when used without handling. This ensures molded parts are comfortably extracted from the mold.

Boy also offers a hybrid or electromechanical injection unit that can enable simultaneous operation without the use of a double pump. The servo motor drive for injection and retraction of the screw operates independently of the machine's hydraulics.

SOFTWARE

## Software Helps Processors Make Better Business Decisions

Maguire Products' Tracker Monitoring and Reporting Software is billed as a cutting-edge, web-based equipment and software solution that empowers processors with comprehensive monitoring and control capabilities for all Maguire WSB Blenders, MGF Feeders, ULTRA Dryers and FlexBus Conveying Systems.

With seamless accessibility via any internet browser, Tracker is said to ensure real-time insights and secure data transmission for downloading data into a third-party database for reporting and analytics. This enables integration with ERP or other software systems for enhanced operational efficiency.

The company says Tracker represents a significant advancement in process optimization, quality control and cost management for Maguire customers. It provides invaluable support for ISO reporting and material validation, including postconsumer recycled (PCR) usage and equipment status monitoring, which ultimately facilitates smarter decision-making.

Maguire says Tracker is user-friendly and easy to install. Tracker includes a Maguire MT Hub capable of connecting an unlimited number of Maguire units

using regional hubs, if necessary, over a customer's existing network. A software subscription includes secure encrypted cloud-based data storage, rolling software updates and remote technical support after initial startup for 90 days.

Operators can perform various tasks, including sending recipes, monitoring material usage, reviewing system setup, and addressing alarms and process interactions, all from a single web-based platform, using any device. Additionally, Tracker enables remote monitoring of dryer parameters, material status, conveying operations and more to enhance operation visibility and control.

Upon log-in, users can configure their Maguire auxiliaries based on their specific operational needs, organizing equipment by type, plant location or production cell. The dashboard interface provides two access levels — operator perspective and production view — enabling users to remotely interact with Maguire blenders, feeders and ULTRA dryers. Maguire GT will also enable customers to connect with the conveying controls remotely, viewing statuses and load frequencies, and checking overall performance.

## INJECTION MOLDING

## Six-Axis Top-Entry Robot Debuts

Absolute Robot Inc. (ARI) will present a variety of automation products at NPE2024, including the new MaxCW10-1600A+B+C top-entry robot. The latest Max-Series top-entry robot features an updated motion controller, which includes additional axes of motion and enhanced “Y-Free” on the demolding stroke. ARI says the axis options paired with faster motor speeds can reduce overall cycle time, with the updated “Y-Free” function enabling the robot to synchronize motor speed with molding machine ejectors to mirror part-eject speed. The Max-Series control has up to 16 axes of control, up from only five axes on the previous control. In addition to enabling control of multiple additional movements on the robot arm, this also gives Max-Series users the ability to control servos on downstream automation, like an indexing rotary table. The additional robot axes transform an X, Y, Z cartesian robot into one that can spin, grab, flip and reorient parts. ARI notes that the layout, programming and form factor of

the robot remain the same, keeping them economical and less complicated to operate than a floor-mounted, 6-axis robot arm. The new generation robots are equipped with safe torque off (STO) ASDA A3 servo drives. ARI says the new servo drives deliver a 10-15% increase in speed. The robot has 1,600-mm of vertical reach and a 2,500-mm traverse, with four vacuum and two gripper circuits shipped as standard, and 20 spare I/O ports in the control cabinet.



## BLOW MOLDING

## Midsize Electric Shuttle Balances Flexibility, Compactness

Magic North America is showcasing the new Model ME T14-600-D, a double-sided shuttle designed for compactness plus flexibility to run up to 10+10 cavities with 50-mm center distance or 1+1 cavities for 2.5-gallon F-type containers.

This midsize machine has a 15.4-ton clamp, 600-mm carriage stroke, and a 2 × 230-mm head. Designed specifically for the U.S. market, the new model boasts several new features:

- Automatic deflashing inside the machine with scrap conveyor
- Bottle conveyor belt on rear side of the machine
- Internal pick-and-place system to place bottles on conveyor (40% smaller footprint than previous generation)
- Motorized height adjustment of extruder/head assembly
- Quick-connect plugs for extruder head zones
- 15-in. display screen on telescoping arm
- Remote connectivity for service support



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INJECTION MOLDING

## Strategic Workforce Management Supports the Moldmaking Industry

Injection molding simulation service and technology provider Kruse Analysis Inc. says the key to organization within a company lies in its tactical management of human resources.

Kruse Analysis' ATR (attract, train and retain) framework offers a complete approach to optimized workforce management. According to the company, the first step is attracting the best talent, followed by honing their skills via practical training to ensure a long-term company commitment.



This strategy is in tune with evolving workplace dynamics and promotes continued learning within an organization.

Kruse Training implements

eLearning complete with virtual reality training methods for recruiting and developing a skilled engineering workforce. In today's modern world, the prevalence of technology makes clear that quick learning is key to asserting a competitive edge in mold design and moldmaking.

The company says eLearning techniques in the moldmaking industry are the first steps toward a more sustainable economy. The progression includes technological advancements, cost-effectiveness and resource optimization, accessibility and inclusivity, and the impact on employee productivity and retention. These factors encapsulate the reason why this advanced and strategic workforce management in the moldmaking industry is successful.

COMPOUNDING

## Twin-Screw Showcased in Circular Economy Demo

KraussMaffei (KM) is running its ZE28 Blue Power twin-screw extruder as part of a circular economy demonstration at its booth.

A medical blood vial molded on the machine builder's PX251 injection molding machine will be pelletized on the ZE28. The compounding extruders will be furnished with KM's Color Adjust process to produce KraussMaffei blue. This material will then be sent over to a PX81-180 press with a full side-entry robotic cell, where bottle openers will be overmolded.

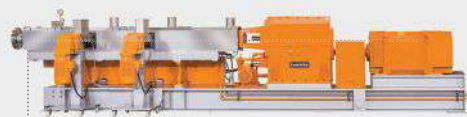
Also on display is a KMD-114 pipe extruder. While this machine is not running, it is powered to KM's controls, an iNOEX feeder system and a Sikora measuring system.

INJECTION MOLDING

## Economic Machine Line Molds Floor Tiles from Ocean Waste

The Wintec line of servo-hydraulic, two-platen toggle machines are back at NPE. This time in Orlando, the machine will mold garage floor tiles from 100% recycled ocean waste, using an integrated Engel viper 40-linear robot for part removal and applying iQ weight control to simplify the use of recycled materials.

Wintec customer CH3 Solutions supplies the mold for this cell, with raw material from Chilean firm Atando Cabos, which takes on ocean waste by recycling discarded fishing ropes in Patagonia. ExxonMobil supplies material and additives for enhanced processing of the reclaimed resin.



EXTRUSION

## Equipment for Compounding, Reactive Extrusion, Devolatilization, Foaming and Direct Extrusion

Leistritz Extrusion will have the following equipment displayed at NPE2024:

**ZSE-60 MAXX co-rotating twin-screw extruder:** The 60-mm MAXX features a modular design for barrels and screws that are rated for 425°C operation. Auxiliary equipment integrated with the MAXX includes an LSB-side stuffer for downstream introduction of fillers into the process section and an LSA swing gate strand die with provision for filtration.

**ZSE-40 MAXX co-rotating twin-screw extruder:** Well suited for color concentrates and small lot production, the ZSE-40 MAXX also features a modular design and an LSA swing-gate strand die. An AC water-cooled motor is integrated into the machine design.

**ZSE-27 MAXX co-rotating twin-screw extruder:** The ZSE-27 MAXX is suited for research and full-scale production, and features a quick-change flangeless barrel design for accelerated barrel reconfiguration, as well as a gearbox attached to a dovetail mounting plate that enables the gearbox to be quickly repositioned to facilitate different L/D ratios testing.

**ZSE-18 twin-screw extruder:** Well suited for R&D, the ZSE-18 offers a fully segmented design and can operate from ½ to 10+ kg/hr. A base-mounted LSB side stuffer enables downstream introduction of fillers, fibers and shear-sensitive materials into a process melt stream. A highly customized front end consisting of a gear pump positive displacement device and candle filtration assembly will be mated to a film die. All electricals are integrated into a roll-around stainless-steel base, and a Siemens PLC/HMI controls architecture is a new feature.

**ZSE-12 twin-screw extruder:** Exhibited for the first time at NPE, this machine is suited for continuous operation and is designed for low rate and small-batch processing. Modular stainless-steel barrels and screws are assembled on splined shafts. The process section can be configured for liquid injection and multistage devolatilization. The feed section is equipped with a patented microplunger feeder, which facilitates processing as little as 50-100 g batches.





## INJECTION MOLDING

## Supplies Target Mold, Molding Challenges

In its quest to eliminate costly injection molding problems, Plastix LLC is announcing several new products, which attendees can explore at its NPE2024 booth.

Offering comprehensive hot runner mold protection, the Airtect Ultimate incorporates both “Point” and “Loop” plastic leak detection zones in its design, ensuring safeguarding of molds.

When durability and reliability are crucial, Plastix's HiTemp and Xtreme HiTemp manifold assemblies can handle temperatures and pressures at elevated levels, 400°F (250 psi) to 450°F (680 psi). These manifolds are made from corrosion-resistant stainless steel, feature a compact and configurable design, and include leak-free JIC connections and safety locking handles.

The X-Flow is another novel technology with multifold circuit validation, enabling quick and easy validation and troubleshooting of mold flow rate and temperature per circuit, up to 8 or 16 circuits simultaneously.

To ensure faster and safer mold changes, Plastix introduces the LinkedX-Valve system, which offers a single lever to operate both mold cooling supply and return lines simultaneously, enhancing efficiency and reducing the footprint of standard manifolds.

The X-Pure water supply system provides a compact and cost-effective solution for supplying clean, distilled water to high-temperature water units. Well suited for applications operating at 300-450°F, X-Pure effectively prevents contaminants from damaging molds and machinery.

Another innovation, Barb-Tech push-lock assembly tools eliminate the hassle and potential injury associated with using traditional methods of installing push-lock fittings by providing a quick, safe and effortless method for push-lock hose assembly.

## INJECTION MOLDING

## Faster Top-Entry Model Among 19 Robots in Orlando

Sepro Group will introduce the newest S5-25 Speed top-entry robot at NPE2024, targeting fast-cycling injection molding applications. Upgrading to a more powerful servo motor and gear box on the horizontal (X) axis has resulted in 63% quicker acceleration and faster overall cycle times — as just some of the design improvements made since the robot's introduction in 2018 at Fakuma. The top-entry configuration results in a smaller molding cell footprint compared to side-entry robots often used in high-speed applications. Sepro says ideal applications include simple packaging like flowerpots and thin-wall food containers and tubs.

Now equipped with Sepro's ECO Air feature, the S5-25 Speed has reduced compressed-air requirements for vacuum part gripping by as much as 85%. Instead of continuously using compressed air, the ECO Air system now monitors vacuum levels and only initiates vacuum generation when it's required.

In one of three demonstration cells in the Sepro booth, the S5-25 Speed will be paired with a 5X-25 robot to compare performance in side-by-side tests of speed and agility. Both units are based on the same mechanical platform but, while the S5-25 Speed is built for fast acceleration and short cycles, the 5X-25 is a 5-axis servo configuration with a 2-axis servo wrist, helping it excel at complex and precision part manipulation.

Another cell in the Sepro booth will feature three robots supporting a 125-ton Milacron Q Series injection molding machine. A Success 11X 5-axis Cartesian robot, a 6-axis 6X-170 articulated-arm unit and a cobot will handle not only part removal but also degating, laser marking, sorting (using 2D and 3D vision), label application and packing. All operations will be integrated by a Sepro Visual 3 control system.

