PT
PTonline.com

Plastics Technology®

AUGUST 2023 № 8 VOL 69

Plastics' Final Frontier

Allegheny Performance Plastics Molds for the Skies and Beyond

A property of Gardner Business Media

Calling All Molders:
IT'S CONFERENCE TIME!

If your job involves injection molding (or moldmaking) in any way, Minneapolis is your end-of-August destination. Once a year, like-minded molding professionals unite to share unparalleled access to the experts and opportunities necessary to forge new industry connections and level-up your operation.

The top molders will be there — will you?

CO-LOCATED WITH:

MoldMaking CONFERENCE 2023

PRESENTED BY:

PT

DON'T MISS OUT!
SCAN TO REGISTER
BEFORE IT'S TOO LATE!

THANK YOU TO OUR 2023 SPONSORS:

simform Easy Mold Cooling Prediction

YUSHIN

Beaumont Revolutionizing Injection Molding

INCOE Hot Runner Systems

MANTLE

MOLD-TECH Precision Injection Molds

oerlikon hrsflow

PCS COMPANY Turn To The Industry Experts

RiverdaleGlobal Changing the way you think about color

SMARTFLOW

CONTENTS

VOLUME 69 • NUMBER 8

Plastics Technology

On-Site

Atop the Plastics Pyramid

Allegheny Performance Plastics specializes in molding parts from high-temperature resins for demanding applications as part of its mission to take on jobs 'no one else does.'

By Tony Deligio
Executive Editor

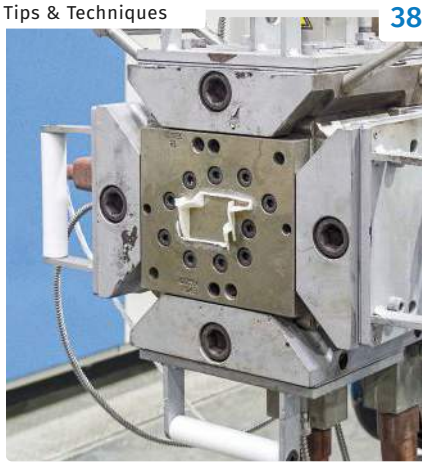
Tips & Techniques

Foam-Core Multilayer Blow Molding: How It's Done

Learn here how to take advantage of new lightweighting and recycle utilization opportunities in consumer packaging, thanks to a collaboration of leaders in microcellular foaming and multilayer head design.

By Sam Dix
Trexel

Tips & Techniques



Is Your Die Flow Changing Despite Following All the Correct Formulas?

Maybe the problem is that you're starting up with a dry die. Here are tips to solve this issue.

By Tim Groth
Extrusion Solutions LLC

YouTube Keep up with our video reports by subscribing to our YouTube Channel: *short.ptonline.com/yfZBD0uY*

Plastics Technology®

ptonline.com @plastechmag

PUBLISHER	Ryan Delahanty *rdelahanty@ptonline.com*
ASSOCIATE PUBLISHER/ EDITORIAL DIRECTOR	Jim Callari *jcallari@ptonline.com*
EXECUTIVE EDITOR	Tony Deligio *tdeligio@ptonline.com*
ASSOCIATE EDITOR	Matthew Stonecash *mstonecash@ptonline.com*
MANAGING EDITOR	Angela Osborne *aosborne@gardnerweb.com*
CONTRIBUTING EDITORS	Matthew Naitove *mnaitove@ptonline.com*
	Lilli Manolis Sherman *lsherman@ptonline.com*
DIGITAL ASSISTANT EDITOR	Sarah Barnett *sbarnett@gardnerweb.com*
ADVERTISING SALES	Lou Guarracino *loug@ptonline.com*
	Jackie Dalzell *jdalzell@ptonline.com*
	Dale Jackman *djackman@gardnerweb.com*
	Madeline Kline *madeline.kline@gardnerweb.com*
ART DIRECTOR	Sheri Kuchta Briggs *sbriggs@gardnerweb.com*
MARKETING MANAGER	Andrew Roe *aroe@gardnerweb.com*
AD PRODUCTION MANAGER	Becky Taggert *btaggert@gardnerweb.com*

Subscription Inquiries: For questions or issues related to your subscription, please call 513-527-8800 or email subscribe@ptonline.com.

PLASTICS TECHNOLOGY IS A PROPERTY OF

GARDNER Business Media, Inc.

6915 Valley Avenue
Cincinnati, OH 45244-3029
Phone 513-527-8800
Fax 513-527-8801
gardnerweb.com

Richard G. Kline	Chairman
Richard G. Kline Jr.	President
Ernest Brubaker	Chief Financial Officer
Melissa Kline Skavlem	Chief Marketing Officer
Bill Caldwell	Advertising and Production Director
Ryan Delahanty	Executive V.P. Sales
Tom Beard	Executive V. P. Custom Content
Jeff Norgord	Executive V. P. Marketing & Creative
Kate Hand	Executive V. P. Content
Dave Necessary	Executive V. P. New Product Development
Allison Miller	Chief Events Officer
Jan Schafer	Director of Market Research

GARDNER BUSINESS MEDIA ALSO PUBLISHES

Plastics Technology Handbook	NPE Official Show Directory
Plastics Technology Mexico	MoldMaking Technology
Modern Machine Shop	IMTS Directory
Additive Manufacturing	Production Machining
CompositesWorld	Products Finishing

Canon
CANON VIRGINIA, INC.

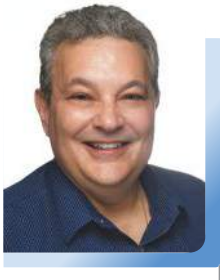
One partner. More mold-making possibilities.

Choosing Canon Virginia, Inc. as your one dedicated partner could help enable cost reduction and stronger lead-time efficiency. Learn about bundling your Canon Hot Runner System and mold builds alongside other services at **cvi.canon.com/mfg**.

Attention Molders: Time to Get Serious About Sustainability

You'll be able to get up to speed on this critical issue by registering now for the Molding 2023 Conference.

If you're not looking at ways to make your injection molding operation more sustainable, perhaps you'd better get started. Fortunately, *Plastics Technology* is here to help.



Jim Callari
Editorial Director

The Molding 2023 Conference, to be held Aug. 29-30, in Minneapolis, Minn., will feature numerous presentations that put sustainable injection molding in the spotlight. Speakers from the supply side — notably injection molding machine manufacturers, hot runner suppliers — along with OEMs and custom molders will, in *Plastics Technology*'s Tony Deligio's words, "directly address technologies and business strategies that can help processors operate more sustainably, meeting self-imposed targets, customer requirements or both." Tony is executive editor of *Plastics Technology* and technical program chairman of the Molding Conference.

Truth be told, if you dawdle on implementing ways to make your process more sustainable, you could see chunks of business moving to competitors that already have. Numerous OEMs and brand owners have already set 2025 as the year in which their suppliers must reach specified sustainability goals. As if that were not enough, governments are passing legislation that mandates sustainable actions to prompt businesses that fail to change behaviors voluntarily.

Specifically, the following presentations will headline sustainability, while many others will also touch on aspects of the topic:

- *A Practical Road Map to No-Nonsense Recycling*, Joachim Kragl, Engel
- *Sustainability in Action at ADS and Infiltrator*, Brian King, ADS
- *Sustainability From Molding Machine to End Product*, Samira Uharek, Arburg
- *How Hot Runners Can Accelerate Your Green Approach*, Mike Curran, Oerlikon HRSflow
- *Driving Sustainable Manufacturing: The Crucial Role of Injection Molders and Mold Makers*, Dave Hemink, Velosity
- *Play the "PART" in Systems Thinking and Sustainability*, Tory Flynn and Peter Smith, Hillenbrand/DME

Of course, topics covered at this annual event are not just limited to sustainability. You'll have an opportunity to get up to speed on new developments in automation, lightweighting, 3D printing, metal injection molding, estimating molding tonnage, process simulation, material substitution and much more.

If you dawdle on implementing ways to make your process more sustainable, you could see chunks of business moving to competitors that already have.

What's more, this year's Molding Conference is co-located with MoldMaking Conference 2023, organized by Christina Fuges, editorial director of *PT* sister publication *MoldMaking Technology*. Fuges has put together a robust program of her own, focusing on best practices straight from the mouths of moldmakers themselves, and she's tapped into a hot topic of her own: *How to Successfully Reshore Tooling*. Fittingly, this will be a collaborative talk, with insights provided from the moldmaker and molder, and also from Sloan Valve's global sourcing manager.

If your plans allow you to get in early, you can participate in an all-afternoon, multifacility tour at Dynamic Group, Aug. 28, brought to you by the American Mold Builders Association (AMBA). You'll have an opportunity to see how the molder has strategically built a footprint in mold manufacturing and plastics processing, leveraging its competitive advantage in both industries. The tour will end with a networking reception at the Hyatt Regency Minneapolis.

I encourage you to go to *moldingconference.com* and make your plans.

#MAGUIRE TRIPLEA

5 YEAR WARRANTY

AAA

ACCURATE - ADVANCED - AUTOMATIC

THE BEST IN CLASS
MGF GRAVIMETRIC FEEDER
FOR THE PLASTICS INDUSTRY

- **Accurate:** Twin load cell control measuring and adjusting for every gram of masterbatch or additive
- **Advanced:** Unique control software features provide faster start-ups and color change
- **Automatic:** 100% color inject with automatic color control for every situation

MAGUIRE®
Intelligent Simplicity

Want a free trial for 100% results with the MGF Gravimetric Feeder? Call us now to find out more.

@MaguireProducts | Maguire-Products | MaguireProducts | **info@maguire.com | www.maguire.com**

USA Toll Free +1 888 459 2412 | **Canada** +1 905 879 1 100 | **Europe** +441827 338 280 | **Asia** +65 6848 7117 | **IMEA** +971 4 817 0419 | **Taiwan** +886 4 2658 1535

Coca-Cola Europacific Transitions to Tethered Caps and Lighter PET Bottle

Large-scale conversion of European PET bottling lines for carbonated soft drinks (CSDs) is underway by Coca-Cola European Partners (CCEP) and Sidel. EU Directive 2019/904 requires that nonreturnable PET bottles up to 3 L size have tethered caps by July 3, 2024, at the latest. With a large number of PET bottle blowing and filling lines to be converted across the EU, CCEP reportedly was among the first CSD producers to switch to tethered caps, along with a new lighter bottle neck.

Drawing on its long historical partnership with Sidel, CCEP worked with the machine builder to navigate the numerous technical challenges of implementing tethered caps — preforms, caps and OEM equipment modifications — and to introduce a new 1-g lighter neck (GME30.40). Pilot tests with the new bottles were performed on two lines, including one Sidel line in Barcelona, Spain. These tests enabled Sidel and CCEP to assess the new specifications along with the new equipment configuration to ensure optimum efficiency of the converted lines, validate quality requirements of the new necks and enable CCEP to conduct a small-scale market test of the new bottles.

The first line to be converted was completed in April 2022 in Scotland, which produced a 1.5 L bottle, and a second single-serve line was completed at the end of 2022. The first market-test bottles from the pilot line in Barcelona were released in the UK in May 2022. Once pilot tests were finalized in Barcelona, Sidel was engaged to convert all of CCEP's 32 Sidel lines in Europe. Some conversions required significant development for a change to the tethered cap and new neck, including adaptation of the preform feeder, stretch-blower, capper, cap feeder and labeler.

To date, Sidel has converted one-third of CCEP's European PET bottling lines for CSDs, with final line conversion scheduled to be completed by the end of the first quarter in 2024.

Haidlmair Expands Service Offerings and Hires Head of Service for U.S.

Haidlmair Corp., the subsidiary of Austrian firm Haidlmair GmbH, operating in the U.S. since 2022, has expanded its service offerings for U.S. customers. Located in the Pfaff Molds building in Charlotte, N.C., Haidlmair provides enhanced maintenance, repair and optimization services for injection molds, both in house and on site.

As part of its strategic initiative, Haidlmair introduced Andy Bennett as the new head of service in the U.S. effective June 2023. With more than 30 years of experience in moldmaking, Bennett brings expertise in project management, molding technologies and program management, according to Haidlmair.

ADG Solutions Expands Recycling Product Line

ADG Solutions, supplier of recycling equipment and technology, announced it has expanded its portfolio to include Baracco and Break Machinery products. ADG Solutions offers a range of equipment that can be purchased singly or as part of a comprehensive recycling system. Current equipment partners also include Weima, Hosakawa, Davis Standard, Promeco and Lorandi, encompassing size reduction, material handling, extrusion, filtration, pelletizing and densifying.

Baracco offerings include both underwater and water-ring pelletizing systems. Break Machinery produces filtration equipment, including the DUO self-cleaning filter system.

New $50 Million Pyrolysis Facility Planned in West Virginia

Clean Vision Corp. will invest $50 million in a new waste processing facility in Kanawha County, W. Va. The company's Clean-Seas subsidiary signed a memorandum of understanding with the West Virginia Department of Economic Development.

The new facility, Clean-Seas' first in the U.S., will convert waste plastic to fuel using the company's pyrolysis technology. Throughput is expected to be 100 tons/day starting in 2024. According to the company, plans will enable expansion of throughput up to 500 tons/day.

Under the agreement, Clean Vision will leverage over $12 million in incentives from the state. According to Gov. Jim Justice, the new operation will bring 40 full-time jobs.

KEEP YOUR CLEAN ROOM CLEAN!

- Calibrated to medical specifications – clean room ready!
- Easy to clean stainless steel hopper
- Capacities from 3 grams to 3000 pounds per hour
- Process all medical resins

YOUR DRYER CHOICE DOES MAKE A DIFFERENCE.

Our exclusive 4 bed technology displaces 85% less regeneration air into the clean room than wheel dryers. That's 85% less heat, moisture and particulate – while using 50% less energy. Keeping your clean room CLEAN and Green!

PROUDLY MADE IN THE USA

DRI-AIR Industries, Inc.

T: 860.627.5110 | E: sales@dri-air.com www.dri-air.com **The Drying and Blending Experts**

BASF Opens Biodegradation and Microplastics Center of Excellence

BASF recently opened a center to provide holistic, tailored solutions to processors supported through scientific studies and consulting, increasing speed-to-market for circular economy products and advocating on sustainability topics. The Biodegradation and Microplastics Center of Excellence at BASF's site in Wyandotte, Mich., is designed to help customers across North America achieve their circularity and sustainability goals.

As part of the Center of Excellence, the biodegradation laboratory is starting operations at the site, working closely with customers to address the important end-of-life performance of their products.

The new laboratory will support biodegradable product development primarily in food service and packaging, agriculture, detergents, cleaning and cosmetics industries.

Digital Inventory Startup Replique Spins Off From BASF

Chemovator, BASF's business incubator, announced that Replique has spun off and closed a successful round of financing. Replique offers a digital manufacturing platform incorporating 3D printing technology aimed at spare part management and small production runs.

The funding round was led by an investment from STS Ventures. Replique will maintain a close relationship with BASF, and BASF 3D Printing Solutions will continue to be a material partner.

Replique's software platform enables OEMs to store parts digitally. When needed, the parts are printed at one of a network of over 80 printers around the world and delivered to customers. Replique is now focused on expanding its reach and acquiring new customers in various industries. With the proceeds, Replique plans to enhance the platform's development with new features, as well as invest in human resources.

SABIC Gets 2023 ACC Sustainability Leadership Award

SABIC has received a 2023 Sustainability Leadership Award for Exemplary Achievements in Circularity by the American Chemistry Council (ACC), recognizing the company's pioneering collaborations to bring ocean bound plastic (OBP) back into a circular material.

Next to Product Safety, Innovation & Transparency, Environmental Protection and Social Responsibility & Community Engagement, Circularity is one of four priority areas of the ACC Sustainability Leadership Awards, which are granted to ACC-member companies for innovative products, technologies and initiatives that help advance sustainability.

New Blow Molding Service Offerings from W. Müller

A leader in extrusion blow molding extrusion heads, W. Müller is introducing several aftermarket service packages, along with a new director of aftermarket and service, Mario Jardin (photo). He comes to the company from managing field service and aftermarket activities for Kautex Machines. For the past year, he has been developing these new service initiatives for W. Müller:

- *Spare-parts packages* help customers stay ahead of the supply chain and avoid unplanned downtime.
- *Maintenance contracts* make budgeting easier and offer expert technical and emergency support as needed. Reduced rates for repair services and savings of up to 31% vs. non-contract inspection are offered.

- *Refurbishments* can improve performance and energy efficiency and renew equipment warranties with an "As-New Performance" certificate.
- *Retrofits* can provide new die head and extruders to convert from mono to multilayer capability.

Spring Water Bottler Opens rPET Facility

CG Roxane announced the official opening of its second in-house recycled PET plant in Benton, Tenn. The plant will process recycled PET flakes into pellets and mold new bottles in support of the company's shift to manufacturing bottles for the Crystal Geyser brand from 50% rPET.

CG Roxane's goal is to produce 32.9 million lbs of rPET this year between the Benton plant and its facility in San Bernandino, Calif. The company's strategy to integrate recycling and molding into its operations is expected to yield gains in control and efficiency.

Processor Turns to AI to Help Keep Machines Humming

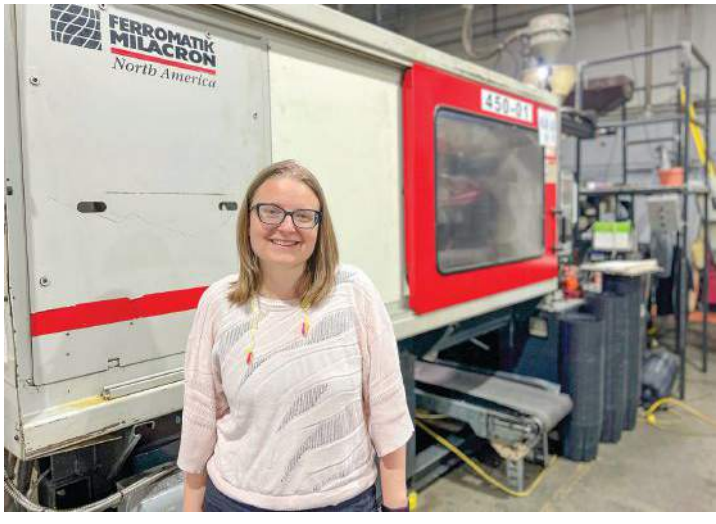
At captive processor McConkey, a new generation of AI models, highlighted by ChatGPT, is helping it wade through the shortage of skilled labor and keep its production lines churning out good parts.

By Jim Callari
Editorial Director

The North American plastics processing market has a long-standing and justifiable reputation for being conservative when it comes to implementing new technology. Apparently, McConkey Company didn't get the message. The third-generation-owned processor recently turned to artificial intelligence (AI) as a way to replace the tribal knowledge lost when older-generation technicians retired.

Based in a 72,000 ft^2 plant in Sumner, Wash., McConkey makes pots, containers, planters and other products for the horticultural industry, mostly under its own label. It runs nine injection presses, three thermoformers and a sheet extrusion line. The problem it was facing is typical across manufacturing: skilled senior technicians retiring, those who haven't yet but have one foot out the door and a new generation of younger technicians in short supply.

Plastics processors have typically responded with documentation and training, notes Derek Moeller, founder of CognitionWorks, a company that develops expert AI systems for the manufacturing industry. In this process, production managers and process engineers write up standardized processes, and then supervisors train floor staff on those procedures. But there are two problems that actual practitioners face.



McConkey COO Stina McConkey reports that an AI system has helped her technicians troubleshoot and keep machines operating. Photos: McConkey Company

DUSTY BINDER PROBLEM

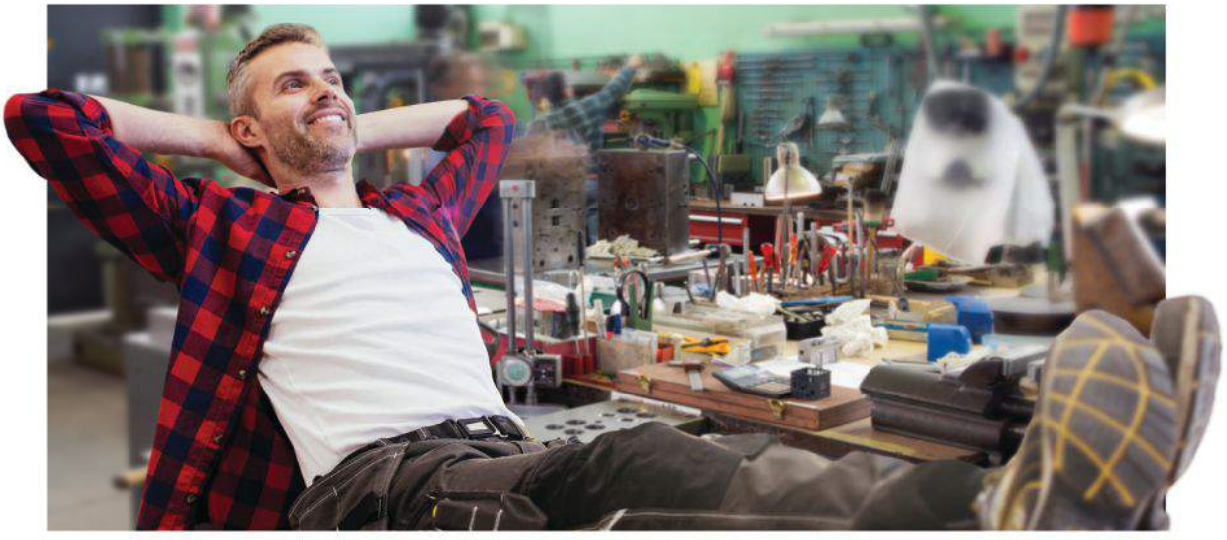
One is what Moeller has dubbed the "dusty binder problem." He elaborates, "First, manufacturing has so many processes and edge cases, it's hard to make them all accessible to employees when and where they need them. Yes, the process is documented, in that binder up on the shelf, or uploaded to some file system. But it doesn't always work in reality. An extruder goes down at 2 a.m. with a fault code on a VFD, and the technician on duty has been there six months. And, while it's not the first time this has happened, it's been a year since it last occurred."

Moeller continues, "Is that binder getting opened at 2 a.m. when a machine has a fault? Does the technician know where to find the procedure? Do they know the problem happened before? Do they know what the solutions are? Or will the technician make a couple of attempts to fix it based on their best guess, and then leave it down until someone more experienced shows up for day shift?"

The second problem is job tenure, according to Moeller, and it exacerbates the first problem. "According to the Bureau of Labor Statistics, manufacturing employees in the 24-35 age category only stay in their jobs for an average of 2.9 years. Compare that to the 55-64 age category, with an average tenure of 10 years. Good news for recruiters, bad news for employers: the tenure problem is going to get worse."

In response, Moeller notes managers train new employees, but 12-18 months later many of them leave. Even with great documentation and training, that leaves little time for new employees to be effective before they've left again.

Your maintenance department can relax for the next five years



Your new Niigata all-electric injection molding machine comes with an industry-leading 5-year warranty

Meticulously engineered and solidly built, Niigata machines are a thoroughbred and a work-horse all in one.

Precise and productive, Niigata's reduce cycle times to help you increase profitability. You can start scientific molding and low pressure molding on day one.

And now even more competitively priced for an even shorter ROI.

It's time to make more. Contact Niigata today.

NIIGATA

1-630-283-5880
www.niigatausa.com

WHAT'S GENERATIVE AI?

Just six months ago, the AI company OpenAI released a product called ChatGPT. Moeller says it's arguably been the most popular launch of a new product in history, with more than 100 million new users within a few months. "This system — the GPT stands for "Generative Pretrained Transformer" — has hundreds of billions of neurons and is trained on trillions of words from the internet and books," he says.

Horticultural pots conveyed from one of McConkey's nine injection molding machines.

Explains Moeller, "What does ChatGPT do? Simply, write text. People are using it in all sorts of ways. Marketers use it to write blog posts. Students use it to write essays. People ask it to write recipes, emails and letters.

"ChatGPT's ability to write and reason in a surprisingly human way is startling, especially with the latest, biggest model, called GPT-4, in which Microsoft researchers said they found 'sparks of artificial general intelligence,'" Moeller adds, meaning human-level intelligence.

ARTIFICIAL INTELLIGENCE IN PLASTICS

At first, language-based AI systems like ChatGPT may not seem at home in a plastics processing facility. But Moeller says they are remarkably good at finding, processing and summarizing information for people, which has been precisely McConkey's experience.

"We turned to CognitionWorks to develop an AI system that could provide advice and help to employees in the form of an AI chat assistant, and that relied on the manuals, troubleshooting guides and prior maintenance logs to make recommendations," recalls Stina McConkey, the company's COO.

As McConkey recalls, the company had three objectives. First, McConkey had tens of thousands of technical documents, troubleshooting guides and repair logs going back more than 10 years. It wanted technicians to be able to query this large body of knowledge and get actionable answers back, without sorting through binders or shared drives.

Second, it wanted it to be very easy to use. Says Stina McConkey, "It had to use natural language, so a technician could text as though they were texting a friend, messages like, 'I'm not building enough pressure on injection line 8, how do I fix it?' and get helpful, well-organized information back. We use Microsoft Teams, and we wanted to chat with the AI assistant as if it were another colleague."

Third, Stina McConkey also wanted the system to be able to intelligently answer questions for company management. "I wanted to easily get a summary of production from the previous day — and the major issues — by production line, without having to log into a production record-management system and scroll through all the database entries."

To do all this, Moeller says CognitionWorks created an integrated system, driven by a trained AI language model, that could interact with the company's existing work order tracking system, and ingest all the prepared manuals, procedure books and other documentation.

"And we threw everything at it: scanned equipment manuals, tens of thousands of work orders, PowerPoint presentations of procedures, Word documents, tool setup sheets," McConkey says. "We even taught it to use the company's production record database, which it interfaced to using the database language SQL, a language the AI naturally 'speaks.'"

McConkey wanted technicians to be able to query this large body of knowledge and get actionable answers back, without sorting through binders or shared drives.

A NEW COLLEAGUE IS BORN

Then the new system was switched on. Immediately, McConkey says the tool showed its promise: "It had an uncanny ability to structure actionable steps, via a chatbot, after it found work orders that were sometimes years old but relevant to the problem at hand," she says.

Maintenance mechanics could ask about a fault error they saw and get a concise summary of possible causes, compiled from machine manuals and maintenance logs, in about 15 seconds. Injection molding process technicians could ask about a product defect they saw, and 20 seconds later get an answer on how to

On sheet extrusion lines like this and other processing equipment, companies that will benefit the most from AI are those that have kept manuals, documents, repair logs and the like up to date.

McConkey serves the horticultural market with a range of molded and thermoformed pots, containers, planters and other products.

correct it, based on the company's prior knowledge. And production managers could get fast summaries of problems recorded by production teams over preceding shifts.

Even those with decades of experience at the company found it useful because it would "remember" older events that were relevant to the question at hand and, instead of thinking about the top one or two possible causes, the AI suggested seven or more for the team to consider.

LIMITS OF AI

There were limitations to what the new AI colleague (which the team affectionately calls 'Sprocket') could do. The main ►

one, Stina McConkey recalls, was when there wasn't relevant documentation. If a problem is novel, an AI will not typically be successful at reasoning through to an unknown solution.

The good news, according to Moeller, is that adoption of these tools will give a leg up to plastics processors that have already been diligent with documentation. He elaborates, "Their existing assets — whether it be manuals, procedure documents, repair logs, regulatory documents or similar — will simply become vastly more valuable and effective, and enable these companies to fix machines faster, provide faster service to customers, become less reliant on any individual expert and make new employees productive much faster than those companies that don't have the same existing data. This will also make process engineers and anyone who writes documentation more valuable, because their work will be used to train AI assistants to support front line employees."

He adds, "Secondly, they will make employees much more productive — imagine any employee being able to casually chat with an AI that has the totality of every documented piece of history in your company in its brain — but they will not replace team employees who innovate and develop new ideas. That's human territory.