The third demonstration in its booth features a 7X-55 robot designed to service larger molding machines up 2,500 tons. Here the robot will handle four different big parts: a rollout garbage can, a large-diameter pipe fitting, an automotive component and a heavy dumbbell. Quick-change end-of-arm tooling (EOAT)

will enable the robot to handle each part in succession, demonstrating how automation can support efficient short-run production of large components.

In addition to the six Sepro robots in its booth, a further 13 will be operating on the stands of partner exhibitors, so that 19 Sepro robots in all will be running in Orlando, making Sepro's NPE2024 presence its largest ever in terms of individual robots it has exhibited at a trade show.

Milacron will show four private-labeled robots supplied by Sepro: a Success 33, two 6-axis articulated arm



units will operate together in a Sepro-automated cell, and an S5-15 will operate on another Milacron machine. A fifth Milacron/Sepro robot, a servo-driven S5 Picker, can be seen on a Milacron press demonstrating gas-assist molding at the Bauer Compressors booth. Sepro will also supply end-of-arm tooling and guarding for all these installations.

Maruka will operate a total of four Sepro robots, with Cartesian units including a 5-axis 5X-15, a Success 11 and a Success 22, and a 6-axis articulated-arm 6X-70 also exhibited.

Elsewhere, Shibaura will operate a 5X-25 in axial configuration for clamp-end part deposition with Sepro-provided EOAT; Chen Hsong has a 5X-35 on a 700-ton press; and hot-runner system supplier Incoe will demonstrate a Success 11X on a 240-ton LS Mtron machine, with Sepro-provided conveyor and guarding.



## COMPOUNDING New Machines, Spare Parts and Auxiliaries for Compounding

ENTEK is featuring new twin-screw extrusion equipment and technology, new replacement wear parts with an interactive screw design display, and new material handling equipment at NPE2024. *Twin-screw machinery equipment news will include:*

- Updates on the company's new -high output HT 162 twin screw extruder, which is in production and scheduled for shipment in Q1 2025.
- Announcement that another new ENTEK twin-screw extruder, the HT 92, is now in development.

ENTEK's new HT (for high torque) line, which began with the introduction of the HT 72 machine in 2020, is being expanded with the development of the new HT 162 (photo) and the newest machine, the HT 92. News on the HT line expansion will be released at the show.

*Twin-screw machinery technology displays include:*

- Vent flow sensor technology mounted on a 103-mm twin-screw extruder barrel.
- VFT twin-screw machinery compounding technology for increased output and improved product quality.
- 37-mm QC<sup>3</sup> stuffer, with mounting arm and 4 × 43-mm twin-screw extruder barrels (to show reach/flexibility) as well as ease of switching between vacuum stuffer and side feeder.
- ENTEK twin-screw extruder machinery controls.

ENTEK will be focusing on its technology offerings for twin-screw extrusion at NPE. All of these technologies are designed to improve productivity and end-product quality for compounders.

*Replacement wear parts displays include:*

- Screw layout program 2.0
- New features added since 2018 launch
- Live demos/interactive station
- 162-mm screws
- 133-mm screw set on shafts
- 27-mm screw set on shafts
- Many wear parts, including 250-mm screws, 82-mm round barrel, 160-mm barrel holders and more.

## INJECTION MOLDING

### Low-Flow Indication and Metering in Injection Mold Cooling

Burger & Brown Engineering will introduce new Smartflow low-flow indication and metering products for use in injection mold cooling. The low-flow indicators come in standard- and high-temperature versions, and the updated Smartflow low-flow electronic flow meter incorporates a new sensor that enables high-temper-



ature capabilities, analog outputs and programmable alarm functions.

The low-flow indicators and meters are designed for flow rates between 0.3 and 4 liters/min (0.08 and 1 gpm). Operating pressure and temperature

limits reach 250 psi at 204°C (400°F). The new standard temperature indicators are designed for cooling circuits between 1/4 and 1/2 inch, with high-temperature and high-pressure units available with 3/8-inch threaded connections.

The low-flow indicators and meters enable molders to confirm the movement of cooling flow in complex tooling with small passages such as those with bubble or baffles. They can also work with conformal cooling circuits featuring internal restrictions where flow is critical to ensure robust cooling for molded part quality and fast cycles.

Burger & Brown notes that plastic injection molds are trending toward more complex designs, featuring restricted cooling passages. In addition, the company says the automotive lightweighting trend has resulted in more use of temperature-sensitive resins.

## INJECTION MOLDING

### Direct Communication, Control Between Cobots and IMMs

Universal Robots' Injection Molding Machine Interface (IMMI) Module enables direct communication and control between Universal Robots and injection molding machines. The modules can control mold movements, including ejectors, cores and open/close, as well as monitor rejects from the press. Safety devices between the press and robot can be integrated, and the module is compatible with standard communication protocols, including Euromap 67 and SPI AN 146.

A user interface is directly accessible in the cobot's own teach pendant for easy integration, programming and control. NPE2024 will also feature cobot demonstrations by UR partner DesignPort. Visitors can see the cobots perform various tasks, including assembly of molded plastics parts to other plastics, as well as joining of molded plastics to nonplastic elements. There will also be demonstrations of cobot-powered pre- and post-mold operations, including insert loading and runner degating.

## EXTRUSION

### Refurbishing Service for Biax Lines

Brueckner Group USA is introducing newly developed local services for film-stretching lines as well as digitalization solutions, both providing a service platform for the full life cycle of a film stretching line.

Concerning the former, Brueckner has established a refurbishment shop in Dover, New Hampshire, where the latest clip and chain systems, as well as legacy systems (such as FOK 4.5, 4.8, and 4.4.6) can be overhauled. The advantage of free sample inspections for condition monitoring and the expertise at the workshop minimizes downtime and helps ensure maximum availability of North American customers' film production lines.



On the latter, new modules for the web-based Brückner ONE digital service platform for the Help Center and E-Learning support film manufacturers to reach a higher line availability with step-by-step instructions for all Brückner ONE modules and self-learning videos. Additionally, new maintenance, production and analytics modules will be available for preview.



## INJECTION MOLDING

## Electric Servo Cylinder Enables Detailed Valve Pin Control, Energy Efficiency

Yudo USA features the Yu Drive II Eco electric servo cylinder. Its electric servo valve pin control enables more delicate, individual control of the valve pins in a compact setting using only the signal from the injection molding machine, potentially solving a wide range of challenges that can occur during production.

Use of the Yu Drive II Eco reduces the cost of Capex because the input signal comes from the molding machine and eliminates the need for an external controller. Moreover, the solution has a finite amount of settings, making setup quick and easy. Seven total configurations are possible.

Yu Drive II Eco can be sequenced like conventional hydraulic/pneumatic cylinder systems. It uses the same 24 VDC signal used to operate solenoids. Importantly, Yu Drive II Eco consumes less energy than a typical hydraulic cylinder, adding to its more eco-friendly nature.

The company notes that sustainability has been a trend it continues to pursue, whether through the electric servo cylinder or hot runner systems and components that perform well with eco-friendly recycled resins.

## SHEET

## Roll Stand is Compact, Flexible

On display for the first time at NPE2024 is the eG-Series Roll Stand from Processing Technologies International (PTI). Designed as a streamlined alternative to PTI's prevalent G-SERIES Configurable Roll Stand, this one provides the most compact roll stand variant offered by PTI. The configuration benefits sheet processors that have very limited production floor space, while maintaining the most pragmatic features within the G-Series.

Features found on eG-Series include PTI's patented technology:

- Linear roll stand traverse
- Vertical nip height positioning
- Chrome roll safety lockout
- TRC-transfer roll coating technology

The eG-Series roll stand can be tailored to include the following equipment: roll skew, servo-motorized gap, safety roll lockouts and an eAntiSTAT coater with one set of rubber-covered squeegee rolls. The roll stand on display has a Manual Gap Positioning and a TRC (Transfer Roll Coater). The TRC includes a split-style frame arrangement for ease of maintenance and internal access, a preheater for temperature regulation, application rollers (for top, bottom and dual side coating), air wipes and full guarding.

In addition to the roll stand, PTI is featuring its Super-G HighSpeed Extruder, the SGHS 3000. The SGHS series is a desirable solution compared to a conventional extruder for a variety of

reasons — small footprint, versatility, reliability and ease of maintenance.

The SGHS 3000 extruder itself will feature a 500-hp tuck-under motor, two-stage Super-G Lobe screw technology, oversized feed section, pneumatic slide gate, CoolTouch heater shrouds and blowers, and an out-the-back feed screw removal.

The extrusion system will also include PTI's patented M-ATEX die and component support. This technology assists in managing thermal expansion while maintaining proper nip between the die and chrome rolls of the roll stand.

NPE2024 marks the first time uCAMS Plus will be on display at NPE. The uCAMS was developed to be the foundation of any offline die maintenance program, serving as a single-die, splitting cart capable of accommodating a variety of die widths in one system. PTI says uCAMS Plus has transformed the functionality of this die-splitting cart into a multipurpose unit for servicing dies, chrome rolls and screws, making it a "triple play" in an extrusion maintenance program.



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TRAINING

## Smart Assistant Bridges Injection Molding Skills Gap

RJG Inc. announces an innovative feature for its CoPilot process control system called molding automation xperience (MAX), the Process Advisor. MAX utilizes AI technology powered by Master Molder techniques to provide molders with real-time, expert guidance to optimize their injection molding processes. The technology will be available to demo at RJG's booth. Today, molders encounter an increasingly pressing and distinctive challenge: a shortage of skilled processors to troubleshoot their injection molding processes, resulting in excessive scrap, machine downtime and wasted engineering hours. RJG developed MAX to assist in bridging that skills gap and reducing waste during production. This smart assistant monitors process parameters in real time and offers troubleshooting advice. Featuring an intuitive and easy-to-use interface, MAX offers guidance to molders by delivering step-by-step instructions for restoring a process to optimal performance. This empowers personnel on the floor, regardless of their experience, to handle process issues effectively, enabling them to make an immediate impact.



INJECTION MOLDING

## Bonding, Sintering Tech Advances Metal Bonding for Mold, Die Components

Punch Industry USA Inc. is exhibiting its parent company's bonding and sintering technology called P-Bas. P-Bas, an alternative to 3D metal printing, is used to fabricate custom conformal cooling channels for mold and die components by bonding split parts, offering an extensive compatibility with iron-based materials. Punch Industry has applied for a patent for this novel technology.

P-Bas, denoting Punch Bonding and Sintering, employs heat and pressure for metal bonding, achieving joint strength surpassing 90% of the base material. Additionally, P-Bas produces parts and cooling lines with a finer, smoother surface finish

than that of 3D metal printed parts; the process includes a surface coating to reduce rust formation in the cooling lines.

Parts that can be made using P-Bas include gate inserts for components to make plastic bottles, core pins for injection and die-cast molds, and sprues.

Customers can initiate the P-Bas ordering process by designing components with cooling channels, approving suggested split parts and receiving a quotation. Rigorous testing, encompassing bend tests for joint strength and leak tests for watertight integrity, ensures the reliability of P-Bas technology.



MATERIALS HANDLING

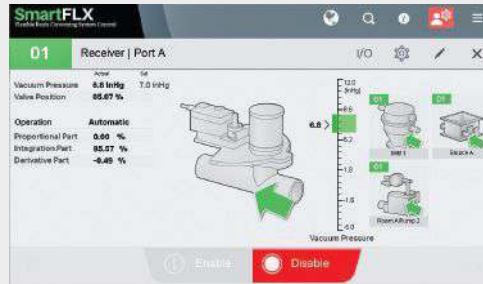
## Conveying System is AI-Driven

Among the products on display at Conair is a live, interactive demonstration of a novel and patented AI-driven conveying technology that virtually eliminates the need for human interaction or adjustments to central conveying system.

As Conair explains, this patented AI technology creates and maintains optimal source-to-destination material flows regardless of material characteristics, distances or destinations, while automatically compensating for common conveying problems. All the operator needs to do is tell the conveying controller where to send the material and the technology takes care of the rest.