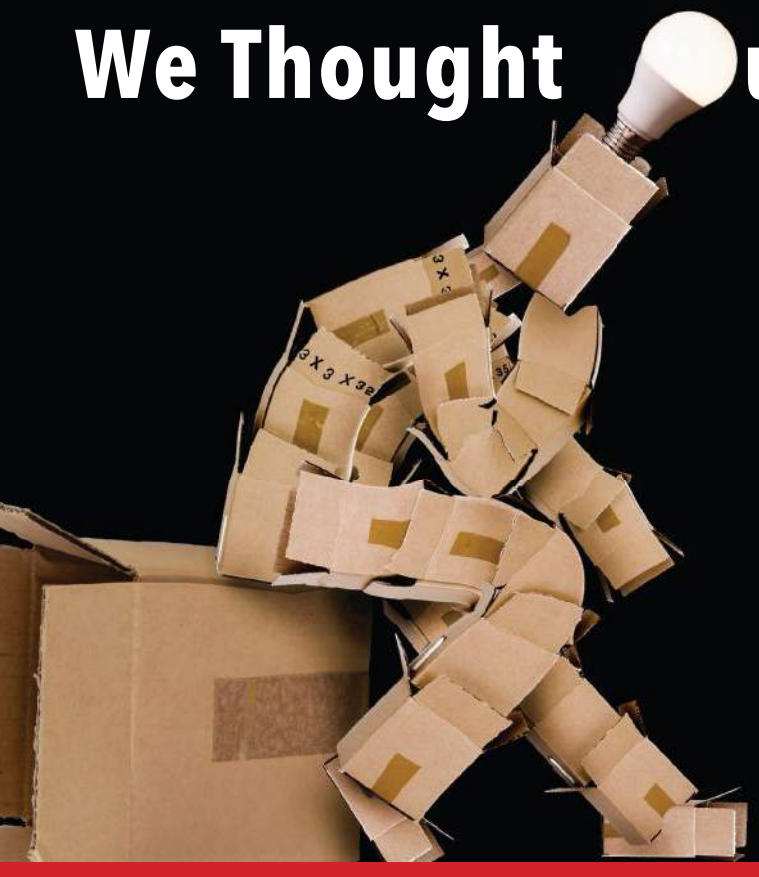
THE SECURITY CONUNDRUM

For many processors and other manufacturers, their internal procedures are trade secrets and it's vital this data stays private. Moeller says the AI industry has recognized this necessity and responded in two ways. OpenAI, currently the company with the biggest language models, has contractually agreed to not retain or train on any data submitted through its API.

> ***Injection molding process technicians could ask about a product defect they saw, and 20 seconds later get an answer on how to correct it, based on the company's prior knowledge.***

"For most companies, that will be good enough," he says. "For some companies in sensitive industries, stricter security is required. Amazon and Azure, the two leading cloud server providers, can host a separate instance of advanced large language models from other companies (including Anthropic, A21 Labs and Cohere) in an encrypted and secure virtual private cloud, so that no data ever leaves the manufacturer's private cloud, and it is impossible for data to be retained. Naturally, the complexity of these implementations is higher, but it's a good solution for companies with legal requirements for it." PT

We Thought Outside of the Box



The Result... the Sentra® SR-Series Mold Temperature Control Unit

With all NEW Single Piece Pump & Tank Assembly that is up to 20% More Efficient Than Previous Models

- **MODULATING COOLING VALVE** standard on G & T models
- **LOW WATT DENSITY**, long life heaters
- **HIGH EFFICIENCY, HIGH FLOW** single piece pump & tank assembly
- **COMPACT SIZE** only 29½" height x 12½" width x 19" depth
- **OPC UA EUROMAP 82.1** communications available
- Easy access **STAINLESS STEEL** cabinet & enclosure panels
- **UNRIVALED** Warranty
- **PROUDLY** made in the U.S.A.

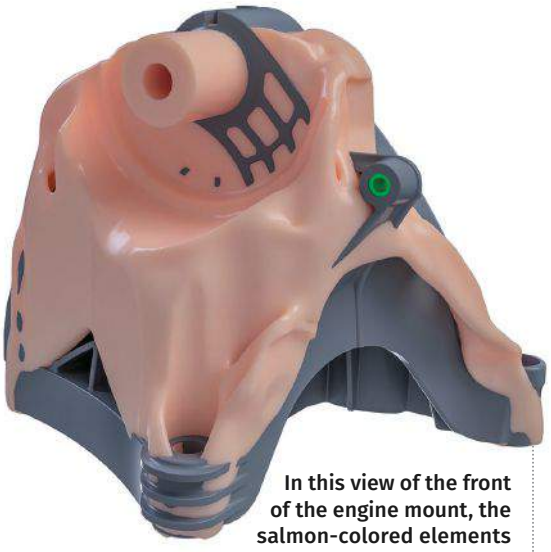
Three **TAILOR MADE, USER-FRIENDLY** control options

ADVANTAGE®
MAKING WATER WORK.

525 East Stop 18 Road • Greenwood, IN 46142 • 317.887.0729 • **www.AdvantageEngineering.com**

Design Optimization Software Finds Weight-Saving Solutions Outside the Traditional Realm

Resin supplier Celanese turned to startup Rafinex and its Möbius software to optimize the design for an engine bracket, ultimately reducing weight by 25% while maintaining mechanical performance and function.



In this view of the front of the engine mount, the salmon-colored elements were generated by the Möbius software, while the gray areas are the original design. (Photos: Celanese)

By Tony Deligio
Executive Editor

German Tier 1 automotive systems supplier ElringKlinger had already worked with Celanese's design engineering team to optimize an injection molded engine bracket for a leading European luxury sedan supplier when Celanese decided to apply an emerging technology to see if further optimization was possible. Celanese's Computer-Aided Engineering (CAE) team located at its European Technical Centre (ETC), in Meyrin, Switzerland, turned to Möbius software from Rafinex, a software startup based in Luxembourg. Experts in established CAE software, the Celanese team wanted to evaluate Rafinex's new stochastic topology optimization software to determine its potential utility going forward to help it support customer projects.

AUTOMATED ITERATIVE DESIGN

"Stochastic topology optimization" may seem like quite a mouthful. Wikipedia defines "topology optimization" as "a mathematical method that optimizes material layout within a given design space, for a given set of loads, boundary conditions and constraints with the goal of maximizing the performance of the system." Wikipedia further defines "stochastic optimization" as "optimization methods that generate and use random variables."

In the case at hand, Möbius software employs a probabilistic approach to generate a large number of potential designs and identify the optimal one. This technology can optimize the structural design of automotive thermoplastic and composite components such as automotive engine mounts, suspension brackets and body panels. Notably, Möbius software also claims to produce designs that meet safety requirements precisely and withstand forces beyond those foreseen during vehicle operation.

The software evaluates initial designs based on a set of predefined criteria, including weight, strength, stiffness and durability. The best-performing designs are then used to generate a new set of designs, and the process continues until the optimal design is identified. Depending on the application and its constraints and manufacturing method, that design may be more organic or biomorphic in shape.

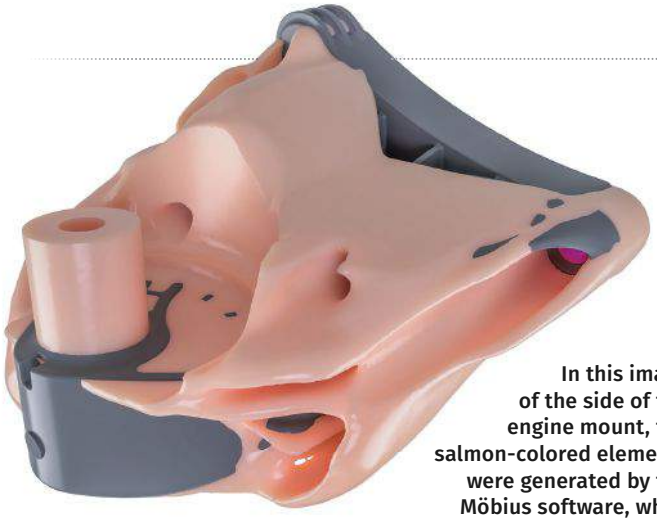
What sets stochastic topology optimization apart is its ability to uncover designs and structures that wouldn't come out of traditional methods. The technology enables engineers to fine-tune the design of automotive plastic parts, resulting in lighter, stronger and more efficient components, cutting weight but maintaining strength in parts where lightweighting was already believed to be maximized.

Rafinex offers Möbius using a software-as-a-service (SaaS) model, where users access the program on the Cloud with state-of-the-art Intel Xeon and AMD EPYC processors for efficient computation. Möbius then applies adaptive local mesh refinement technology and optimization algorithms to optimize design. Armin Lohwasser, chief business office and partner at Rafinex, explained that Möbius requires only a browser on the user end. Data transfer, translation, modeling and setup, optimization and validation (including storage) are provided by Möbius.

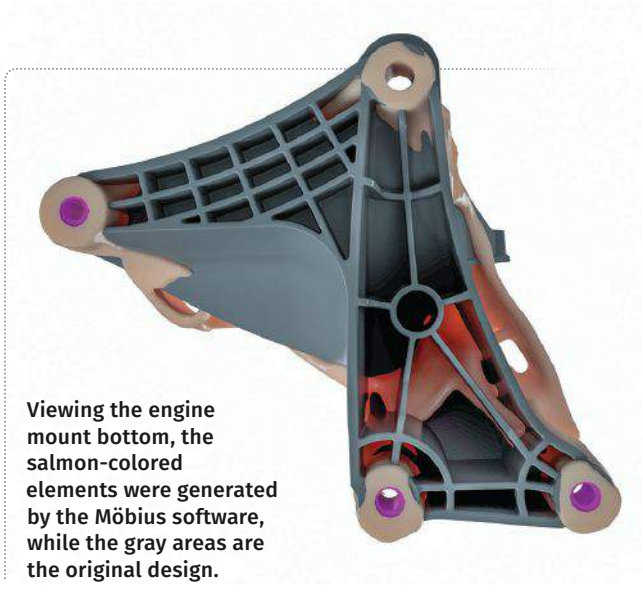
A TEST CASE

To test drive the software, Celanese's automotive team in its ETC decided to run an existing engine bracket molded from Zytel 70G50 (50% glass-filled nylon 66) that had already been optimized through Möbius. Rafinex ran the optimization based on the design space, constraints and load cases Celanese provided. Then the Celanese team evaluated the optimal result for injection molding processability, as well as structural performance.

According to Pieter Volgers, technical programs manager/CAE at Celanese, the biggest challenge for structural components in engi-



In this image of the side of the engine mount, the salmon-colored elements were generated by the Möbius software, while the gray areas are the original design.



Viewing the engine mount bottom, the salmon-colored elements were generated by the Möbius software, while the gray areas are the original design.

neering polymers is to create a sufficiently stiff and robust design using the minimum amount of material. "Traditional design is usually based on experience and previous developments," Volgers says. "This history is not available for new applications, making the design of these very challenging. As a result, designs tend to be 'conservative' or 'traditional,' excluding shapes and solutions which could be more efficient."

Volgers says that enhancing the bracket's topology using the advanced stochastic optimizer developed by Rafinex enabled Celanese to conduct iterative design studies and eventually recommend a solution that it knew could be successfully injection molded.

What sets stochastic topology optimization apart is its ability to uncover designs and structures that wouldn't come out of traditional methods.

Celanese provided Rafinex the available design space for the engine mount with instructions to maintain thickness constraints for the boss, bolt seating/washer areas and holes. The washer projected areas were assumed to be fully constrained, and a rotating load vector was applied in the ZX plane to the boss surface.

Next, Rafinex ran the model through the topological optimization process within its Möbius software. The process was driven by mass targets for maximum stiffness. A brief visual evaluation of the results and design variants led the team to believe the 15% mass target design would be most suitable for further study.

The 15% mass target Möbius results were then compared with the original injection molded rib designs. In the images, the salmon-colored elements are from Möbius designs, while the gray areas are the original design.

Nonlinear structural analysis was performed and compared with the results obtained with the traditional design. The latter included the effect of fiber orientation, as well as more accurate modeling of bolts and bushings. Although important, this was not considered to influence the results so much that it would invalidate the conclusions. This also further validated the Rafinex design, which showed equivalent structural performance.

In the final analysis by the team, the Möbius-optimized design resulted in 25% less volume for the engine mount. A subsequent Moldflow analysis of the optimized design showed balanced filling of the part via a single gate, with low injection and holding pressures. Celanese notes that as the optimized design is 25% lighter than the original version, significant opportunities remain to finalize the shape so that it meets all the structural and moldability requirements while still providing significant weight and cost savings.

With the experiment deemed a success, Celanese's Volgers says that by applying Möbius software in the early stage of development, Celanese could quickly come to an optimal design shape. "The shape not only has a mass potentially even lower than the existing design but a more natural and unconventional shape," Volgers says.

He also noted that while the Rafinex tool provided a manufacturable shape via injection molding, the design would likely require minor modifications for ease of demolding. Once implemented in a design process, Rafinex expects that five to 10 design variants can be generated per week with Möbius, including structural FEA validation. According to the company, these structural FEA validation runs can be prepared and solved automatically in the browser-based UI. Having established itself in Europe, the company is now eyeing expansion into North America in 2024, according to Lohwasser. PT

MATERIALS

PART 31

Tracing the History of Polymeric Materials

Let's close this lengthy series with some personal anecdotes.

By Mike Sepe

Nearly three years ago, I received an email from a reader asking if I knew the story about John Wesley Hyatt's development of Celluloid. I wrote back that not only did Hyatt discover the chemistry behind Celluloid, he developed the machinery for forming the material — a process that today we call injection molding. That reader then suggested I write about that, and we have been doing so ever since November 2020.

We have covered a lot of ground during that time, 31 articles in all, and I am going to close with a couple of stories — one personal and the other historical — that involve two of the materials we mentioned in the first installment of the series.

We certainly have not covered everything that exists in the world of polymers. One item we have neglected that comes to mind is the fascinating history of the development of ABS, with its evolution from the use of nitrile rubber to butadiene rubber, the ongoing advances in the technology used to incorporate that rubber into the polymer matrix, and the breakthroughs in the 1980s with improved purity and color pioneered at Dow by my esteemed colleague, John Bozzelli. I am sure there are others.

But, hopefully, we have provided an informative, interesting and even entertaining account of the history of polymer development and the personalities that contributed.

EXPLODING PING PONG BALLS

The first story involves my attempt to identify the material used to make a common recreational product. Working in the lab, we would often get people coming in from the production floor inquiring about the composition of this material or that material. In the early days, the only pieces of equipment we had in the lab were a melt flow rate tester and a moisture analyzer. So to determine composition, we did what many in the industry have learned to do, identify a material using the sense of smell.

An observant person working on the manufacturing floor quickly learns that certain materials, when heated, give off distinctive odors. When presented with an unknown material, heating the material with a torch and then smelling the off gasses at least enables us to identify the overall polymer family. It can also lead to some interesting injuries which the Human Resources Department probably frowns upon. But back then we did not yet have a Human Resources Department, so we got away with a lot.

In my lab years ago, we heated a ping pong ball with a torch, figuring we'd be able to identify its chemical composition by smelling the off gases. But it burned right away, leaving nothing behind but a trace of ash. The explosive nature of the reaction made it clear to us that the material was cellulose nitrate.

On this particular day, the object of interest was a ping pong ball. We dutifully exposed the part to a flame, expecting that we would be able to extinguish the resulting fire and smell the vapors arising from the ruins. Much to everyone's surprise, the object burned instantaneously and completely, leaving nothing behind but a trace of ash. But the explosive nature of the reaction was unmistakable; the material was cellulose nitrate.

It illustrated why this material never became the commercial option for billiard balls. It also brought to life stories about the movie house fires in the early 1900s when film was made from cellulose nitrate, and the origin of the nickname "mother-in-law silk" for the fabric made from this polymer that caused people to suddenly lose a layer of clothing when they came too close to a flame source.

The second story goes back to the 19th century and is worth considering as we go through our current political climate. In the mid-1850s, the country was becoming increasingly polarized over the issue of slavery and the U.S. Congress was the focal point of this debate. The passing of the Kansas-Nebraska Act in May 1854 had prompted the formation of the Republican Party and galvanized the abolitionist movement. It gave individual territories entering the Union as states the right to decide whether they would enter as free states or slave states, with Kansas being a focal point of conflict over the question during this time. While Kansas did ultimately join the Union as a free state early in 1861, violence and armed conflict over the issue raged for years prior to that event.

A CANE MUTINY

The conflict was reflected in the U.S. Congress, where disagreements over the issue boiled over on May 22, 1856, when a Democratic member of the House of Representatives from South Carolina, Preston Brooks, entered the Senate chamber and beat Charles Sumner, the abolitionist Republican senator from Massachusetts, with his walking cane. Sumner's injuries were so severe that he was unable to serve in his role as Massachusetts senator for almost three years.

During this time, Massachusetts chose not to elect someone else to take Sumner's seat, actually reelecting him in 1856 and leaving his seat in the Senate chamber empty as a visual reminder of the event. Brooks was arrested for assault, tried in a D.C. court and fined $300, but served no prison time. He resigned from his seat on July 15 of that year, but was reelected in a special election on August 1, having achieved substantial support from his constituency due to the assault on his colleague. He was then elected to a new term during the regularly scheduled elections later that year.

Ironically, Brooks died of an upper respiratory infection before the new term began in 1857. But in a magnanimous gesture before the end of the 1856 term, he gave a speech in which he stated he would be satisfied with Kansas entering the union as a free state if that was the decision of those writing the state constitution. It was a speech that earned him some unlikely support among abolitionists and the enmity of his pro-slavery supporters. Sumner returned to his seat in the Senate in 1859, but suffered chronic pain and what we would today identify as post-traumatic stress disorder for the rest of his life, while his detractors mocked him for exaggerating the extent of his injuries. He lived until 1874, still serving in the Senate when he died.

The parallels between that period in our history and today are notable. The emotionally charged ideological disagreements, the invective flying between the different sides, the compartmentalized media fanning the flames and even the physical assaults all have modern counterparts. But the historical fact that likely catches the attention of a chronicler of the plastics industry is the material from which Brooks' cane was made. It was a relatively new material known as gutta percha, a thermoplastic derived from a tree of the same name. PT

ABOUT THE AUTHOR Mike Sepe is an independent, global materials and processing consultant whose company, Michael P. Sepe LLC, is based in Sedona, Ariz. 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.*

Scan for more expert advice in materials.

INJECTION MOLDING

The Cost of High Employee Turnover: Why Retention Matters

Starting in molding in 1993 and clocking in for nearly every job on the floor over the intervening decades, I've seen all sides of the hiring, training and retention process in the industry. Here are my thoughts on how to keep your most important asset — your people.

Rodney Davenport

Have you ever worked in a company where employees come and go like the wind? It can be frustrating, right? High employee turnover is not just annoying; it's also expensive. In the injection molding industry, retaining your key talent is critical to success. The cost of high employee turnover in injection molding cannot be ignored. From training new hires to lost productivity, every aspect of your business will suffer if you don't prioritize retention. So why does retention matter so much, and how can you keep top talent engaged? Let's dive into this crucial topic together.

Retaining employees who've completed the application, onboarding and training processes is key to an injection molder's commercial success. Photo: iStock

BARRIERS TO RETENTION

Injection molding is a critical process in the manufacturing industry, and retaining experienced and qualified personnel is essential to maintaining a high level of quality and productivity. Unfortunately, the injection molding industry faces significant challenges in retaining employees.

One of the biggest challenges is the nature of the work itself. Injection molding can be repetitive and physically demanding, which can lead to boredom and burnout. Additionally, many injection molding facilities are located in remote or rural areas, which can make it difficult to attract and retain workers.

Another challenge is the low wages often associated with injection molding jobs. While some companies are able to offer competitive salaries, others may not be able to afford to do so. This can lead to high employee turnover as workers move to other industries in search of better pay and working conditions.

The highly technical nature of injection molding can make it difficult to find qualified workers. Many positions require specialized training and experience, which can limit the pool of potential applicants. As a result, companies may have difficulty filling vacant positions, leading to extended downtime and lost production.

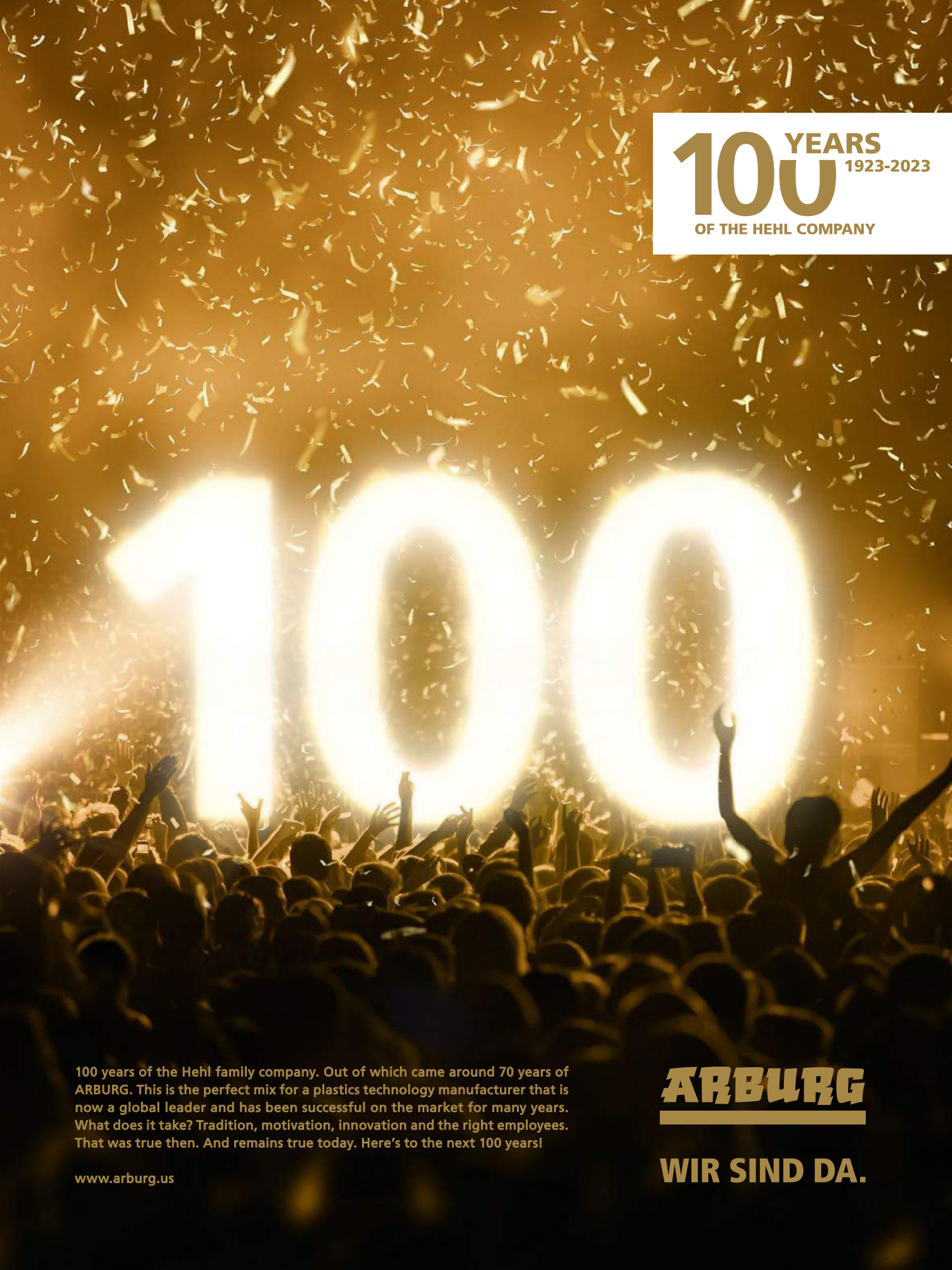
The cost of high employee turnover in injection molding can be significant. Not only does it lead to lost productivity and lower quality products but it also increases costs associated with recruiting and training new employees. For these reasons, it is essential for companies in the industry to focus on retention strategies that will help them keep their best workers for the long term.

THE COST OF HIGH EMPLOYEE TURNOVER

The high cost of employee turnover is a huge problem for injection molding businesses. Not only does it cost money to replace employees but it also disrupts production and can lead to lower quality products.

There are a number of reasons why employees may leave an injection molding business, but the most common is dissatisfaction with their job. This can be due to a number of factors, including low pay, long hours, poor working conditions or a lack of opportunity for advancement.

When an employee leaves, it costs the business money in a number of ways. First, there is the direct cost of recruiting and training a new employee. Second, there is the indirect cost of lost productivity while the new employee gets up to speed. And, finally, there is the opportunity cost of not having an experienced employee on staff. ►



100 years of the Hehl family company. Out of which came around 70 years of ARBURG. This is the perfect mix for a plastics technology manufacturer that is now a global leader and has been successful on the market for many years. What does it take? Tradition, motivation, innovation and the right employees. That was true then. And remains true today. Here's to the next 100 years!

www.arburg.us

ARBURG

WIR SIND DA.

The best way to reduce the cost of employee turnover is to focus on retention. This means creating a work environment that employees enjoy and providing opportunities for them to grow within the company. By doing this, you'll keep your best employees around longer and save yourself a lot of money in the process.

REASONS FOR HIGH EMPLOYEE TURNOVER

Injection molding is a complex and demanding process that requires skilled workers. Unfortunately, the turnover rate in this industry is notoriously high, which can be costly for employers. There are a number of reasons for this high turnover, including:

- **Low wages**: Many entry- and mid-level injection molding jobs are low paying, which makes it difficult to attract and retain workers.
- **Poor working conditions**: Injection molding can take place in a dirty, hot and noisy environment, which can be tough to work in on a day-to-day basis.
- **High stress levels**: The demands of the job can be very stressful, which can lead to burnout and turnover.
- **Limited advancement opportunities**: Due to the nature of the work, there are often limited opportunities for advancement, which can be frustrating for employees.

STRATEGIES TO DECREASE TURNOVER

There are a number of strategies that employers can use to decrease turnover in their injection molding businesses. Some of these include:

- **Offering competitive pay and benefits**: In order to attract and retain workers, it is important to offer competitive pay and benefits. This may include things like health insurance, paid time off and retirement savings plans.
- **Providing training and development opportunities**: Employees who feel like they are constantly learning and growing are more likely to stick around. Providing opportunities for training and development shows employees that you are invested in their future with the company.
- **Creating a positive work environment**: A positive work environment goes a long way in keeping employees happy and engaged. Things like open communication, respect and appreciation can go a long way in making employees feel valued at work.
- **Encouraging employee input**: When employees feel like they have a say in how things are done at the company, they are more likely to be invested in its success. Encouraging employee input shows that you value their opinions and want them to be a part of the decision-making process.
- **Recognizing achievements**: Employees who feel appreciated for their hard work are more likely to stick around. Showing your employees that you notice and appreciate their efforts will make them feel valued, which will increase retention rates.

When employees feel like they have a say in how things are done at the company, they are more likely to be invested in its success.

From training new hires to lost productivity, every aspect of your business will suffer if you don't prioritize retention.

It is clear that employee turnover in injection molding can be costly to both the company and the broader industry. Companies should focus on creating a positive workplace environment, offering competitive salaries and benefits, providing extensive training opportunities, and engaging with their employees through effective communication. By doing so, companies will be able to reduce employee turnover rates while increasing efficiency and profitability in the long run. With these strategies in place, employers can ensure they are retaining their most valuable asset — their employees!

ABOUT THE AUTHOR: Rodney Davenport is vice president at CH3 Solutions, an injection molding company in Dalton, Ga. He has more than 20 years of experience in the industry. Rodney grew up in Michigan, moved to Florida and started his career in injection molding there. Rising through the ranks through hard work and a helpful attitude, his passion for technology helped propel him further as he learned new processes and technologies throughout his career. In April 2015, Davenport helped establish CH3 Solutions as a brand new injection molding company.

2023 FORMNEXT FORUM AUSTIN

Be a part of this year's hottest AM event!

Formnext Forum: Austin is additive **FOR** manufacturing.