Conair says the AI-driven conveying technology offers processors "a practical, affordable and technically advanced way to meet high labor training and turnover costs head-on. Investing in this product is going

to directly save labor and simplify training because artificial intelligence will not only optimize the process of conveying but also will eliminate labor costs, specifically the need for error-prone manual interactions with the conveying equipment."



BLOW MOLDING

## New 15-Ton All-Electric Shuttle

Italy's Plastiblow is introducing to the U.S. market the latest addition to its all-electric shuttle blow molder line, the 15-metric-ton PB15ED. The double-sided machine is producing 500-ml HDPE oval cosmetic bottles in a 4+4 cavity setup. The machine is equipped with a quad parison head at 4 x 1,000-mm center distance; a 90-mm, 28D extruder with a barrier screw; and a servo-driven parison cutter. This new model is available with stroke from 480 to 800 mm.

Automated bottle takeout units have servo drive on two axes (YE and ZE). Bottles are picked up in the deflashing station and deposited on the merge conveyor, which brings them to the left side of the machine for further downstream operations. Plastiblow machines are distributed in North America by Globeius, which is exhibiting separately at the show.



## WELDING

## Next-Generation Fully Electric Ultrasonic Welding System

A new ultrasonic welding system is being highlighted by Rinco Ultrasonics and is the company's next-generation eMotion (Electrical Motion) servo-driven machine, available in 20 kHz and 35 kHz frequencies. It is said to provide superior performance, cost effectiveness and the latest in user-friendly features for the medical device market. A key feature of the next-generation eMotion 2.0 welding system is a completely redesigned microprocessor operating system which significantly increases screen response time. The Linux Ubuntu operating system is logically structured, self-explanatory and easy to use, granting operators and maintenance personnel easy access. In addition, the new operating system doesn't require a licensing agreement like Windows-based systems.

The eMotion 2.0 welding system also boasts a completely new graphical, ergonomic and intuitive user interface which affords operators much greater flexibility, access and speed. The user interface is easily operated via a larger color touchscreen monitor which provides quick and easy operation.

A new stack mounting feature facilitates easy alignment for quick-change tools. The eMotion 2.0 welder is also fully calibratable and offers permanent audit trails so users can track all system errors and adjustments. To ensure quality and process traceability, all events and changes to the parameters are automatically stored in an audit trail protocol. This permanent audit trail, along with eMotion's ISO13485 and Class 6 cleanroom certifications, helps medical device manufacturers comply with the industry's requirements.



## INJECTION MOLDING

## All-Electric IMM Advances for Packaging, Medical and LSR

Sumitomo SHI Demag says that, under a theme of sustainability and efficiency, its NPE2024 booth will exclusively feature its all-electric machinery lineup, showcasing a range of sizes and capabilities.

Attendees will see Sumitomo's all-electric machines, as well as its automation offerings, in action across various industries, including packaging, medical and LSR molding.

In packaging, the PAC-E machine features an injection unit specifically designed for beverage closures and thin-wall packaging with injection speeds of 550 mm/sec. Developed in Germany, its toggle levers, platens, tie bars and plasticizing elements (including screws and cylinders) are geared for precision. The Japanese-designed electric drives and injection unit promise energy efficiency, requiring about 50% less energy than hydraulic models. At the show, the machine will run a 72-cavity water bottle cap mold, producing 5 million caps during the week of the show.

In medical, a SE130EV-S SHR machine, featuring enhanced injection unit capabilities for thin-wall and high-precision applications with increased acceleration and deceleration, will be displayed. The machine, which achieves injection speeds up to 1,000 mm/sec, will be paired with an ISO Class 7 pipette automation system that handles part removal and inspection.

In LSR, Sumitomo (SHI) Demag introduces its SE-EV-A machine with a built-in dosing unit and mold temperature control. A 130-ton SE-EV-A will run a 15-cavity fully automatic piston mold with an 8-drop valve-gate cold runner tool from M.R. Mold & Engineering.



### In INJECTION

#### Blow Molding Technology

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AUXILIARY EQUIPMENT

## Relaunched Chillers, Blenders, Dryers

AEC is introducing numerous new auxiliary equipment products for plastics processing at NPE2024. New offerings include:

- **GPL Packaged Chillers:** AEC has completely redesigned its line of packaged chillers with significant improvements for processors. The GPL packaged chillers are available with two refrigerant choices — R-410A or R-454B. R-454B is a “Low GWP” (Global

Warming Potential) refrigerant that meets new environmental requirements of 12 U.S. states which went into effect Jan. 1, 2024. The GPL has a controller with a new color touchscreen for simple operator use. The new product design enables much easier access to components

for regular maintenance. The GPL has a wide variety of option choices, but also many items are included as standard now, such as an audio/visual alarm. The new GPL is available as both air- and water-cooled models for 5- to 60-ton cooling needs.

- **New GPL Small Packaged Chillers:** These GPL chillers use R-513A refrigerant. R-513A is a “Low GWP” (Global Warming Potential)

refrigerant which meets new environmental regulations. This refrigerant is also classified as nontoxic and nonflammable, similar to the R-134A and R-410A it replaces. The units use an air-cooled system and have many features included as standard such as an audio/visual alarm. The new GPL chillers are available in 1-, 2- and 3-ton cooling capacities.

- **Line of Desiccant Wheel Dryers:** AEC’s new line of desiccant wheel dryers for the plastics industry will also be on display at NPE. These dryers provide high-performance moisture removal and have adjustable process air flow that prevents resin over-drying and reduces energy consumption. Available in three configurations — ADP, ADW and ADC — the AD Series is a direct replacement for AEC’s earlier NGX and RDX series dryers.

The new dryers are said to be well suited for most beside-the-press drying applications and small central drying systems, and are available with throughputs ranging from 50 to 2,500 lbs/hr. Options include an internal dew point sensor, level sensor, take-off boxes and integration with industry 4.0 equipment. For precision control, the AD series also utilizes a high-resolution HMI touchscreen and proprietary PLC. Key drying data is visible on a single screen: drying temperature, dew point, material throughput and total energy consumption.

- **BD-100 Gravimetric Batch Blenders:** This new AEC blender is designed to meet the demands of applications with lower throughput rates. It features exceptional performance and versatility and is perfect for injection molding, extrusion, blow molding and other processes. With a throughput of up to 100 lbs/hr, the BD-100 has small batch capability with a one pound batch size and feeding accuracy of ±0.1% over time for each material fed into the batch.

The BD-100 also has a precision 0.01% span accurate load cell weigh system. It is the latest addition to AEC’s renowned line of gravimetric blenders, and expands the company’s offerings to six models by joining the ranks of the BD-500, BD-900, BD-2500, BD-4000 and BD-6000.



COMPOUNDING

## Pelletizer Developed

### Specifically for Pharmaceuticals

Bay Plastics Machinery (BPM) is demonstrating a new pelletizer specifically developed for pharmaceutical applications, as well as new feed roll material for strand pelletizing, at NPE2024 in Orlando.

BPM’s new PH25 pelletizer features construction with 316 stainless steel at all material contact points to comply with pharmaceutical regulations. Most of the PH25’s cutting chamber parts are easily removable for cleaning and, if required, sterilized in an autoclave. The face of the machine can also be washed down.

Furthermore, the PH25 offers a wider process window and enhanced control thanks to servo motors that are standard for feed roll and rotor drive. Advanced data visibility is afforded by the machine’s HMI.

Meanwhile, BPM’s new InduraMaxx coating is a proprietary feed roll material for resin manufacturing that can handle various plastic compounds flawlessly — whether users are processing standard or filled resin, or colored material.

Featuring excellent wear properties and high heat capability (176°C/350°F), InduraMaxx is engineered with cutting-edge technology to provide optimal feed control and a uniform strand cut. Customers can choose durometer 65 Shore A and 90 Shore A to handle a range of plastic materials from soft and flexible to tough and rigid. And, for customers who need their covering quickly, BPM offers one-week turnaround time from order receipt.

DRYING

## Compressed-Air Dryer for Low Throughputs

The MicroDryer Series (MD) from Dri-Air Industries is a line of sleek, compressed air dryers designed for very low throughputs. The series of dryers start with the MD-1 equipped with drying hoppers with a capacity of 1-3 lbs and range up to the MD-3 with the largest capacity of 15 lbs. Low dewpoints, -40°F and below, are assured as the dryer is equipped with a membrane and compressed air prefilter.

Built as a matched dryer/hopper combination, the fully stainless-steel construction and glass hopper is well suited for medical molding with low throughputs and/or high-cost resins. An optional adjustable fill sensor can be used with the standard full-length sight glass to vary the capacity of the hopper from 1 lb to 3 lbs.

The dryer is available to operate on 120 V or 230 V single-phase power and a 100 psi clean compressed air supply. For ease of use, the 4-in color touchscreen will easily guide the operator for temperature and alarm settings, and a 7-day timer

for automatic start/stops.

The MD-1 is also available with options to make the system even more flexible and user friendly:

- -40°F dewpoint meter
- Adjustable fill sensor
- Integrated compressed air loader for loading drying hopper
- Feed throat adapter
- Remote dryer capabilities



## INJECTION MOLDING

## System Simplifies Thread-Repair Insert Installation

C-Sert Manufacturing is introducing a new installation system for its C-sert thread-repair inserts, enabling fast, safe installation on injection molding machine platens. C-Serts are self-tapping inserts made from through-hardened S7 high-impact tool steel for the permanent repair of damaged platen holes. The new C-Sert installation system can remove damaged threads and create new pilot holes in 10 to 15 minutes per hole. The system consists of four components, starting with a 29-lb German-made magnetic drill. Enabling one-person operation, C-Sert says the drill eliminates the need for 100-lb magnetic drills or overhead cranes.

Next, annular cutters replace traditional drill bits, creating far lower tool pressure so the 29-lb mag drill can open large holes up to 1 3/4 inch. A 60-degree center positions the mag drill squarely on the platen hole, preventing misaligned drilling or drill placement, and the paste coolant replaces gravity-fed coolant.

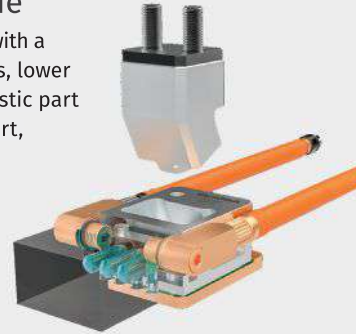


## TOOLING

## Cooling Added to Compact Slide

CUMSA is adding a cooling system to its Compact Slides (CS) with a floating insert, helping molders optimize the cooling process, lower cycle times, decrease energy consumption and improve plastic part quality. This cooling system design, combined with the insert, eliminates the need for a high-precision pocket. Available in three standard sizes — CR42, CR52 and CR62 — the cooled, compact slides feature an insert with predrilled holes to ease finishing the cooling circuit once the insert detail is machined. The three sizes have three, four and five predrilled holes, respectively.

Helping remove heat during molding, these cooling systems target difficult-to-cool areas in the CS line. The inserts have a 1/8 Gas-threaded hole on each side to connect the cooling hoses, which are sold separately, directly to the waterlines. The compact slides have strokes ranging from 9 to 22 mm, with ±0.05 mm horizontal movement to ease installation.



## MATERIALS

## Portfolio of Reduced Carbon Footprint Engineering Compounds

An expanded portfolio of sustainable engineering resin compounds, containing at least 50% recycled content, is being highlighted by Polymer Resources. Initially, the company's portfolio of such sustainable materials was comprised of four general-purpose grades, but as it approaches mid-2024, the portfolio is being expanded to include several flame-retardant products listed by Underwriters Laboratories (UL).