The exhibits, events and experiences are all designed to help evolve expertise in additive manufacturing for industrial production. The event is packed with **technology displays, facility tours, technical sessions** and **special events** that are authentically manufacturing, uniquely additive and only available in Austin at Formnext Forum!

MONDAY, AUGUST 28TH

- Cumberland Additive Facility Tour
- EOS Facility Tour
- BBQ and Beer Hall Reception at Banger's Sausage Haus
  SPONSORED BY: EOS

TUESDAY, AUGUST 29TH

- Exhibits
- Product Technology Sessions
- Design for Additive Manufacturing (DFAM) Track
- Additive Manufacturing for Production (AMP) Track
- AM Industry Reception at Palmer Events Center
  SPONSORED BY: SEURAT TECHNOLOGIES

WEDNESDAY, AUGUST 30TH

- Exhibits
- Product Technology Sessions
- Design for Additive Manufacturing (DFAM) Track
- Additive Manufacturing for Production (AMP) Track
- Closing Events

LAST CHANCE

Register today and save $100.
PROMO CODE: AM100

ORGANIZED BY

AM ADDITIVE MANUFACTURING · GARDNER Business Media, Inc. · AMT

LICENSED BY

mesago · messe frankfurt

BAYSTAR

We're known for durability, flexibility, and long service life. So is our polyethylene.

On any given day at Baystar headquarters, coveralls and safety gear blend right in with business casual. The corporate offices are located at the production site in Pasadena, Texas, with the polyethylene producer's three production units forming the view from most offices. Unlike many larger producers, this unique environment cultivates a "one team" attitude where hands-on customer service managers, production engineers, quality control lab technicians, and senior leadership connect in hallways and meeting rooms to change the game in plastics manufacturing.

Solutions impacting customers need to come quickly when you're introducing market-first technologies delivered with hyper-customization. Attentive and personal service coupled with leading products is the exact space where Baystar plans to win in a highly competitive market. Feedback from customers proves the polyethylene producer has found its sweet spot.

"Because of our size, we are meeting the evolving needs of manufacturers by providing a level of speed and customization not available from larger manufacturers," said Baystar's Technical and Quality Manager, Leonardo Cortes. "Our leading technologies give us the ability to provide custom solutions and provide our customers with performance never seen before in North America."

Introducing market-leading technology to help customers push boundaries is at the heart of the company's growth. Baystar will more than double its capacity this year, adding 625,000 metric ton-per-year with its Bay 3 unit featuring Borstar® technology – a first in North America.

Better, stronger, lighter

"The Borstar technology is amazing because it has different variables that we can play with to design a completely new product. As technical people, we are always looking for the perfect polyethylene," Cortes explained.

The proprietary multimodal design allows us to create a unique polymer architecture, resulting in an exceptional product, empowering customers to meet the demands of modern manufacturing – and explore new frontiers – with increased flexibility for lighter weight, increased strength, excellent processing, and enhanced sustainability with the incorporation of up to 50% post-consumer recycled material. The state-of-the-art technology, licensed by Borealis, delivers superior physical properties, processes better than other PE, and requires no process aids. The technology also delivers enhanced sustainability attributes for downstream customers via low energy consumption during the production process and zero CO2 footprint capability.

One of the most exciting developments, Cortes added, is the ability to introduce mono material solutions in the packaging industry. "What that means is replacing a multi-polymer structure – like a flexible packaging – that can be a blend of polyethylene, polypropylene, and/or polyester. Now we can design a 100% polyethylene product, which also means that it's 100% recyclable."

Baystar is no stranger to delivering brand power to its customers. For example, with Lumicene® technology, Baystar is giving manufacturers and converters powerful new options, representing a new generation of metallocene polyolefins with superior cleanliness, improved gloss and transparency, and enhanced processing and mechanical properties. The product is ideal for reduced thickness, tougher multilayers, enabling reduction of virgin material, offering high impact resistance, excellent optics, and rapid tight sealing.

Taking customization to a whole new level

The high level of product customization provided by Baystar is enabled by the company's investment in best-in-class lab and quality control equipment. In addition to employing top equipment and technologies, Baystar adheres to industry best practices, which it meets or exceeds when possible. This includes ISO 9001 certification, a set of internationally recognized standards for quality assurance and management published by the International Organization for Standardization to encourage the production of goods and services that meet a globally acceptable level of quality.

"The lab is critical to the success of Baystar and our customers," said Jeremy Gasper, quality control lab superintendent. "When you're a customer and you can know somebody gave their all to make sure that you're getting a quality product, it speaks volumes. We highly customize to meet the specifications of each unique operation."

Baystar's broad range of linear-low, medium- and high-density polyethylene resins serve various film, pipe, blow-molding, rotomolding, and specialty applications including:

All-PE formulated stand-up pouches

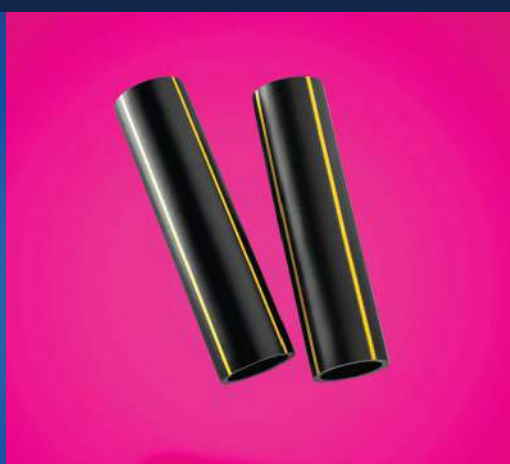
Agriculture films (e.g., mulch films and greenhouse films) that provide diffused light which has been shown to improve crop yield, and resistant to tear

Collation shrink capabilities providing down-gauge, easier extrusion, improved hot-shrink and cold force characteristics, and puncture resistance

A range of general purpose small and large part blow molding grades, specialty bimodal blow molding grades with enhanced processability, light weighting, and incorporating higher loads of post-consumer recyclable (PCR) material

Specialty resins for injection-stretch blow molding (ISBM) and coextrusions with higher gloss and softer touch

Discover how Baystar is changing the game at Baystar.com



Allegheny Performance Plastics • Leetsdale, Pa.

By Tony Deligio
Executive Editor

Atop the Plastics Pyramid

Allegheny Performance Plastics specializes in molding parts from high-temperature resins for demanding applications as part of its mission to take on jobs 'no one else does.'

In satellites, in jets, in automotive transmissions — the parts that Allegheny Performance Plastics molds for the roads, skies and outer space operate at the boundary of the harshest environments that plastics can inhabit. The list of materials that can survive in these environs is short, as is the list of molders that can successfully run them. Allegheny gladly, intentionally calls this rarefied air home. "We don't like easy; we want difficult," explains Robert Stutzman, Allegheny CEO. "We want something no one else does."

One common means for organizing polymers that's familiar to those in the industry is the "plastics pyramid." From a large base of commodity resins, the pyramid builds upward, getting smaller as it goes with engineering plastics in the middle and high-temperature plastics — those

Allegheny Performance Plastics CEO Robert Stutzman (left) and CTO Greg Shoup on the company's molding floor, which applies lean and scientific molding principles. Photos: Allegheny Performance Plastics

with melt temperatures typically above 300°C (572°F) — occupying the smallest space at the pinnacle. Within this capstone, you find resins like PEEK, PEI, PPS, PI, PBI and PAI with familiar trade names such as Ultem, Ryton and Torlon. For these materials, Allegheny offers its customers assistance in selection, design optimization, sample production/testing and cost-competitive production.

"The key is that we can't be everything to everyone," Stutzman says. "So you focus on a certain type of material offering. The reason being that if you mold PP and PE, thousands of people in the country can do that. You use a commodity material, and you're one of many — you become a commodity yourself."

EARLY INNOVATORS

Established in 1936, Allegheny Plastics Inc.'s initial focus was using plastics to print and laminate reusable charts. Based in Leetsdale, Pa., the Allegheny Performance Plastics division has been in injection molding since the 1960s. In 2016, Allegheny executives Greg Shoup and Shevey Westbrook, with the backing of two investment firms, completed a management buyout of the molding unit. Shoup and Westbrook remain at Allegheny, serving as chief technology officer and director of operations, respectively, with Stutzman hired on in October 2022 to act as CEO.

Since Stutzman's hiring, Allegheny has added a network of 17 external sales agents, and laid out a 5-year plan with four key pillars: people, where/how will the company grow, operational excellence and continuous improvement. To support this plan, the company is seeking to update its ERP program, and add other operations and manufacturing software, including MES, this year.

"I want data off the manufacturing floor and I want it all tied together."

"We're at the point now in our business that we need to be able to have some things integrated," Stutzman says. "Not just ERP and MRP to handle our purchasing — we're tight on space so we don't want to have a warehouse full of stuff — but an MES system. I want data off the manufacturing floor and I want it all tied together. The business is going to grow and for us to maintain what we have — our performance financially but also for our customers — we can't get bogged down doing stuff manually."

PARTS POTPOURRI

In the eight months he's been on the job, Stutzman walks the floor every day, and virtually every day he has seen a new part in production as the company maintains several hundred active molds. When *Plastics Technology* visited, the manufacturing floor — which features 30 injection molding machines (mostly Nissei, ranging from 20 to 500 tons), seven CNC machining work cells for post-mold processing, and 40 ovens for post-curing parts molded from Solvay's Torlon PAI resin — was humming with production of an array of parts. Seal rings; a satellite bound insert- and over-molded part; nylon gears and brake pistons; an Ultem transmission component; and an elastomer pad whose surface texture, imparted by the mold, imitates the grip of a gecko's feet, were among just a few of the jobs in production.

A six-axis Fanuc robot removes parts and adds inserts in an automated production cell.

Using high-temperature materials means that Allegheny runs oil through the molds instead of water, with longer cycles required and more expansion and contraction of the molds over time, demanding vigilance in preventive maintenance. How hot do these resins run? As we pass a hot runner temperature control unit in front of a press, the display's set point reads 750°F.

The manufacturing floor is divided into three "teams," with all 19 presses in Team #2 utilizing RJG's eDART process monitoring technology, with molds featuring temperature and pressure sensors. This team focuses on high-volume jobs, while Team #3 targets low-volume/high-mix jobs. Team #1 handles lower volume aerospace work. The Haas CNC machining centers are utilized to machine in part features post injection, where molding them in would have required more expensive tooling with longer lead times. ►

Running three shifts, Monday to Friday, with the occasional Saturday, Allegheny has roughly 50 employees, with the goal to be at 57 by the end of the year. Thanks to automation and process monitoring, Stutzman notes that in Team #2, two employees can keep tabs on 19 machines. All the workers on the floor are cross trained such that they can take on all the production roles: mold setup, process technician, inspection and more.

That inspection also happens on the floor simultaneous to production. In the middle of the molding cells, an inspection station (including a CMM), moisture analysis and more, resides. "It's more about quality assurance than quality control," Stutzman says. A lean manufacturing concept, this cell ensures good parts as they're molded. Allegheny also operates a full quality control lab in a climate-controlled space off the molding floor.

Allegheny performs some part inspection and validation on the molding floor simultaneously with part production.

Stutzman notes that on the floor and throughout the company, there is a culture of genuine teamwork, with no cliques. Over his 25-plus years in molding, he says he's managed other production floors that operated socially more like a high school, making him feel like the principal.

Adjacent to the molding floor, Allegheny operates a full tool room with a handful of in-house mold builds each year. The molds that do come in, don't leave, Stutzman says, with all the maintenance and tuning handled internally. In addition to three full-time toolmakers, the toolroom has an employee focused on preventive maintenance, with two younger employees — including an apprentice and a college student studying mechanical engineering — as Allegheny builds a bridge to the next generation of moldmakers.

Just off the plastics machining area, Allegheny houses its "skunk works," a space for experimentation as well as validation. All new projects are scaled up here, ensuring a repeatable process is introduced to the molding floor once a tool goes into production. The company houses a polymer 3D printer here. For the materials and markets Allegheny works in, Stutzman says 3D printing for production isn't currently viable, but it does use the machine to trial test fixtures, for instance, before creating final designs. This room also houses certified secondary cleaning processes for parts destined for outer space.

Treated like a clean room, Allegheny ultrasonically cleans, packs and ships parts, which can have no contamination. The final element of this room is dubbed the "supermarket." Racks hold labeled blue bins full of parts that require some additional processing, typically machining, that workers pull from and refill based on a kanban system to track work in progress.

'GEEK OUT'

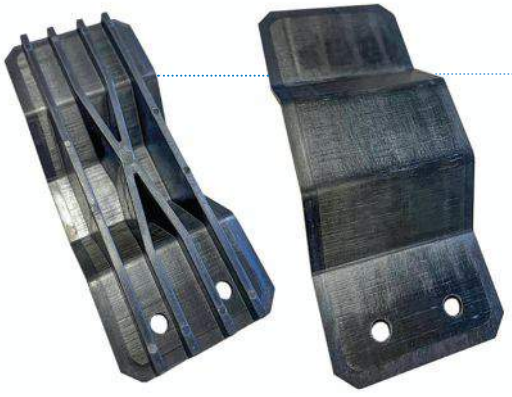
Allegheny's expertise in high-temperature materials has placed it at the forefront of metal-to-plastic conversion in the automotive and aerospace industries. Shoup — who's been with Allegheny for 28 years, including the last 18 in the Performance Plastics molding division — has seen these plastics wins firsthand, and the impact they've had on Allegheny's portfolio, with the 2009 recession and subsequent "transmission wars" in auto as an inflection point. Shoup estimates that, prior to the recession, Allegheny's business broke 70/30 aerospace to automotive, while today those figures are flipped, as both markets grew overall with auto outpacing aero.

"We developed experience in these high-temperature materials," Stutzman says, "and aerospace presented the opportunity. Then in the '90s, automotive started to embrace polymers, especially in these critical wear opportunities. That business was slightly different — same materials and same technical challenges, but the scale was different."

"We don't like easy; we want difficult. We want something no one else does."

As an example, Allegheny points to a thrust washer it molds from Torlon that's part of a hydrodynamic bearing for automotive transmissions. This part replaced a metal roller bearing and, to date, the company has made more than 100 million polymer thrust washers. In addition to lower weight and more design freedom (including possible part integration), polymers in applications like this offer lower NVH (noise vibration harshness) than metals, while resistance wise, the coefficient of friction is the same. In terms of wear, Allegheny says that, with proper hydrodynamic lift, polymers can provide unbeatable durability.

Allegheny has invested in testing technologies to fully vet these materials and



Working in collaboration with Solvay and Alpine Advanced Materials, Allegheny developed this test application dubbed TPC-IOM (thermoplastic composite injection overmolding) combining composite tape materials with an injection molded backing.

Allegheny's toolroom has the capability to build new tools and maintain existing molds.

Molded from Solvay's Torlon PAI resin, this thrust washer replaces metal within an automotive transmission.

applications, including adding a differential scanning calorimetry (DSC) unit. Used in troubleshooting, the DSC can determine if a resin is contaminated or not what the supplier said it was. In particular, the DSC can be used to determine the polymer's crystallization, melt and glass-transition temperatures.

Allegheny also recently converted a used piece of equipment into a friction and wear test stand, enabling it to perform lubricated and dry tribology testing. These capabilities and Allegheny's extensive research database make it a sought-after partner of resin suppliers as they test new materials and applications. Its collaborations with Solvay over the years on the processing and functionality of Torlon have helped create best manufacturing practices for the specialized material.

Allegheny is IATF 16949, AS9100, ISO 9001 and ITAR (International Traffic in Arms Regulation) certified, in addition to earning Supplier Gold and Quality Clinic accreditation from United Technologies Corp. Aerospace Systems. These acknowledgments of capabilities will help lead the company's next stage of growth as it pursues and wins jobs in electric vehicle charging, drones, UAVs and advanced missile systems. The company estimates that it currently has nearly 50,000 molded parts in space, with the number growing all the time.

All those capabilities and in-house expertise are also reflected in Allegheny's approach to new product and process development. "I use the phrase 'geek out,'" Stutzman says. "There's a technology there that created the excitement — the impetus to want to do something different — that's really sort of the catalyst that drives (geeking out)."

When Stutzman was recruited to lead Allegheny, that curiosity and drive to try something new lent the company a highly appealing atmosphere. "There was this vibe to just get stuff done, move forward," Stutzman says. "There was excitement, and it wasn't like, 'Oh my god, we won this job, and now we have to do it.' There was this infectious desire to want to move forward." PT

Extrusion 2023

PT A Plastics Technology Event

Conference Agenda Now Available!

At **Extrusion 2023**, you'll learn best practices, processing tips, techniques and new technologies to help you meet customer requirements for more sustainable products.

The sessions and speakers coming to Indianapolis have been announced and you can view them all online!

Scan here to view the agenda and secure your conference pass!

***THANK YOU** TO OUR EXTRUSION 2023 SPONSORS!*

DIAMOND

ABS ADVANCED BLENDING SOLUTIONS LLC

Vecoplan®

PLATINUM

GRAHAM ENGINEERING

PTI®

GOLD AND SILVER

AssetWatch

BANDERA EXTRUSION INTELLIGENCE USA

CDS

CONAIR

DAVIS-STANDARD Where your ideas take shape.

DOTECO ART OF CONTROL

Guill

Nordson

Nordson MEASUREMENT & CONTROL NDC & BETA LASERMIKE Products

PSI POLYMER SYSTEMS INC.

RiverdaleGlobal® Changing the way you think about color

SBI MECHATRONIK

WEIMA SHREDDING + COMPRESSING

Leistritz EXTRUSION TECHNOLOGY

PRESENTED BY: PT Plastics Technology | GARDNER Business Media, Inc.

ExtrusionConference.com

Foam-Core Multilayer Blow Molding: How It's Done

FIG 1

Retrofit of Trexel's B-Series delivery system to add physical blowing agent to the polymer melt through a port in the extruder barrel. (Images: Trexel Inc.)

Learn here how to take advantage of new lightweighting and recycle utilization opportunities in consumer packaging, thanks to a collaboration of leaders in microcellular foaming and multilayer head design.

By Sam Dix
Trexel

Use of recycled plastics materials is a critical factor in the move toward a fully closed-loop economy in the plastics industry. Simply put, producers must reduce their energy and raw-material consumption to meet strict new legislation planned for introduction in 2025, as laid out in the proposed packaging regulation published in November 2022 by the European Commission. Cosmetic products that are contact sensitive, for example, will contain 40% postconsumer reclaim (PCR) and all other bottle packaging will contain 35% and 65% by 2030 and 2065, respectively. This is a tall order.

The challenge is not only the supply, availability and quality of recycled resins but also the development of new processes to enable their use and exploit their potential. With the sudden requirement for PCR and the need for respectable quality, cost will likely be an issue. Brand owners, in particular, are looking for ways to remain cost competitive with the virgin product configurations of today's common packaging specifications. Lightweighting through foaming has also gained growing attention and process adoption in recent years as an alternative to downgauging, which may compromise topload performance.

EXPERT PARTNERSHIP FACILITATES ADOPTION

Trexel, a market leader in foaming technologies for lightweighting, and W. Müller, a market leader in blow molding multilayer head design, have partnered to create a lightweighting solution for inclusion of PCR and lowering the cost of bottle production without significantly sacrificing mechanical properties. Trexel has been delivering both physical and chemical foam lightweighting solutions for injection and blow molding. Its MuCell physical foaming technology is now standard or optional on many OEM injection molding platforms. With a recent focus on packaging solutions in injection molding, plus the company's history of foaming blow molded automotive ducts with the accumulator-head process, Trexel has implemented a MuCell foaming solution for extrusion blow molding (EBM) on shuttle and wheel machinery. Trexel is now working with brand owners on scale-up bottle projects.

Lightweighting through foaming is an alternative to downgauging, which may compromise topload performance.

The multilayer solution involves metering nitrogen into the barrel of the EBM machine and foaming the core layer of a three-layer sandwich such that the layer ratio (by thickness) remains similar to the solid predecessor three-layer design but with reduced weight in the PCR core. There is also reduced core extruder speed associated with a given volumetric bottle output. By specifically coupling the MuCell process with a proprietary patented additive, impact strength as well as topload and ESCR will pass the necessary industry tests. Typically, there has been an improvement of up to three times in impact performance over previous foaming technologies, which is driving the ability to make larger foam-core bottles. The system and method are license-free and may be retrofitted to the existing screw and barrel, as depicted in Fig. 1. In addition to weight savings, TiO_2 and other white masterbatches can often be reduced or eliminated, because foam adds an opaque appearance, as shown in Fig. 2.

W. Müller's multilayer head and extruder systems can be retrofitted to most monolayer systems as well as on new systems. W. Müller, which built its first three-layer head in 1990, brings significant process experience with PCR-laden products through its RECO head series. MuCell is a physical foaming process, depending partially on the pressure events in the head or multiple heads in structures of three or more layers. As noted by Jens Schlueter, president of W. Müller USA, "Although there are many standard three-layer extrusion head designs out in the market, it is essential to have the experience with how to create designs that accommodate the foaming process. Understanding melt flow, melt pressure and how to perfectly dimension the flow channels inside the head is critical to a successful foaming application. Our expertise in providing custom-designed heads for different materials and designs ensures that our customers get the right solution for their needs and particular specifications."

FIG 2

Left: Solid, natural color. Middle: Foamed with no TiO_2. Right: Foamed with 2 wt% TiO_2 in outside skin. Foaming adds opacity with less or no need for pigment.

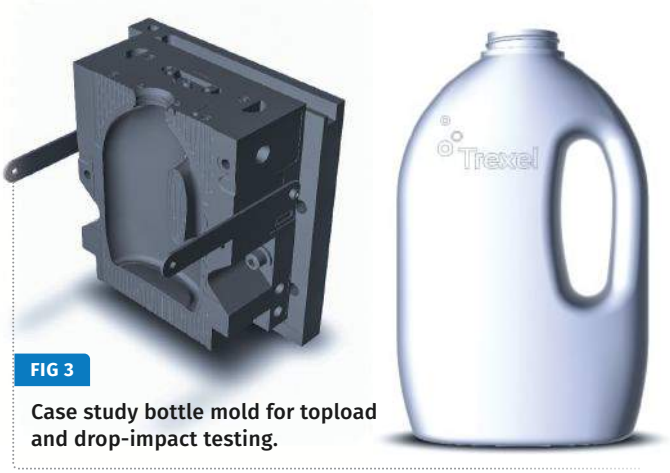
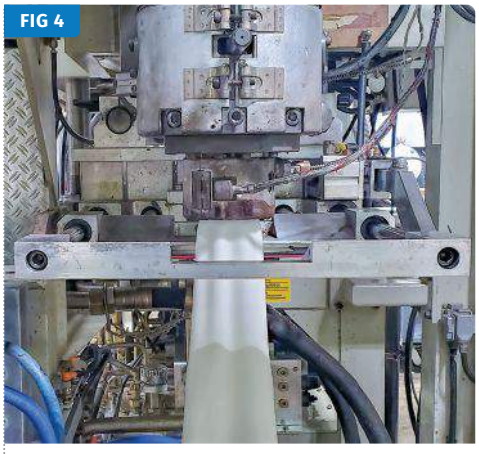


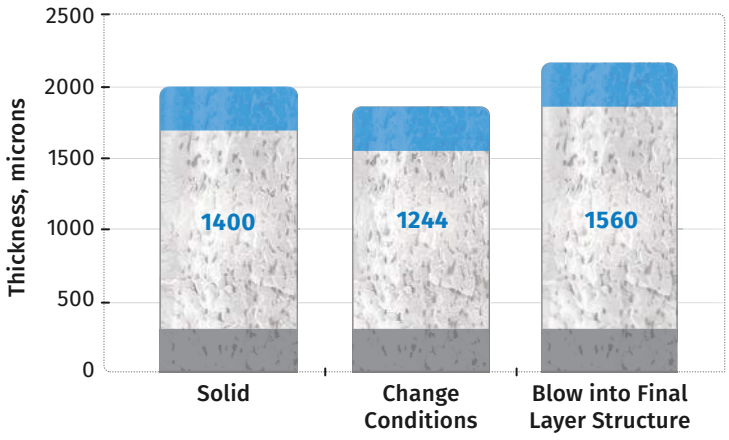
FIG 3

Case study bottle mold for topload and drop-impact testing.

Of particular importance to the process is the ability of the Trexel SCF (supercritical fluid) delivery system to respond to pressure fluctuation that may arise from the addition of some lower-grade PCR to the extruder. Trexel's proprietary system will "learn" process patterns and react to real-time events to keep foaming levels consistent to ensure process stability and consistent

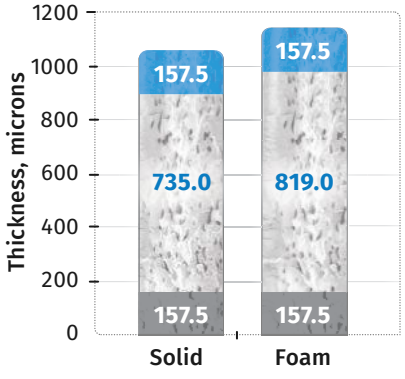
FIG 4





Parison layer structures between solid and foam test bottles. Die tooling was downsized so that the parison layflat dimension was the same for solid and foamed extrudate – producing the same amount of flash/top/tail.

FIG 5 **Better Economics Through Foaming**



Foam vs. Solid Metrics

Metric	Change
Bottle Weight	-6 g (-8%) (Solid = 70 g)
Density Saving	-15%
Cost Saving	-9%
Thickness Increase	+8%
Cycle Time Saving	-5%
Layer Ratio Solid	15/70/15
Layer Ratio Foam	14/72/14

Final bottle structures after blowing and foam versus solid metrics (table), showing savings in bottle weight, cost and cycle time.

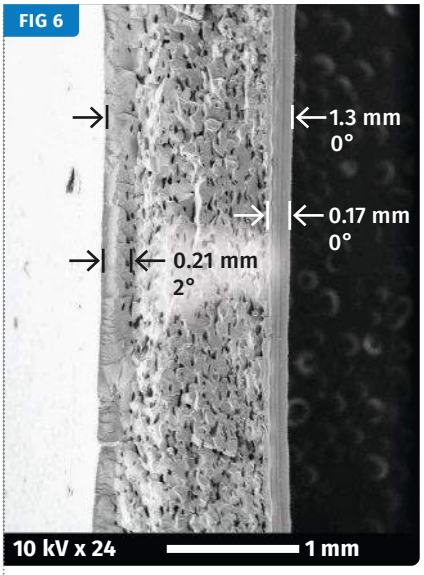
bottle geometry. To enable this, simple process timing signals from the blow molding machine are used.

W. Müller has installed two lab foaming systems, one at its headquarters in Troisdorf, Germany, and the second at its U.S. office in Agawam, Mass. They are both equipped with Trexel's latest B120 SCF delivery system and a handled bottle mold for use in demonstrations. Clients may also pick from other standard molds or supply their own molds to test out the technology.

To retrofit the pumping system, a hole is drilled in the existing barrel in a position so there is enough residence

time to dissolve nitrogen gas in the melt. Trexel has conducted background research to mathematically define the exact parameters required to ensure homogeneous gas diffusion in such processes through work with its recently patented injection molding screw designs. Because almost 10 times less gas is used in the foam blow molding process than in injection molding, there is usually enough residence time to mix gas with an existing blow molding screw design, and therefore the process will not typically require a new screw and barrel.

It is anticipated that, in the future, Trexel's SCF delivery system controls will be integrated into the W. Müller control system to provide a one-stop foaming add-on that will convert an existing monolayer system to a full multilayer foam system.



Scanning electron micrograph of a typical three-layer foam structure, with a 1.3 mm total thickness, outer solid skin layer of 0.17 mm, foam layer of 0.92 mm and inner solid skin layer of 0.21 mm.