The company's initial commercial offering included a low-flow PC (PC-GP1S),

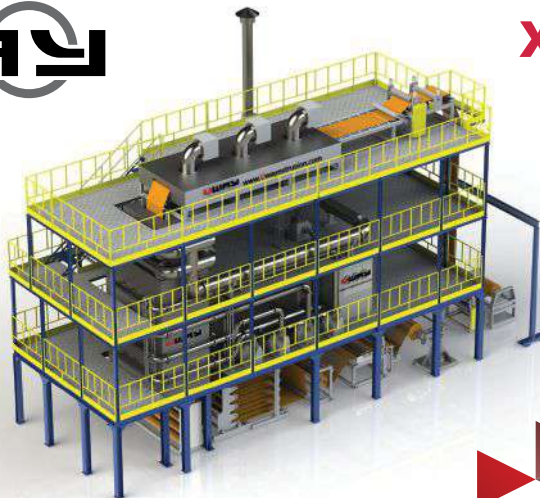


a medium-flow PC (PC-GP2S), a high-flow PC (PC-GP3S) and a PC/ABS (GP1S). With at least 50% recycled content, all are opaque and available in natural, black or custom colors. The properties and processing parameters of these grades are said to be very similar to those of their

virgin counterparts, making it possible, in many cases, to use these sustainable materials as drop-in replacements for existing fossil-based resins. This is also the case with the FR compounds added to the expanded portfolio.



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MATERIALS

## Updated Interactive Tool for Predicting Multilayer Film Performance

Further enhancements to the interactive web-based tool for predicting multilayer film performance developed by NOVA Chemicals are being presented to existing and prospective customers. With a wide range of tools at their fingertips, customers can find the most promising resins and structures that meet their requirements without the extensive physical trials that are typically needed during the design phase. The Bonfire Multilayer Property Predictor (MPP) also helps customers reach their sustainability goals by supporting downgauging and the incorporation of recycled polyethylene (rPE) to ensure their packages are designed for recyclability. The enhancements of Bonfire MPP 6.0 enable users to do the following:

- **Film Comparison Guide** — Compare predicted properties of similar films with different resins, blends or layer ratios.
- **Coex Structure Builder** — Assess the effects of additives on final film properties.
- **Customization** — Add a custom resin to a private database.
- **Profitability Module** — Enhanced features to access and compare the cost and profitability of different films and processing factors.
- **Team Access** — Add multiple users within a company to collaborate on structures, pricing, customizations and more.



NOVA is also presenting the latest on its Syndigo rPE portfolio, including rPE-0860-FC, a 100% postconsumer rPE mechanically recycled resin sourced from natural HDPE milk, water and juice containers, which is said to be well suited for both rigid and flexible packaging. Possible applications include beverage caps, cereal films, barrier film and all PE stand-up pouches. Due to the robust mechanical recycling process, including sortation, washing and post-extrusion devolatilization to eliminate odor, the result is a best-in-class resin.

MATERIALS HANDLING

## Compact, Mobile Dryer Has Unique Conveying Capabilities

The CRX Comb series of Mobilux Dryers is a compact line built around Moretto's popular X Comb dryer and is available in models that range from 5- to 50-lb/hr drying capability. Each CRX Comb model includes a honeycomb wheel of zeolite desiccant, and is equipped with anti-stress technology preventing overdrying and automatic modulation of drying air for optimum drying performance with minimal energy consumption.

The use of exclusive Zeolite desiccant delivers continuous dew points of -78°F and each CRX Comb requires only a single electrical power connection for operation; no compressed air or water is required, adding to the portability and convenience of the system.

Coupled with the X Comb dryer is Moretto's unique OTX hopper, ensuring

homogeneous dehumidification in a shorter time and smaller size than conventional hoppers. This is made possible by the hopper's internal geometry, which directs resin into a cylindrical flow pattern through the hopper, equalizing the surface resistance common in hopper flow, guaranteeing consistent, efficient and homogeneous treatment of technical polymers.

The stainless-steel hopper is insulated and covered over its entire exterior with corrugated, "shockproof" stainless steel. The hinged lid is designed for ease of use and safety which streamline inspection activities, and enhance operation and maintenance.

Conveying is provided via a powerful peripheral vacuum pump for filling both the system's drying hopper and the processing machine the system will serve. To prevent the regain of moisture by the resin between the drying hopper and the processing machine, the CRX includes closed-loop conveying, minimizing the use of ambient air for resin movement.



MATERIALS HANDLING



## Loaders, Blenders Made Specifically for Medical Processors

Motan has designed the Metro G med material loaders for plastics processors in the medical and pharmaceutical industries. The extensive family of loaders are said to meet all strict FDA hygiene requirements. Special filters with high-quality FDA-compliant seals and electropolished stainless-steel surfaces are said to ensure reliable, dust- and contamination-free operation. A highlight is the new membrane implosion vacuum valve, which does not require compressed air.

Also, Motan's Gravicolor 110 med gravimetric batch dosing and mixing unit is tailored to the same target group. Motan developed this new FDA-compliant version for flexible and reliable mixing and dosing in injection molding, blow molding and extrusion applications.

The dosing and mixing technology is identical. Specially developed vertical slide valves dose and mix up to four different components precisely and with the highest recipe accuracy. The integrated and improved IntelliBlend analysis function records the recipe, material and operating environment, and documents all process data.

With the help of this function, the user achieves continuous self-optimization of the system and consequently the best possible operating point with the highest recipe accuracy and consistent, high product quality. Thanks to event-based logging, all parameter changes are stored in a control report and can be subsequently evaluated.



## MATERIALS HANDLING

## 5-Component 'Plug-and-Play' Conveying System

The VAC-U-MAX Signature Series is billed as a quick and easy "plug-and-play" solution for conveying powders, pellets, flakes, fibers, wood flour, pigments and more to processing lines from drums, bulk bags, totes, bag dump stations, IBCs and more. Systems are available in the 1500 Series for conveying rates from handfuls to 1,500 lbs/hr (680 kg/hr) or the 3500 Series for conveying rates up to 3,500 lbs/hr (1600 kg/hr). Each 5-part "plug-and-play" system includes a pickup wand, conveying hose, vacuum receiver with automatic pulse filter cleaning, vacuum producer, and UL-listed controls.

VAC-U-MAX is a UL-listed design and manufacturer of control panels for general purpose and hazardous areas. Typical applications include feeder and gravimetric blender refill for compounding and extrusion applications.



## MATERIALS HANDLING

## Automated Resin Management and Blending System for Tight Spaces

The LIAD Smart BlendSave Compact from Ampacet LIAD is an automated resin management and blending system for new and existing operations with up to 10 machines and limited available space.

LIAD Smart BlendSave Compact uses patented weighing and blending technology to manage the increasing number of resin and PCR materials, and recipe change requirements demanded by today's processors. This smaller system includes a compact, dust-tight Octobatch automated manifold for up to 1,500 kg/hr or up to 3,300 lbs/hr total throughput. BlendSave Compact weighs resin materials of up to 40 ingredients and distributes individual blends to any 10 machines for total flexibility, unmatched accuracy and automated blending of custom recipes. The compact model takes only 6 ft x 6 ft. (1.8 x 1.8 m) of floor space and is 14 ft. (4.27 m) high.

BlendSave Compact precisely weighs each ingredient individually for accurate batches and delivers them to the machines using dedicated material lines. A separate storage and weigh hopper for each raw material means there are no cleanouts required, no hoses to switch and no operator mistakes.

Unlike conventional blending systems, which can be inefficient and overly complex, BlendSave accurately weighs each ingredient individually and conveys a unique recipe through dedicated lines to a mixer on each molding machine or extruder, eliminating

the risk of material contamination and segregation during conveying. Through ERP integration, the recipe selection function is managed automatically, virtually eliminating manual setup and daily operator interactions and enables true "lights-out" operations, a competitive advantage within the highly competitive plastics industry.

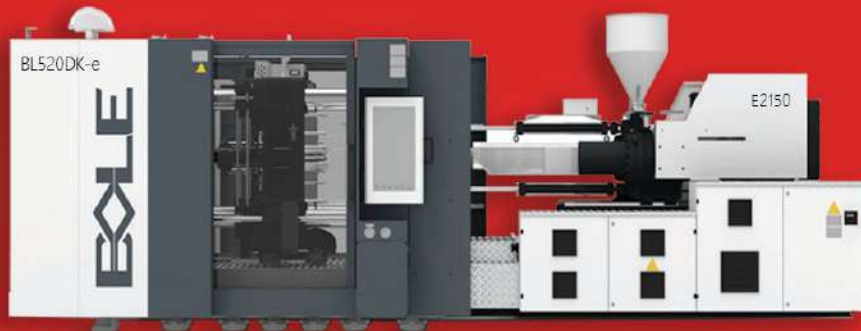
BlendSave's automated manifold system, OctoBatch, distributes the individual ingredients of a recipe to as many as 10 hoppers, one dedicated for each machine, eliminating the risk of contamination and human errors that result in downtime. BlendSave's total traceability and verification of raw materials in each batch formulation; real-time data management of all resin ingredients per run, per shift, for the entire operation through a centralized control; and existing ERP systems assure adherence to Industry 4.0 objectives.

Ampacet LIAD also provides the option to integrate LIAD Smart ColorSave gravimetric feeders on the machines, which will significantly save on additive and color usage, and enable quick color changes without the threat of contamination.



# BOLE

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By Jim Callari  
Editorial Director

# Engineering Resins Compounder Expands to Take on More Scrap



Polymer Resources responds to sustainability push by upgrading plant with grinding and shredding equipment to take on both postindustrial and postconsumer reclaim.

Polymer Resources recently expanded its operation in Rochester, N.Y., to handle more scrap. Pictured (left-right): Rob Currie, plant manager; Scott Anderson, president and COO; and Timothy Farrell, director of technology. Source: *Plastics Technology*

The entire supply chain for plastics is responding to market demands that promote sustainability and a circular economy. Some are responding quicker than others. Count Polymer Resources Ltd., a leading U.S. compounder of high-quality engineering resins with headquarters in Farmington, Connecticut, among the fast movers.

Last year, the compounder of engineering resins completed the expansion and enhancement of its compounding facility in Rochester, New York. The company has significantly upgraded an existing building on its campus to support a 40% increase in overall compounding capacity.

Polymer Resources, founded 50 years ago, serves customers in a wide range of markets, with a strong emphasis on electrical/electronics (it offers more than 70 UL grades).

Its specialty is electrical/electronic compounds which are used in buildings for wiring devices, circuit protection, cable ties, connectors/ terminal blocks and power equipment; in electronics for flashlights, residential and commercial controls, signaling protection and communication (such as automatic detectors and traffic cameras); and in lighting systems for controls and sensors, emergency lighting and exit signs.

The compounder also participates in a variety of other markets with injection molding, extrusion and blow molding grades for medical/health care, transportation, industrial, appliances, housewares, sporting goods, toys and more.

Its range of services extend beyond formulating compounds to include product design, tooling recommendations, trouble-

shooting and process development, agency approval support (both UL and CSA) and thermoset-to-thermoplastic conversion, which is a big issue for some electrical components.

Some seven years ago, when *Plastics Technology* visited the Polymer Resources operation in Connecticut, President and COO

**“We are developing and formulating grades that come with specific specifications for demanding applications that must perform as well as their all-virgin counterparts.”**

Scott Anderson described the company as a “small big guy,” meaning that it provides the speed, flexibility and service that are usually the hallmarks of a small business, and combines that with the technical firepower of much larger firms. Says

Anderson, “Every product we make is for a specific customer. We don’t shoehorn customers into this grade or that grade. Our orders range from 250 lbs to a full truckload.”

The compounder has stocking programs for customers and will inventory compounds in either of its two production plants or at one of 10 distribution centers across the country. Polymer Resources has four-week lead times for custom-colored compounds, two weeks for black and gray, and offers an Express Service program that can provide turnarounds in as few as three days.

### UPGRADES IN ROCHESTER

The compounder’s two production plants, as Anderson puts it, “back up each other,” meaning there is built-in manufacturing redundancy that enables orders to be filled in either location. That said, each plant has its particular focus, with the Connecticut facility honing in on color formulations and Rochester riveted on sustainable, natural and black formulations.