CASE STUDY: TOPLOAD & DROP IMPACT

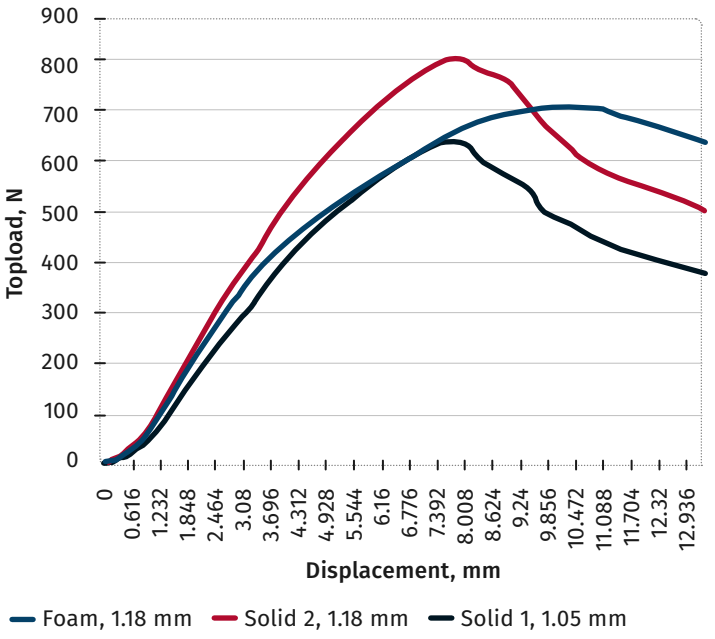
The following case study was used to corroborate and summarize recent work using the demonstration mold. A blow molding system was configured as in Fig. 2 and combined with Trexel's handled bottle mold as shown in Fig. 3. The die tooling was downsized such that the parison layflat dimension was the same for solid and foamed extrudate — yielding the same amount of flash/top/tail. In some cases, die ovalization may change slightly from that for a solid product.

Weight was then reduced in the core extruder, as shown in the center bar in Fig. 4; here, the tail was too short to actually mold a product. Gas was then injected and the structure was foamed back to a thickness similar to a solid part, as shown on the right-hand bar of Fig. 4. Given that stiffness is a key factor that varies as a cube function of nominal thickness, overall thickness can be manipulated to offset the reduction in density, which varies only linearly with stiffness. In essence, foam has a better stiffness-to-weight ratio than solid structures.

Blow pressure was then applied, typically lower than for solid molding, sometimes in multiple stages. The lower pressure at these thicknesses does not introduce the need for greater cooling time or a change in mold venting. In the process, minor calibration or crushing of the structure takes place to leave the final product as shown in Fig. 5. For example, the final foam parison from Fig. 4 is 2.16 mm, which is calibrated (compressed) by nearly 50% during the blow process to leave a final thickness of 1.12 mm, shown in Fig. 5.

The result was a foamed bottle that is 6 g lighter, with an overall density of 0.830 g/cc and a core density of 0.760 g/cc. Nominal thickness of the outside layer was the same as in the solid structure, and extra thickness to maintain stiffness came from the foamed ►

FIG 7 Increased Stiffness-to-Weight Ratio with Foaming



Topload Test Results

Condition	Attributes		
Foam, Trial 8	Thickness	mm	1.18
	Density	g/cc	0.84
	Weight	g	64
	Topload	N	707
	Energy	lb	6743
Solid 2, Trial 10	Thickness	mm	1.18
	Density	g/cc	0.95
	Weight	g	72
	Topload	N	801
	Energy	lb	7045
Solid 1, Trial 11	Thickness	mm	1.05
	Density	g/cc	0.95
	Weight	g	64
	Topload	N	637
	Energy	lb	5454

Topload tests show that for foamed and unfoamed bottles of the same weight (trials 8 & 11), topload force per mm of thickness was the same, but the foamed bottle exhibited 20% more total energy absorbed before peak topload was reached. A solid bottle of the same thickness but higher weight showed greater topload strength.

layer. The cycle time in this instance was reduced by 2.5 sec. The final metrics of the bottle are shown in the table in Fig. 5, which notes savings in bottle weight, cost and cycle time. It should be noted there are multiple ways to quantify the savings. Cycle time may remain constant (same volumetric output) but with reduced material consumption; or alternatively there might be similar material weight throughput as with a solid wall, but with increased volume output — more bottles per hour. In this case study, it was a mixture of both.

An important factor in the technology, as noted, is the homogeneous mixing of gas, but also the synergy of the gas desorption at the instant that pressure is released at the die exit. This creates very small bubbles with an aspect ratio typically no more than 2:1 and cell size less than 100 microns after blowing (Fig. 6). The foam parison continues expanding such that there is ample thickness in the base of the bottle. Unlike traditional nucleating agents,

the proprietary nucleant additive in this process does not negatively affect impact strength (if, for example, you were to put it in an unfoamed product). The combination of those factors enables the foam technology to apply to much larger bottles than just 200 ml and pass impact tests.

Three base tests were performed on the test bottle. The drop-impact test was 11.5 ft for the foamed bottle with an ESCR test pass. Topload test results showed that for the same weight (comparing Trials 8 and 11 in Fig. 7), force per mm of thickness was the same for foamed and unfoamed bottles. Furthermore, the foamed bottle showed a 20% increase in total energy absorbed before the peak topload was reached.

Of particular importance is the ability of the gas-injection system to respond to pressure fluctuation that may arise from addition of some lower grade PCR to the extruder.

Further work is now being conducted on different materials and shapes for brand owners. This extends to biopolymers, which will not be subjected to the regulations in Europe when they begin to roll out but would benefit from cost reduction. Work is also being conducted on wheel machines where the technology has been run successfully at full scale on larger bottles for applications like household detergents.

Trexel has shown a new and improved way to foam bottles with the ability to reduce the cost of PCR-laden bottles and/or simply to lightweight bottles as an alternative to downgauging, which is limited by topload strength. Foam has an improved stiffness-to-weight ratio and provides opacity without adding masterbatch.

Trexel has addressed a key shortcoming of previous renditions of the foaming technology — in particular, drop-impact resistance has been addressed, while topload strength can be maintained by increasing thickness at the foamed lower density. Foaming will not be suitable for every product, such as monolayer, very thin, heavily embossed or with ultrahigh drop-impact requirements. But the list of successful applications is ever growing and gaining attention.

Foaming can be retrofitted to old machines or installed as new. In the former instance, W. Müller and Trexel have partnered to provide the ability to change a monolayer machine to make multilayer foam structures with minimal capital investment and no royalties. PT

ABOUT THE AUTHOR: Sam Dix is the R&D director at Trexel and previously of Zotefoams PLC. He has dedicated over 20 years to developing innovative lightweighting solutions for the plastics industry. This has included a wide range of hardware, systems and processes for customers worldwide. Contact: *S.Dix@trexel.com*; *(781) 266-7391*; *trexel.com*.

Is Your Die Flow Changing Despite Following All the Correct Formulas?

Maybe the problem is that you're starting up with a dry die. Here are tips to solve this issue.

By Tim Groth
Extrusion Solutions LLC

One of the most common problems extrusion plants have is flow shifting in the die tooling, especially after starting up. This can occur even when the run history and setup documents are followed and painstakingly reviewed to the letter. What should be a quick changeover turns into the dreaded scrap nightmare. What went wrong?

Sharing knowledge in tool building has historically been taboo. Toolmakers had their little notebook of cheat sheets on land ratios and what drawdown to use with each material. In the end, each tool made from any given tool shop was different. Fast forward and shops are run differently, with most shops running toward one common standard. More literature on tool design is available than in the past, so what is causing the flow shift?

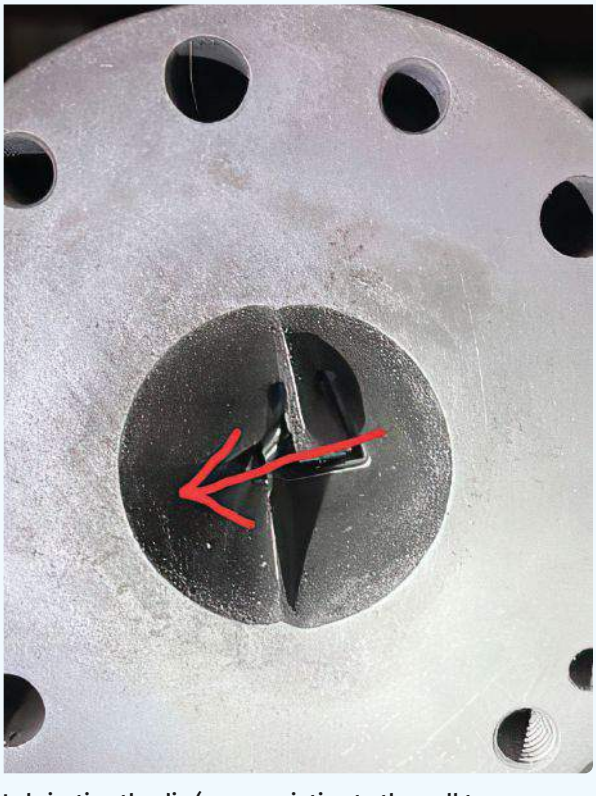
Let's troubleshoot and look at the steps which may be causing the flow shift.

- **Pressure:** Back pressure is usually monitored and recorded in most extrusion shops but is seldom manipulated to optimize the process. When a new tool is tuned, the pressure is recorded

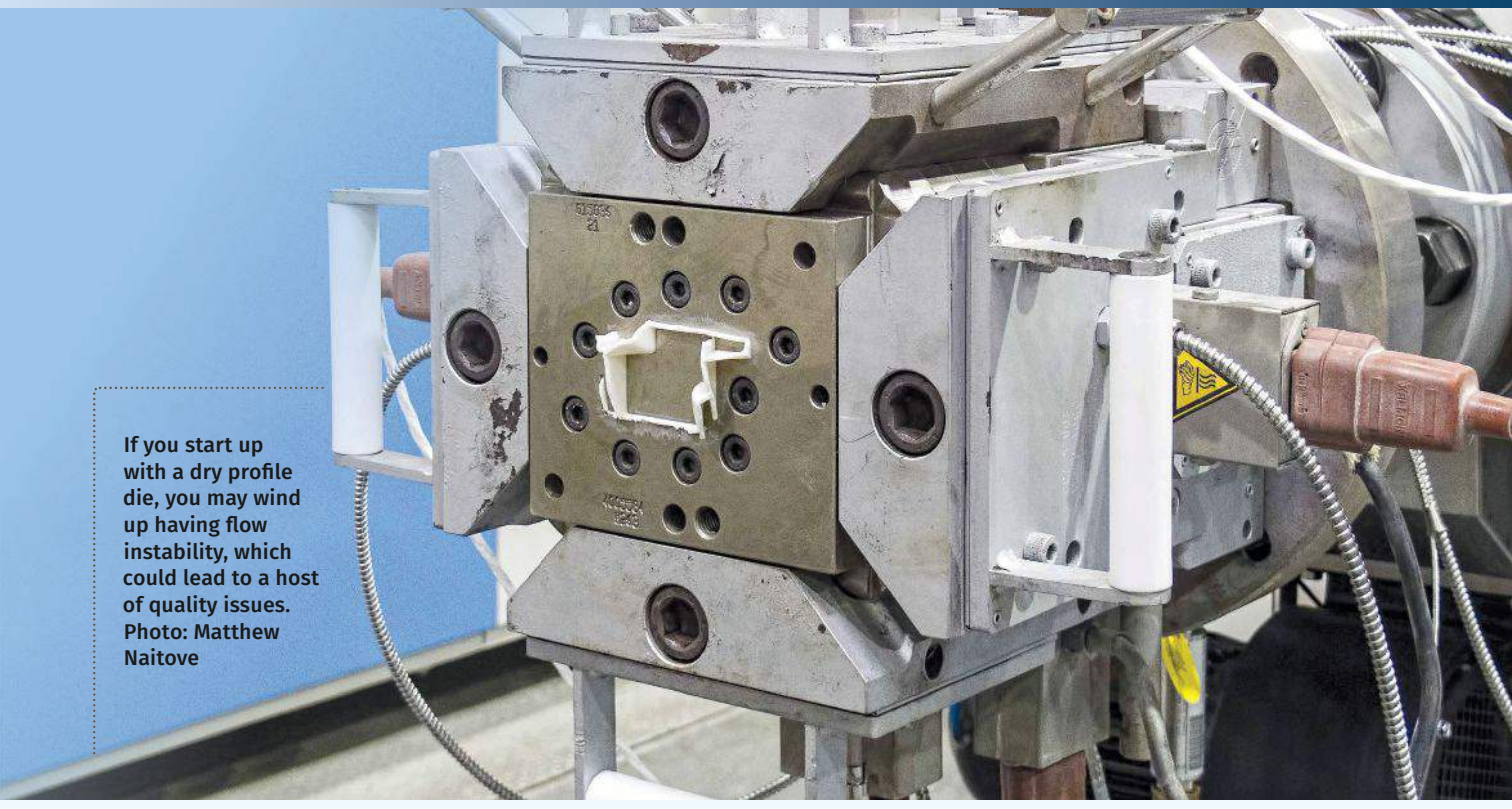
QUESTIONS ABOUT PROFILE EXTRUSION?

Learn more at PTonline.com

Navigate to Extrusion under Processes at the top navigation bar, then select Pipe, Profile and Tubing.



Lubricating the die (arrow pointing to the wall to be lubricated) will sometimes improve drag flow and eliminate flow shift. Photo: Tim Groth



If you start up with a dry profile die, you may wind up having flow instability, which could lead to a host of quality issues. Photo: Matthew Naitove

as a standard and not questioned if it is correct. Many articles have been written on how the low head pressure can cause poor screw performance in a single-screw extruder. What we are looking for in pressure as it pertains to flow shift in the die is consistency. A consistent pressure should always be presented to the die for stability.

- **Melt Temperature:** Much like pressure, the melt temperature should always be presented to the die in a consistent manner to ensure stability.

- **Die Land:** If the die-land ratio is not sufficient, the lowered residence time (along with a lack of back pressure) will create flow shift and instabilities. Many shops tend to start out light on the land ratio and do not have sufficient land for stability after the land is reduced in the development process. Be steel safe and err on the extra landside. As an added benefit, land reduces the swell of the material as it exits the die. Most materials call for a 15:1 land ratio or greater.