Two years ago, the new location for the plant in Rochester was mainly used for warehousing, while a separate site housed three compounding lines. Over the course of a year, under the direction of Rob Currie, plant manager in Rochester, the facility was upgraded for manufacturing, with a focus on enhancing extrusion operations and handling scrap. As part of that process, it built out a separate, soundproofed, 3,250-square-foot room for grinding and shredding postindustrial and postconsumer waste for its sustainable resin grades. It also moved a twin-screw extruder from its Connecticut plant to New York. All told, the new equipment increased capacity by 40%.

The project expanded the footprint of the compounding facility from a total of 35,000 square feet, previously divided between two buildings, to 60,000 square feet in one building. This change offers far

more space for compounding and grinding operations, storage, a laboratory and offices, and it improves process efficiency and streamlines workflow. The firm has the space in Rochester to add an additional twin-screw line and also owns property close to its existing location to enable future expansion to 100,000 square feet. Polymer Resources runs three shifts/5 days a week in Rochester and operates with 25 employees.

Polymer Resources also designed the Rochester facility with employees in mind. It houses a powerful air filtration system, a dust collection system for the grinding operation and a modern break room. Greater space between machines also improves workers’ physical safety as they move around the production floor. This is consistent with its move years back in Connecticut, when it installed an air-purification system on the production floor to capture dust.

Material suppliers formulating with scrap feedstock have two critical challenges. Steady supply is one. Polymer Resources has long-term agreements in place with molding customers to take back their scrap — off-spec parts, purging, runners and the like. The



**Grinding and shredding scrap is handled in a separate, sound-proofed 3,200 ft<sup>2</sup> room. Source: Polymer Resources.**

company works with its customers to help them in establishing best practices on segregating scrap for ultimate delivery to Rochester.

And it is working with undisclosed brand owners to reclaim postconsumer scrap. When *Plastics Technology* toured the Rochester plant, it was packed with rows of post-consumer parts made of PPO that previously had been discarded.

A second critical challenge for material suppliers formulating with scrap, whether postindustrial or postconsumer, is performance. “For years we’ve produced utility grades of material containing PIR or PCR to help our customers drive costs down,” Anderson says. “But this isn’t that. This is developing and formulating grades that come with specific specifications for demanding applications that must perform as well as their all-virgin counterparts. These materials are made-to-order for specific



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customers and to meet rigorous specification requirements.”

As Polymer Resources’ Director of Technology Timothy Farrell explains, to assure quality and consistency, the company inspects and tests all recycled content according to the ISO 9001-2015 standard for quality management. “Understanding the properties of the recycled content is critical to success,” Farrell notes. Scrap material is moved from the shredding and granulated room in gaylords. A three-ribbon blender then mixes this scrap with virgin resin and various additives and reinforcements, as needed. The mixture is then conveyed to the extruders.

Polymer Resources initiated its sustainable materials portfolio with the development of four general-purpose grades, each containing a minimum of 50% recycled content. The four commercially available products consist of a low-flow PC (PC-GP1S), a medium-flow PC (PC-GP2S), a high-flow PC (PC-GP3S) and a PC/ABS blend (PC/ABS-GP1S). All are opaque and available in natural, black or custom colors.

The properties and processing parameters of these grades are very similar to those of their virgin coun-

terparts, making it possible, in many cases, to use these sustainable resins as drop-in replacements for existing fossil-based resins.

Next on Polymer Resources’ agenda is UL94 V0 listing for flame-retardant grades of PC and PPO-modified polyphenylene ether (PPX) that will enhance the sustainable material portfolio. These grades will also contain at least 50% recycled content. Target applications include electrical/electronic components, industrial parts and consumer products.

“The expansion of our Rochester facility is strategic to the robust growth of our compounding capabilities and the expansion of our sustainability initiatives, both of which are increasingly important to customers,” Anderson says. “In addition to continuing to address customer requirements for scalable, reliable resin supply, short lead times and exceptional quality, the updated facility will help us advance sustainability through plastic waste collection and recycling. We are committed to helping our customers reach their production and sustainability goals, as well as meeting our own sustainability goals, and this new facility positions us to achieve those objectives.” <sup>PT</sup>



Polymer Resources has the full gamut of instruments at its lab in Rochester to inspect and test recycled materials to the ISO 9001-2015 standard for quality measurement. Source: *Plastics Technology*

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# Use Purging Compounds to Mitigate Processing Challenges of PCR and PIR

With frequent purging, you can minimize serious contamination issues and get both better results and higher profits.



If contamination issues are severe enough to necessitate a screw pull, use a specialty purge compound designed to easily peel material off the screw. Source: Asahi Kasei North America

The adoption of postconsumer recyclate (PCR) and postindustrial recyclate (PIR) is a key element in the plastic industry's significant

By Tom Hanvey  
Asahi Kasei Plastics North America

transformation toward sustainability. While these materials offer substantial

potential for reducing environmental impact, processors must grapple with contamination, variability and quality control to fully realize these benefits.

Purging compounds can play a crucial role in addressing these challenges. Whether it's dealing with contamination issues, avoiding costly screw pulls or implementing proactive purging practices, the appropriate purging compound serves as a valuable tool in enhancing overall efficiency and cost-effectiveness. By embracing preventive purging best practices, manufacturers can overcome challenges and improve operational efficiency and product quality.

This article explores the pros, cons and challenges of processing PCR and PIR materials. It explains how purging compounds makes your shift to recycled materials more efficient and cost-effective.

## RECYCLED MATERIALS AND THEIR CHALLENGES

PCR and PIR materials are major components that have become pivotal in reshaping the industry's future. Ten years ago, people used recycled materials to save costs. PCR can now cost you up to

40% more than virgin resins. Whether self-enforced or externally required, recycled plastics are here to stay.

Adopting recycled materials symbolizes a broader shift toward a circular economy — a paradigm that minimizes waste and maximally utilizes resources. PCR represents plastics once destined for landfills but is now given a second life through recycling. These sell at a premium because you're giving new life to plastics already used in the market. Unfortunately, PCR usually originates from inconsistent feed streams. There's a higher risk of cross-contamination of multiple resins (due to poor sorting) or inclusion of other contaminants.

**Whether self-enforced or externally required, recycled plastics are here to stay.**

Conversely, PIR encompasses the scrap generated during manufacturing processes, presenting an opportunity for efficient resource utilization. These are still recycled, but the market views them differently. Although the quality is usually much higher, market demand is lower for PIR because these materials have a different environmental impact. Customers value PIR because they achieve a more consistent product at friendly costs. These recycled materials contribute to the reduction of virgin plastic production, lowering greenhouse gas emissions and conserving valuable resources.

Integrating PCR and PIR materials into manufacturing has its challenges. Variability in quality, contamination concerns, degradation risks and complex processing needs are hurdles companies must overcome. An understanding of PCR and PIR materials' unique properties and characteristics is important. While these materials hold immense potential for sustainability, their utilization comes with a set of distinctive challenges.

Working with PCR and PIR materials requires a comprehensive understanding of their origins and the quality of the streams. Unlike virgin resins, which follow a controlled manufacturing process, recycled materials inherit a history from their previous use. Thus, this history and the sorting process can introduce variations in composition and quality for which manufacturers need to account.

Although people typically assume PCRs are dirtier and PIRs are cleaner, this doesn't tell the full story. 'Your source' is just as important as the material category and you can have serious contamination issues in PIR and PCR alike. As such, it's important to purge your machine often when using these materials to mitigate the likelihood of contamination.

## TACKLING CONTAMINATION AND FREQUENT SCREW PULLS & TEARDOWNS

Removing contamination and improving teardowns are two crucial areas where purging compounds make an impact. Processors in molding and extrusion are no strangers to the frustration caused by black specs or gels — issues that cause their customers headaches, disrupting production and leading to increased scrap rates, reduced profits and missed deadlines. Moreover, recycled resins are prone to much higher contamination levels than virgin materials.

If you're dealing with PCR/PIR-related carbon contamination, we recommend use of a high-performance purging compound. Purging compounds are not all created equal. There are now superior products available designed to tackle the unique contamination challenges presented by recycled plastics.

In cases of severe contamination or prolonged equipment neglect, screw pulls may be necessary. Purging compounds can help in the worst situations and processors using high-performance purging compounds can expect to save upward of 65% when dealing with black specks and carbon contamination.

Sometimes, PCR/PIR contamination issues are so bad that you need to perform a screw pull/teardown. Suppose you're not using purging compounds to assist with screw pulls. In that case, your production stops in its tracks and your team can spend countless production and person hours on one aspect of production. This derails your profit potential.

We recommend the same product for teardowns for severe contamination as it has been shown to save countless labor hours spent cleaning the screw, enabling team members to work on other projects and run more finished products.

For example, a recycler customer had to tear down the equipment for cleaning manually as regular purging proved to be simply not enough and their situation required a screw pull. Use of a recommended grade made its screw pulls much easier, safer and quicker with screw pull time reduced from five hours to 45 minutes.

## PREVENTIVE PURGING BOOSTS PROCESSING EFFICIENCY AND PROFITABILITY

We've covered black specks/gels and screw pulls/teardowns because they're top of mind when people call purge suppliers. The first contact is usually reactive. But when dealing with PCR/PIR, it's better to take a proactive approach. Preventive purging is a crucial component of any efficient preventive maintenance plan in plastics processing, especially when working with PCR and PIR. A proactive approach can significantly impact production efficiency and overall cost-effectiveness.

By focusing on optimizing machine performance, precision and high output become natural outcomes, despite the difficulties associated with recycled materials. In plastics processing, waiting for contamination to appear before addressing it can erode profits. Processing costs encompass more than just the material costs; they also include startup time, scrap rates, machine downtime and, more significantly, impacting the bottom line. ▶

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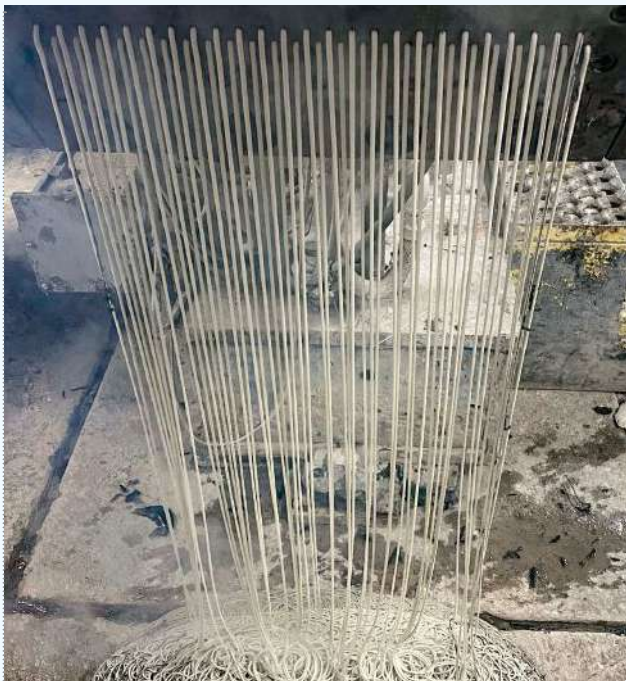
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The best offense is a good defense. Introduce preventive purging to avoid contamination issues and continue running a good product. Source: Asahi Kasei North America

Proactive purging procedures are essential to optimize efficiency and profitability. Here are five preventive purging best practices:

- **Listen to Your Data:** If you're running the same material or color for a long time, you may think you don't need to purge. Eventually, this mentality will hurt you. Try this: Run your product until you start seeing contamination issues. Measure how many parts or throughput it took to get to that point. The next time you run, purge your system just before you experience problems during your test run. "On the fly" purging enables you to increase productivity with a clean machine.

- **Don't Overdo It:** It may sound counterintuitive, but purge experts such as those from Asaclean only want you to use what is necessary. The amount of purging compound required varies with each situation, and operators should purge until cleaning is complete, avoiding a preset amount approach. Avoid overusing purge to minimize waste. If you see diminishing returns, it would be understandable for you to investigate other options. Get the most out of your purge and get back to production.

- **Purge Between Color & Material Changes:** Whenever switching resins or materials, purging machines to eliminate previously run materials and safeguard against color contamination in the next batch is vital. Although an extra step, it is more cost-effective than material waste resulting from rejects.

- **Seal Machines During Shutdowns:** To prevent contamination, seal machines with a thermally stable purging compound during shutdowns and extended downtime events like preventive maintenance. This step minimizes the risk of residual polymer degradation.

- **Purge During Startups:** At startup, extrude a sealing purge followed by one or two barrels of fresh purging compound before commencing production. This proactive approach efficiently removes contamination and carbon buildup, reducing startup time. [▶](#)

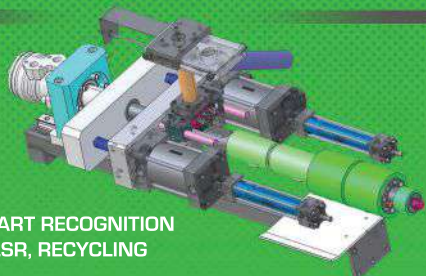
**Editor's Note:** The author acknowledges the contributions made by his colleagues in providing input to this article: Jeremy Berger, application development engineer, Asahi Kasei Plastics North America; Chris Melchiorre, business development manager for Asaclean Purging Compounds; and Hank Moeller, technical sales representative for Asaclean Purging Compounds.

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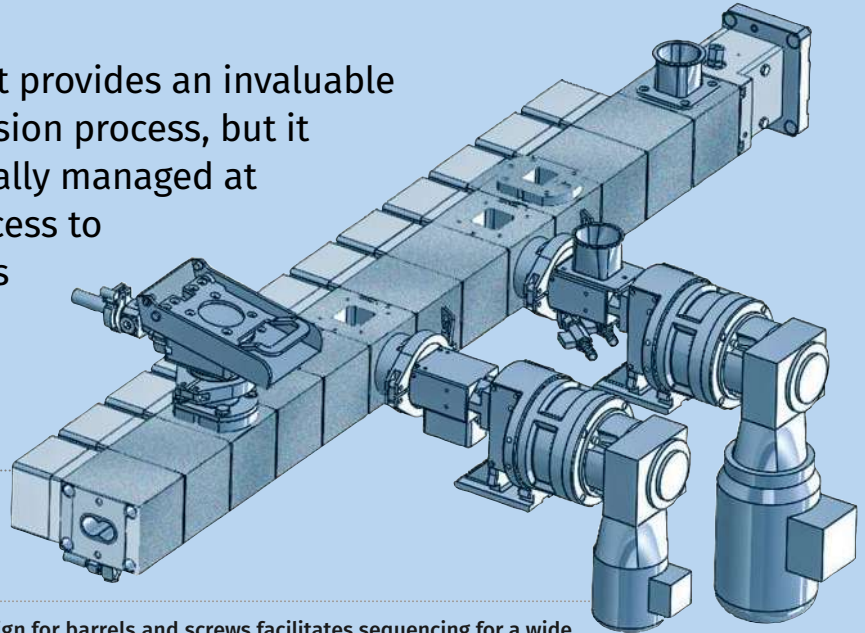
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## Strategically Manage Pressure to Help Ensure Quality in Co-Rotating Twin-Screw Extrusion

Pressure measurement provides an invaluable window into any extrusion process, but it must also be strategically managed at every stage of the process to ensure a quality part is being extruded.



A modular design for barrels and screws facilitates sequencing for a wide variety of unit operations along the length of the process section.  
Source: Leistritz Extrusion

Co-rotating twin screw extruders (TSEs) are typically utilized for mass transfer-dependent processes, specifically compounding, devolatilization and reactive extrusion. This article focuses on managing pressure in and out of the co-rotating TSE. Other type extruders — counterrotating intermeshing and single screw — are better pumps compared to the co-rotating mode, which requires a somewhat different management philosophy.

By **Charlie Martin**  
Leistritz Extrusion USA

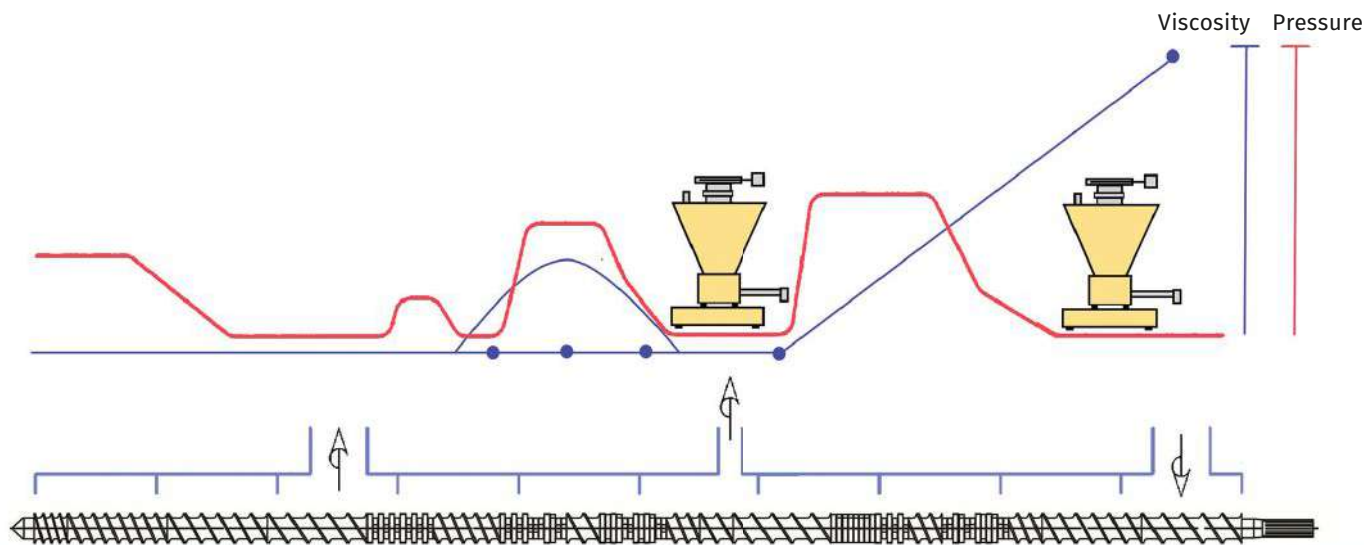
Virtually every extruder integrates a pressure measurement probe in the discharge/die design, but there's much more to managing pressure than that. Pressure measurement provides an invaluable window into any extrusion process, but it must also be strategically managed at every stage in the extrusion process to ensure a quality part is being made.

There are a finite number of parameters that are monitored in a co-rotating, intermeshing, twin-screw extruder: feed rate(s), screw rpm, motor load, temperature set points, melt temperature, vacuum level in the vent and melt pressure. If parameters are optimized and then monitored, and held constant during operation, almost without exception a quality part will be extruded, be it a film, sheet, fiber, profile, tube, pellet, adhesive and more.

Transducers are used to sense pressure of the melt being conveyed by screws rotating inside of a barrel in the process section. Pressure is critical as a quality control measurement for production installations and is a useful tool during the development phase of a novel process. For instance, the measurement of a pressure drop across a die can be used to infer the viscosity of the melt.

### FIRST, SOME BASICS:

- For quality control purposes, every extruder should have a melt-pressure probe placed in the die area.
- A transducer diaphragm causes a minute change in resistance to generate a signal which is proportional to the applied pressure input.
- Pressure sensors range in pressure from 0-500 PSI to 0-10,000+ psi.
- Materials of construction, signal output, range and mechanical configuration of the probe itself are specified based upon the intended process and environment.
- Most melt probes for extruders utilize a ½-inch UNF thread and readout in psi or bar.
- Many types and configurations of melt pressure transducers are available.



The pressure gradient in the twin screw extruder is determined by the selection of screws and operating conditions. Flighted elements that convey higher than the overall feed rate are strategically placed so there is a zero pressure zone underneath downstream vent/feed sections (to prevent vent flooding) and downstream feed zones for both solids and liquids.

The co-rotating, intermeshing twin-screw extruder is the most efficient compounding device in the plastics industry. Rotating screws (1,000+ screw rpms are possible) continuously mix polymers with fillers, fibers, pigments and additives to impart the desired properties into the formulation and eventually into the final part. Additionally, the co-rotating TSE is utilized for devolatilization to remove moisture and other volatiles from the melt stream. A modular design for barrels and screws facilitates sequencing for a

wide variety of unit operations along the length of the process section (for example, downstream addition of fillers, liquid injection, vacuum venting and more).

Feeders for pellets, powders, fibers and liquids meter feed streams into the co-rotating TSE. The feed rate and screw rpms for co-rotating twin screw extruders

are independent and used in concert to optimize compounding and devolatilization efficiencies. Starve feeding refers to when the TSE is fed at a rate less than the forwarding efficiency of the screws. The pressure gradient in the twin screw extruder is determined by the selection of screws and operating conditions. Flighted elements that convey higher than the overall feed rate are strategically placed so there is a zero-pressure zone underneath downstream vent/feed sections (to prevent vent flooding) and downstream feed zones for both solids and liquids.

The downstream addition of fillers and fibers is assisted by a side stuffer, also with co-rotating screws that “push” fillers and fibers into the TSE process section. Side stuffing is desirable to facilitate more efficient melting/mixing with significantly less wear in the melting region of the process section. Side stuffers are also starve fed and require an upstream metering feeder upstream to set the rate to the stuffer.

Almost always, the TSE has the provision to remove volatiles/gases, referred to as devolatilization. Vent(s) are placed along the length of the screws where the screws are unfilled (zero pressure) to prevent vent flooding.

#### FACTORS THAT AFFECT DEVOLATILIZATION EFFICIENCIES:

- Residence time under the vent or vents (longer is better);
- Surface area of the melt (higher is better);
- Surface renewal (higher is better — renewed surfaces from rolling pools in partially filled screw channels)
- Bubbles are key: nucleation, growth and rupture (stripping agents can be injected to facilitate bubbles)
- Vacuum level applied to vent zone(s).

In a starve-fed TSE, melt pressure probes are only placed into barrel sections for specific reasons, for instance to confirm a melt seal of a high-pressure injection of a super-critical fluid. Supercritical carbon dioxide ( $s\text{CO}_2$ ) is injected into the TSE process section to facilitate foaming, as a stripping agent, as well as a process aid for other processes. ▶

**The pressure gradient in the twin screw extruder is determined by the selection of screws and operating conditions.**

A pressure probe is integrated midway in the process section design to ensure there is a dynamic seal to facilitate high-pressure injection of the sCO<sub>2</sub> into distributive mixing elements without blowback.



Twin-screw extruder furnished with a gear pump and an underwater pelletizing die.

As a quick side note: the counterrotating intermeshing is characterized by a controlled melting and inter-screw calendar gap mixing at low screw rpms (less than 50 rpms) combined with high-pressure pumping capabilities, which makes it ideal when processing a thermally sensitive RPVC or similar formulations. The counter-rotating intermeshing twin screw is the only commercially available extruder that can be configured as a positive displacement pump at the discharge. Single screw and co-rotating twin screw extruders pump by drag flow.

## DON'T UNDERESTIMATE FRONT-END PRESSURE GENERATION

It is common to underestimate the role that front-end pressure generation plays in the process. Elevated pressures result in higher

overflight leakage and shear at the discharge of a co-rotating TSE (turning at 500+ screw rpms) that causes a melt temperature rise and possible degradation. What's happening is easily understood by using the temperature rise formula as follows:

$\Delta T (^{\circ}\text{C}) \pm 50\% = \Delta P (\text{bar}) \div 2$ , where:

$\Delta T$  = Change in temperature in  $^{\circ}\text{C}$

$\Delta P$  = Change in pressure  
(1 bar = 14.5 PSI)

For example, if a TSE is processing 500 kg/hr and the die pressure is 40 bar (580 psi), then the associated melt temperature rise might be as much 20 $^{\circ}\text{C}$ . ( $T = 40 \div 2$ )

This formula is meant to be insightful (if not accurate) as TSE rpm, and the geometry of the type of discharge screw elements also plays a

significant factor in the actual melt temperature rise. That being said, it is important to be aware of the detrimental effects of discharge pressures that are too high.

Now that the material is out of the extruder, there's still a lot more process and pressure optimization that is needed. Computer modeling, based on rheological characterization, can help to design dies that are less restrictive (with lower pressure) to minimize the temperature rise associated with front-end pumping by keeping pressures as low as practical.

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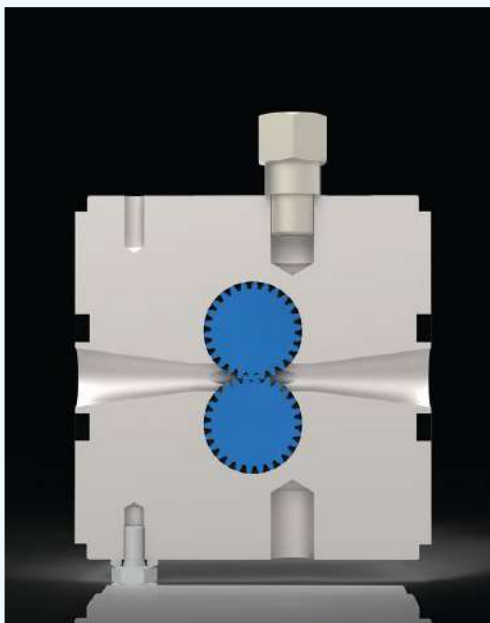
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Front-end systems may require elevated pressures (for example, 3,000 to 5,000 psi), ultra-fine filtration or a high pressure die to optimize the process. A positive displacement gear pump can be attached to the TSE to both manage pressures and make a better, tighter tolerance part.

The inlet/outlet pressure differential (4000+ psi) makes it possible for the TSE to operate with a low discharge pressure (400-800 psi) while isolating the high-pressure pumping task. In addition to melt flow and pressure stability, the ability to set a lower TSE discharge pressure will markedly decrease the melt temperature and result in less discharge screws wear.

When a gear pump is attached to the co-rotating TSE, closed-loop pressure control can be integrated into the PLC/HMI logic to maintain an inlet pressure set point. The feed system, twin screw extruder rpms and gear pump rpms must all be integrated into the algorithm, which is not an easy task. Melt pressure is measured at the inlet and outlet of the gear pump, and before/after the screen changer, to both adjust system parameters and collect data to confirm that the process is consistent.



Side-view of a gear pump front-end attachment to a twin-screw extruder. Source: Maag

A single screw pump, essentially the metering section of a single screw extruder, can also be attached to the TSE. In addition to building pressure, specialized screw and process section designs are possible for processes that require high heat transfer and melt cooling capabilities.

When using a co-rotating, intermeshing, twin-screw extruder, pressure measurement is only a small piece of the puzzle. The management of pressure as part of process optimization should be the goal for any successful extrusion operation. The ability to strategically measure and also manipulate pressure zones inside and out of the co-rotating TSE is a tool to improve an existing extrusion operation, as well as to develop new and emerging processes, and part of the reason it is the most versatile continuous compounding and devolatilization device available today. [PT](#)

*The management of pressure as part of process optimization should be the goal for any successful extrusion operation.*

**About the Author:** Charlie Martin is president of Leistritz Extrusion USA, a company that provides compounding equipment and engineering services to the plastics, medical and pharmaceutical markets. Martin has delivered technical presentations at wide-ranging events around the world and is the co-editor of the textbook entitled *Pharmaceutical Extrusion Technology*. He serves on the board of directors for the Society of Plastics Engineers Extrusion Division and the Polymer Processing Institute. He also serves on the Bioplastics Division Committee for the Plastics Industry Association. Contact: 908-685-2333, ex. 616; [cmartin@leistritz-extrusion.com](mailto:cmartin@leistritz-extrusion.com); [extruders.leistritz.com](http://extruders.leistritz.com)

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# Prices Up for All Volume Resins

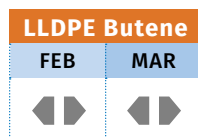
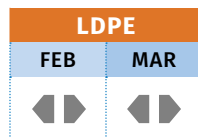
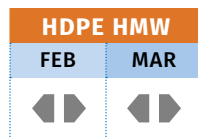
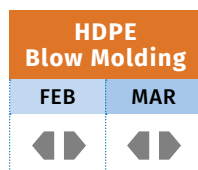
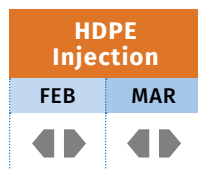
First quarter was ending up with upward pricing, primarily due to higher feedstock costs and not supply/demand fundamentals.

Prices for all the volume resins were on an upward trajectory as first quarter's end approached. Price escalation of key raw materials/feedstocks was the driving factor

By **Lilli Manolis Sherman**  
Contributing Editor

in most cases, though some production issues contributed to a relatively short-term tightness for a few of these resins, as did logistical delays and higher freight costs. Supply/demand fundamentals did not play a role, with supply of nearly all of the volume resins characterized as balanced-to-ample and demand somewhat improved over relatively dismal demand in fourth quarter 2023.

## Polyethylene Price Trends



These are the views of purchasing consultants from Resin Technology Inc. (RTi), senior analysts from Houston-based PetroChemWire (PCW), CEO Michael Greenberg of The Plastics Exchange, Scott Newell, executive v.p. polyolefins at distributor/compounder Spartan Polymers, Mike Burns of Plastic Resin Market Advisors, and resin pricing expert Robin Chesshler.

PE PRICES UP, THEN FLAT?

Polyethylene prices in January moved up by 5¢/lb, although competitive situations were underway for nonmarket adjustments. Meanwhile, suppliers were seeking increases of 5¢ for February and some split a 6¢/lb increase for February and March, according to PCW's Associate Director for PE, PP and PS David Barry, The Plastics Exchange Greenberg, Mike Burns of Plastic Resin Market Advisors, and resin pricing expert Robin Chesshler.

## PE PRICES UP, THEN FLAT?

PCW's Barry saw some resin price stability underway and ventured the February-March increases are unlikely to go through, noting that suppliers were "lucky" to get the January price hike. This is in view of the fact their raw material costs

are at an all-time low, and they have continued to have strong exports activity, making their profit margins healthy. He characterized domestic demand within the first quarter as better than 2023's fourth quarter. Suppliers' plant operating rates stood in the mid-80s percentile, owing to significant new capacity that is being brought on stream by such companies as Shell and NOVA.

## Market Prices Effective Mid-March 2024

Resin Grade	¢/lb
<b>POLYETHYLENE (railcar)</b>	
LDPE, LINER . . . . .	62-64
LLDPE BUTENE, FILM . . . . .	59-61
HDPE, G-P INJECTION . . . . .	59-61
HDPE, BLOW MOLDING . . . . .	57-59
HDPE, HMW FILM . . . . .	62-64
<b>POLYPROPYLENE (railcar)</b>	
G-P HOMOPOLYMER, INJECTION . . . . .	70-72
IMPACT COPOLYMER . . . . .	73-75
<b>POLYSTYRENE (railcar)</b>	
G-P CRYSTAL . . . . .	92-94
HIPS . . . . .	97-99
<b>PVC RESIN (railcar)</b>	
G-P HOMOPOLYMER . . . . .	53-55
PIPE GRADE . . . . .	51-53
<b>PET (truckload)</b>	
U.S. BOTTLE GRADE . . . . .	65.5-67.5

Plastic Resin Market Advisors' Burns and resin expert Robin Chesshler similarly ventured that the January increase was unlikely to be sustainable through the middle of the year. Says Burns, "The suppliers' determination to increase North American pricing remained steadfast. The December and January combined export volume equaled the all-time highest two-month total and contributed to the short-term inventory draw. As the North America market returns to average demand, coupled with continued strong production levels, [it] should enable resin markets to challenge recent increases over the next several months."

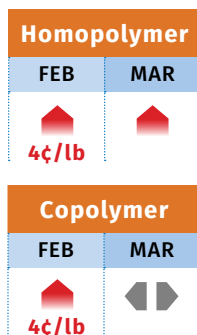
The Plastic Exchange's Greenberg characterized spot resin availability as mostly snug, as suppliers have been very disci-

plined with production while exporting as much as they can. Spot prime PE grades were flat but firm, though HDPE for blow molding trudged another cent higher. He noted that while a bullish sentiment has kept upward pressure on the market, it was not enough for suppliers to secure their entire February 5¢/lb.

## PP PRICES UP

Polypropylene prices were expected to move up 4¢/lb in February, having moved up 3¢/lb in January, in step with propylene monomer.

### Polypropylene Price Trends



However, nearly all major PP suppliers had issued price increases of 3¢/lb to 4¢/lb for the February-March time frame, according to PCW's Barry, Spartan Polymers' Newell and The Plastic Exchange's Greenberg.

Both Barry and Newell ventured that it was unlikely that February would end up with an increase for PP, in addition to that associated with the monomer.

According to Barry, prices in March could go up a bit more depending on resolved supply issues from propylene-on-demand (PDH) plants and startup of planned maintenance at

crackers and refineries. He noted that while domestic demand for PP in first quarter was shaping up to be better than fourth quarter 2023, it is not robust and the PP market could see destruction as in processors moving to other materials and/or imports of resins or finished goods if feedstock costs keep going up. He estimated PP suppliers' production rates in the high-70s to low-80s percentile. Spartan Polymers' Newell ventured that suppliers' nonmonomer increases had little chance to go through in February or March., noting that domestic demand was not good enough and that increases are feedstock driven. In approaching April, however, he saw more volatility, as propylene inventories are tight and plant changeovers were scheduled for both PDH plants and at crackers and refineries.

The Plastic Exchange's Greenberg reported that the PP spot market became even tighter by February's end following Braskem's force majeure announcement. "This is the second supplier in two months to have declared a force majeure on PP, with Ineos doing so at its Chocolate Bayou, Texas, facility in January. After a difficult 2023, we feel that their production discipline these past few months, in the face of rising costs, has put them in the position to reap a little reward."

## PS PRICES UP

Polystyrene prices moved up 5¢/lb in February and were largely expected to move up by another 5¢/lb to 6¢/lb in March based on the volatility of raw materials, particularly benzene, according to PCW's Barry and resin pricing expert Robin Chesshler. Barry notes that the

March issue could be the last increase, depending on when refineries start up after planned maintenance, but also noted that benzene prices typically move up during the driving season. Chesshler notes that some relief in prices had potential for April if benzene prices dropped to under \$4/gal.

Both Barry and Chesshler note they do not see the return of the typical strong seasonal demand for PS that starts in second quarter, and that 2023 was a strong indication of that. The implied styrene price based on a spot formula (70% benzene, 30% ethylene) was up 3¢/lb higher through most of February.

## PVC PRICES UP, THEN FLAT?

PVC prices in January did settle flat as had been expected, but suppliers were out with increases, largely being pushed up to February, according to Paul Pavlov, RTI's v.p. of PP and PVC, and PCW's Associate Director PVC and Pipe Donna Todd. They reported that all major suppliers pushed up and revised their January 5¢/lb increases to 3¢/lb for February, which were implemented.

Industry forecasts for March were for another 2¢/lb increase, which led to one major supplier issuing a 3¢/lb increase for March, but Pavlov ventures that PVC prices were likely to be flat for both March and April. He notes that PVC feedstock prices were low, exports prices were much lower and global prices were dropping.

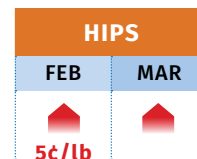
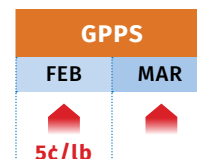
Moreover, new capacity coming on stream would just add to an already well-supplied market. He notes that first quarter 2024 PVC prices are about 10% lower than first quarter 2024.

Todd reports, "Buyers saw these moves as more than a wisp of desperation after the failure of suppliers' January price hike attempt. "Converters were convinced prices would not move up anywhere close to 5¢/lb to 6¢/lb for February, barring an explosive plant accident or natural disaster between now and the time the market settles at the end of March."

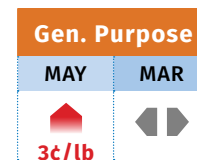
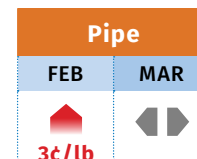
## PET PRICES UP

PET prices moved up another 2¢/lb in February, after a 1¢/lb hike in January, based on raw material formulation costs. This after dropping a total of 7¢/lb in the fourth quarter, according to Mark Kallman, RTI's v.p. of PVC, PET and engineering resins. He ventures that PET prices in March would move up an additional 1¢/lb to 2¢/lb and could be flat in April, depending on prices of paraxy-



## Polystyrene Price Trends



## PVC Price Trends



### PET Price Trends

Bottle Grade	
FEB	MAR
	
2¢/lb	

lene easing up. He notes that PET imports, which now have higher freight costs of 4¢/lb to 6¢/lb are still advantageously priced over domestic resin. He characterizes demand as steady, without signs of second quarter seasonal demand uptick, though that was expected this month.

due to higher feedstock costs, primarily benzene, according to RTi's Kallman. Price increase nominations were out for 10¢/lb by major suppliers. Kallman ventured that by April, some of those increases — most likely below 5¢/lb — would be implemented. This due to continued static demand, ample supply and well-priced imports.

### ABS PRICES UP

ABS prices were on the way up in first quarter, after remaining flat throughout first quarter, according to RTi's Kallman, but the trajectory was changing. This was due primarily to price escalations in key raw materials, including benzene, butadiene and acrylonitrile. Suppliers were out with increases of 7¢/lb to 9¢/lb within the February-March time frame. Kallman ventured that about half of those increases would be implemented by April, owing largely to lackluster demand and cost-advantaged imports.


### PC PRICES UP

Polycarbonate prices dropped between 3¢/lb to 5¢/lb in the January-February time frame, but a transition was taking place

### PRICES OF NYLON 6, 66 UP

Prices of nylon 6 and 66 were on the way up as the trajectory of downward pricing from last year reversed, according to RTi's Kallman and resin expert Robin Chesshier. Key factors include higher costs of key feedstocks such as benzene and caprolactum, but also due to a tightening of supply because of production issues and delayed supply issues going through the Panama Canal.

Effective March 1, companies such as BASF and AdvanSix (previously Honeywell) issued price hikes for nylon 6 and nylon 66 of 20¢/lb, while Nylon Corp. of America (NYCOA) issued price hikes for nylon 6 and nylon 66 of 18¢/lb to 24¢/lb, respectively. Kallman notes these increases were "a big ask," considering that raw material costs were up between 5¢/lb and 7¢/lb. As such, he ventures that by the end of first quarter, price hikes implemented would fall in the range of 5¢/lb to 10¢/lb. **PT**



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# February Index Dips a Tiny Bit

Index holds steady as optimism about future business conditions continues to increase among processors.

The Gardner Business Index (GBI) for plastics processing was 47 for February, down a smidge from 47.5. The index is based on survey responses from subscribers to

*Plastics Technology*. Indices above 50 signal growth; below 50, contraction.

Slowed contraction in new orders and production was joined by a backlog in February. New orders marked the most progress, slowing contraction to the tune of 4 points. Supplier deliveries were a little slower in February, potentially signaling higher demand, while exports and employment were relatively stable, still residing in contraction zone.

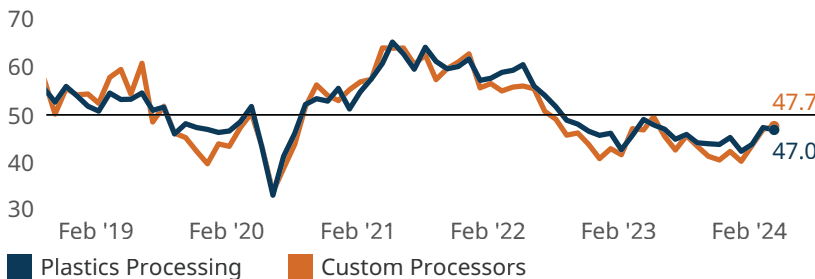
Business optimism among processors has steadily increased since October 2023, reaching in February 2024 the highest level since May

2022. Overall business activity for custom plastics processing changed almost the same amount as the overall index, but in a positive direction. [PT](#)



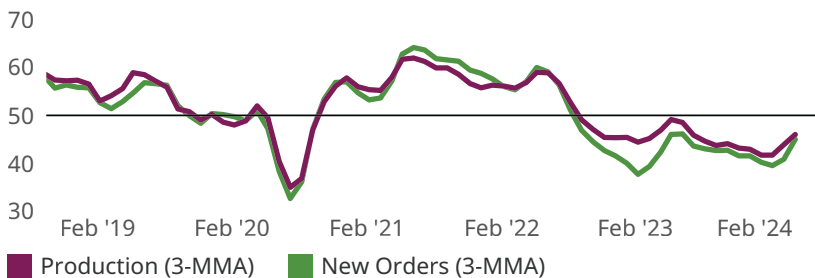
By Jan Schafer

**FIG 1 Gardner Business Index: Plastics Processing**



Plastics processing activity continued to contract in February amid another month of slowed contraction among components.

**FIG 2 Component Moves in the Right Direction**



New orders contraction slowed the most and a lot, reflected in slowed production contraction as well.

**ABOUT THE AUTHOR:** Jan Schafer is director of market research for Gardner Business Media, parent company of both *Plastics Technology* magazine and Gardner Intelligence. She has led research and analysis in several industries for over 30 years. She has a BA in psychology from Purdue University and an MBA from Indiana University. She credits Procter & Gamble for 15 years of the best business education. Contact: 513-527-8952; jschafer@gardnerweb.com.

## Numbers in Perspective

Although the Gardner Business Index (GBI) for plastics processing remains below the growth threshold of 50, the Q1 2024 average surpassed the previous quarter, suggesting a potentially less pessimistic outlook.



By Perc Pineda  
Plastics Industry Association

This perspective aligns with recent expectations for the macroeconomy.

In the latest Survey of Professional Forecasters from the Federal Reserve Bank of Philadelphia, the forecast for U.S. economic growth in the first quarter has been revised upward to 2.1%, a significant increase from the previous 0.8%. While optimism prevails among forecasters regarding the U.S. economy, monthly changes in business indices may continue to exhibit varied movements or remain relatively stable. Such variability is inherent in monthly data.

The Industrial Production Index for nondurable consumer goods showed a favorable change, experiencing a 0.73% increase in January. This reversal follows the monthly downtrends seen in the previous two months. Given the extensive applications of plastic products and packaging in consumer goods, this current shift in direction is a positive development.

In the previous year, the economy surpassed its potential growth rate. Barring substantial adverse demand and supply shocks, a stable-to-positive trajectory in manufacturing activity is more probable than a downturn, reflecting the current macroeconomic outlook for this year.

**ABOUT THE AUTHOR:** Perc Pineda, Ph.D., chief economist of the Plastics Industry Association (PLASTICS), is an industry thought leader and PLASTICS' primary expert and spokesperson on the U.S. and global economy, industry research, statistics, trends and forecasts. He produces PLASTICS' two annual flagship publications — *Size & Impact* and *Global Trends* — and trademarked the Global Plastics Ranking. Read his views and insights on the economy and the plastics industry at [plasticsindustry.org](http://plasticsindustry.org).

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## Consistent Shots for Consistent Shots

Retractable Technologies turned to Arburg and its PressurePilot technology to help deliver more than 500 million syringes during the pandemic.

By Tony Deligio  
Executive Editor

"We had to have machines right away, and we had to have molds right away to help combat the pandemic," says Larry Salerno, director of operations at Retractable Technologies Inc. (RTI), Little Elm, Texas.

RTI designs, manufactures and markets safety syringes and other safety medical products. In 2020, its VanishPoint syringe design was fast-tracked as part of the Operation Warp Speed effort to rapidly mobilize sectors of the manufacturing industry. At that time, RTI purchased and installed many Arburg presses and added 40,000 square feet of additional cleanroom space.

All the installed Arburg machines utilize the company's PressurePilot to automatically optimize the molding process' pressure profile. "The benefit we realize from PressurePilot is better consistency and increased customer satisfaction," Salerno says. "We have a tighter capability potential (CP) and CpK. And, in addition to better consistency, we now make fewer adjustments to the process because we have better control over it."



Retractable Technologies turned to Arburg and its PressurePilot technology to help meet the demand for vaccine syringes. Source: Retractable Technologies Inc.

The syringes used for vaccines measure just a quarter of an inch in diameter but must maintain tolerances of  $\pm 0.001$  or  $\pm 0.002$  inch. Molded from a 96-cavity tool, the syringe applies PP for the barrels and plunger handles, and a TPV for a friction-ring gasket and plunger plug, which seals the medication into the barrel.

A mechanical device with a delicate and important function, the syringe's "friction fit" is key. "Our particular product is friction fit," explains RTI's Jordan Duesman. "So the way the product functions means we have to hold very tight tolerances, and we found that the PressurePilot helps maintain those specifications."

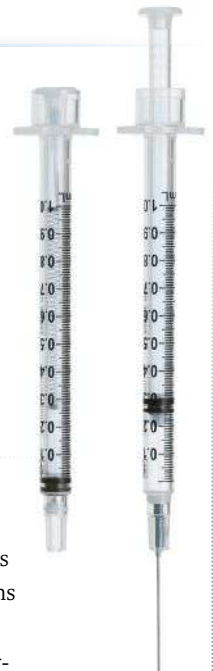
Arburg says the PressurePilot function makes a nonlinear automatically optimized pressure profile possible, enlarging the process window and providing more balanced fill. PressurePilot's automatically generated curve progression eliminates pressure drops or loss by initially reducing pressure abruptly but then ever more slowly. The dynamic, rapid pressure reduction helps avoid internal pressure peaks inside the cavity that could prompt overfilling and flash.

RTI estimates that it uses PressurePilot on roughly 90% of the jobs it runs on its Arburg presses, boosting pressure by up to 250%. In these instances, the company says PressurePilot prevents the screw from bouncing back during pressure changes from boost to hold. "This is an ideal situation for the PressurePilot control," Salerno says. "Some boost-to-hold pressures show a significant change, and it definitely helps with that situation."

Salerno says the "functionality force" and friction generated by the tight tolerances between plunger and barrel wall are key. "In addition to the friction technology holding the pressure against leakage of the medication, the syringe also has to trigger under a certain amount of force so that the pressure on the thumb feels right for the health care worker, but not so low that the medication blows out or leaks during usage," Salerno explains.

"During the pandemic, people were getting vaccinations everywhere," Salerno adds, emphasizing his company's needles ease of use. "You were going to stadiums and sitting in your car and having the health care worker give a shot while you're still sitting in the car."

At this point, Salerno estimates that RTI has molded around a half billion parts on the new Arburg equipment. "The government wanted the ability to have a syringe for every person in the U.S. within a year," Salerno says, "so we have a considerable amount of capacity." **PT**



Before and after shots of Retractable Technologies Inc.'s VanishPoint syringe. Source: Retractable Technologies Inc.



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