- **Heater Bands:** In a past article, I wrote about the five heater band principles being one of the most overlooked variables of the extrusion process. Let's assume you have read the article and corrected any deficient principles of the five and heat to the die is correct and consistent. At this point, you may want to go back and read that article and do a double check on the heater bands.

Ok, so what if the pressure, melt temperature, die land and heater bands all check out, but the dreaded flow shift happens anyway. There is one more thing to do, which many times will stop flow shift: Lubricate the tooling.

Before starting up, lubricate all components of the tooling while hung on the extruder.

LUBRICATION CAN IMPROVE DRAG FLOW

The cavity of a streamline plate does not fill equally because the channel lengths are different, with varying lengths of drag flow. The bigger the tool, the larger the cavity to fill and the greater the potential for problems. Lubricate all components of the tooling while hung on the extruder, before starting up. The initial pressure will be reduced but will increase and reach a stabilization point. Many times, the improved drag flow will eliminate the flow shift issue. PT

ABOUT THE AUTHOR: Tim Groth has more than 37 years of hands-on extrusion experience, specializing in design for extrudability, tooling design, troubleshooting, material selection, plant setup, training of engineers and setup technicians, and practicing Lean Manufacturing principles. He is currently director of engineering for consulting company Extrusion Solutions North LLC, Hastings, Minn. Contact: *(651) 357-0814; timtgroth@gmail.com.*

PT Keeping Up With Technology

INJECTION MOLDING

Injection Molded Tape and Resin 'Sandwich' Technology Debuts

Development partners Engel and KTM Technologies introduced a "tape sandwich" process and design that the companies say creates molded plastic parts with greater stiffness, less weight and low production costs. The aim of the joint development work, which is now commercially available, was to make a motorcycle seat base that's more compact and lighter while retaining the same mechanical properties of its predecessor. Even in motorcycles, drivetrain electrification requires accommodation of an increasing number of electronic components. Belgium toolmaker Feronyl provided tooling for the project.

This advance was shared at the two-day Mobility Days event that Engel and KTM Technologies jointly organized. Bringing together more than 500 experts from the automotive, micromobility, aerospace and transportation sectors in June, the event featured presentations in Linz and machine demonstrations at Engel's large-machine facility in St. Valentin, Austria.

Previous KTM seat bases were thicker molded components, featuring rib structures to boost rigidity, with thicker sections measuring in at 9 mm. To reduce the necessary installation space and create more room for electronics, KTM Technologies cooperated with Engel on a composite part utilizing tape-sandwich technology. The average thickness of this new part was just 2.5 mm.

The tape sandwich process uses thin, single-layer reinforcement materials such as tapes and fabrics with a PP matrix that are inserted into both cavity halves of the injection mold without preheating. The mold closes and PP is injected, resulting in a "sandwich" structure. The mechanical properties of this structure enable the parts to satisfy the stiffness required for motorcycle seat bases with a single-layer UD-tape. Compared to more conventional fiber-reinforced composite plastics processing methods (including preheating organosheets via an oven prior to mold insertion), this process uses less energy and applies a standard molding cell.

The seat bottom that was created provides identical stiffness, while reducing installation space by 66%, with a weight reduction of 26%. The companies note that the sandwich structure can utilize standard thermoplastics but still be exposed to high mechanical stresses. At end of life, using the same resins for the tape and the matrix enables the part to be more easily recycled.

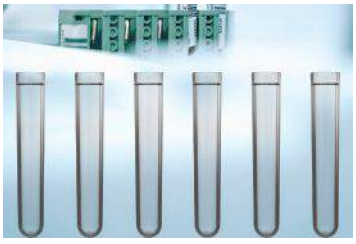
TOOLING

Cold-Half, Core-Centering Technology for Blood Collection Tubes

SIPA has spent several years developing new injection mold tooling solutions specifically for medical applications, encompassing wide cell culture containers to deep and narrow blood collection tubes (BCTs). Based on this work, it has developed a cold-half, core-centering technology that it developed for BCTs, which it says is already being used successfully at a leading global supplier of tubes.

SIPA's patent-pending technology enables molders to adjust the core alignment from the front face of the cold half instead of requiring access at the back of the core plate, making adjustments easier and faster to carry out during production.

Production of high-quality BCTs requires the wall thickness around the circumference to maintain very tight tolerances. SIPA notes that the same is true with more common PET products like bottle preforms, but adds that maintaining consistently uniform walls over long-term production is more difficult to ensure with BCTs.



This is due to the fact that BCTs have a much smaller diameter than regular preforms, which also reduces the dimensions of the various components of the mold. In particular, the small diameter of the cores leaves them more susceptible to deflection during injection, especially with the relatively high injection pressures required for BCTs. SIPA's solution makes it easier to fine-tune the positions of the cores, correcting even small deviations from the set value.

TOOLING

Stainless Steel Sealing Plugs Offer High Corrosion Resistance

Hasco has introduced Z9425/.../VA sealing plugs. Fabricated from stainless steel and particularly suited for use in clean rooms, the plugs enable reliable cooling of injection molding tools when using hot or cold water or heat transfer oil. The sealing plugs are temperature-resistant up to 180°C and have high corrosion resistance. Internal pressures in the cooling system of up to 10 bar (145 psi) are possible.

Assembly is simplified due to the Torx geometry of the fixing screw. Hasco says this design enables torque to be reliably transmitted without any damage to the inner profile. The suppliers note that while assembly with horizontal-drilled cooling holes can be done by hand, it is advisable with vertical cooling holes to slightly increase the size of the sealing plug before mounting it by screwing in the Torx screw and exploiting the friction with the wall of the drilled hole. This enables controlled positioning even with vertical installation.

TOOLING

Hot Tip Sprue Cleaner Unclogs Sprue Bushings and Tips

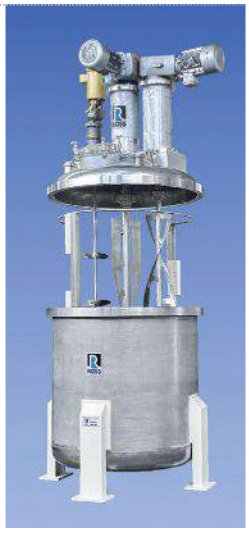
Globeius says its Hot Tip Sprue Cleaner can bring sprues and nozzles back to production-ready life, quickly and safely. Clogged hot sprue bushing and nozzle tips represent critical components that require care during maintenance and repair, while also being costly to replace. Globeius offers a means to eliminate those clogs safely which, in some cases, can be done without removing the mold from the press.

The Hot Tip Sprue Cleaner is a flexible, handheld tool for melting thermoplastics from plugged sprues and nozzles. Users squeeze the trigger and within 10 sec the powerful heater increases the temperature of the tip to 350°C (662°F), melting away the obstructive clog.

Equipped with a timer shutoff feature to protect from overheating, the Hot Tip Sprue Cleaner also features three differently configured copper tips to suit the application; a flexible arm; and a 2.5-m (over 8-ft) cord for easier access to the plugged sprues and nozzle tips. Traditional methods used for melting frozen plastic in gates (including acetylene torches) are less safe and effective, Globeius says.

MIXING

Multi-Agitator Mixing System



Ross has engineered a customized VM-450-gal VersaMix that features three independently-driven agitators, including a two-wing, center-mounted agitator with contoured bottom and Teflon scrapers to efficiently motivate viscous product throughout the mixing zone; a long helical flight agitator to produce better top-to-bottom mixing; and a dual propeller agitator for low-shear, high-flow mixing.

The tank of the VersaMix is fabricated from durable 304 stainless steel, designed for vacuum operation and internal pressures of up to 50 psi. For efficient discharge, a two-way, flush tank ball valve has been integrated, while a 14-in. manway provides access for ingredient additions and cleaning operations.

ADDITIVES

Scavenger for PET and rPET Bottles

A scavenger additive designed to reduce the level of acetaldehyde in PET and rPET bottles, and preserve the organoleptic properties of water is newly available from Ampacet. At a very low addition level, Ampacet AA Scavenger 0846 has been shown to reduce the migration of acetaldehyde by up to 80% while maintaining product quality and brand reputation.

A drawback of PET use for water packaging is the risk of contamination by acetaldehyde (AA), a byproduct of thermal degradation of PET that can occur during PET processing (extrusion or injection molding). According to Ampacet, by controlling acetaldehyde migration, AA Scavenger 0846 also contributes to circular economy initiatives by enabling the use of higher percentages of recycled PET in preforms and bottles without affecting end-product taste.

PS Prices Plunge, Others Appear to Be Bottoming Out

PS prices to see significant drop, with some potential for a modest downward path for others.

By Lilli Manolis Sherman
Contributing Editor

This year's correction in prices of the five major commodity resins was well underway heading into the third quarter. While prices of PE, PP, PVC and PET appeared to be bottoming out, prices of PS were forecast to have a substantial, possibly double-digit, drop.

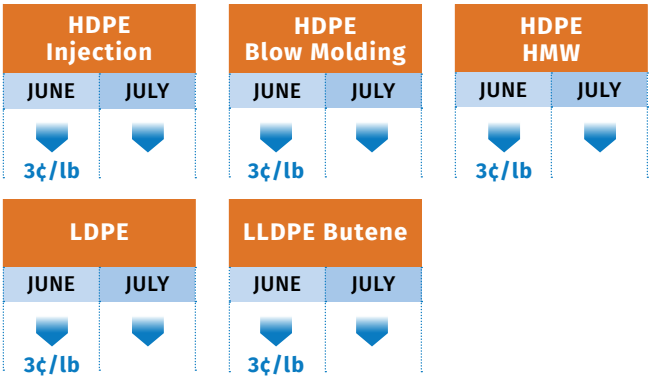
Barring major production disruptions during this hurricane season or other unplanned outages, prices were generally expected to be flat-to-lower for at least part of the third quarter, owing to continued sluggish demand, lower cost feedstocks and oversupply in the case of PET and polyolefins, particularly PE. In the polyolefins arena, spot market buying has been stronger due to much lower price offers that can be had. Domestic demand for both PE and PP through May was down nearly 9%.

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 and Scott Newell, executive v.p. polyolefins at Spartan Polymers.

Market Prices Effective Mid-July 2023

Resin Grade	¢/lb
POLYETHYLENE (railcar)	
LDPE, LINER	85-87
LLDPE BUTENE, FILM	78-80
HDPE, G-P INJECTION	77-79
HDPE, BLOW MOLDING	72-74
HDPE, HMW FILM	78-80
POLYPROPYLENE (railcar)	
G-P HOMOPOLYMER, INJECTION	63-65
IMPACT COPOLYMER	65-67
POLYSTYRENE (railcar)	
G-P CRYSTAL	98-100
HIPS	106-108
PVC RESIN (railcar)	
G-P HOMOPOLYMER	67-69
PIPE GRADE	69-71
PET (truckload)	
U.S. BOTTLE GRADE	66.5-68.5

Polyethylene Price Trends



PE PRICES DOWN

Polyethylene prices were largely expected to drop by 3¢/lb in June, with a similar decrease in July, followed by flat pricing in August, according to David Barry, *PCW*'s associate director for PE, PP and PS, Robin Chesshier, RTi's v.p. of PE, PS and nylon 6 markets, and The Plastic Exchange's CEO Michael Greenberg. This, while PE suppliers postponed their June 3¢/lb increase to July. Greenberg noted that despite supply/demand conditions, it makes sense to have price increases nominated all during the hurricane season and this should also serve as a good reminder for processors to keep an inventory buffer on hand.

Says Barry, "Buyers were expecting a minimum price decrease of 3¢/lb in June. The situation was complicated by price decreases of 3¢/ to 5¢/lb granted on a case-by-case basis in recent months." He notes that 2023 PE contract prices went up a total of 6¢/lb through June, while spot PE prices were down 6¢/lb to as much as 12¢/lb. RTi's Chesshier notes that suppliers' cost to produce PE had dropped by over 40% since the beginning of the year, with plant operating rates below 85%.

Greenberg confirms that some processors continued to engage the spot market for well-priced resin, and that by June's end there was still plenty of it for both prime and offgrade in

bulk railcars and packaged truckloads. Referring to ACC data for May, he notes that while domestic and export sales were a bit above average, it did not prove enough to move all the resin produced, "so collective producer inventories built for a third straight month to the highest level since July 2022."

PP PRICES DOWN, THEN BOTTOM OUT?

Polypropylene prices in June appeared to be heading down by 4¢/lb in step with propylene monomer, after dropping 8¢/lb in May, and a total of 19¢/lb since March, according to *PCW*'s Barry, Spartan Polymers' Newell and The Plastic Exchange's Greenberg. The three generally thought PP prices may have bottomed out, though they saw some potential for a bit further reduction in July-August.

Polypropylene Price Trends

Homopolymer	
JUNE	JULY
↓ 4¢/lb	◀▶

Copolymer	
JUNE	JULY
↓ 4¢/lb	◀▶

Says Newell, "The sentiment on the street is still pretty bearish. This despite an increase in domestic demand of 7% in May over April. But, I'm not very sure that this was indicative of a real rebound starting to take place." He noted that the market, overall, is negative. Production dropped in May, with plant operating rates approaching 70.3% ... the lowest yet in 2023. While this resulted in a resin supplier inventory draw of 73 million lbs, inventory days were still at a high of 43 days going into July.

PCW's Barry notes that spot PP prices, which continued to be 2¢ to 3¢/lb lower than contract prices, were starting to stabilize, indicating that prices could be bottoming out.

Greenberg summarizes the spot market this way, "After rallying during the first quarter, spot prices have really taken it on the chin the past couple of months and have now become well discounted to contract levels, providing processors with excellent buying opportunities. Downstream resin and finished goods inventories have been reduced over the past three quarters, and we are seeing an effort to replenish these stocks now that resin prices have come back down again. Generally speaking, PP supply is sufficient and most grades can be found in railcar quantities and at favorable prices."

Polystyrene Price Trends

GPPS	
JUNE	JULY
↓ 3-4¢/lb	↓

HIPS	
JUNE	JULY
↓ 3-4¢/lb	↓

PS PRICES DROP

Polystyrene prices were expected to drop 3¢ to 4¢/lb in June, after dropping 3¢/lb in May, and a pretty substantial decrease was projected for the July-August time frame, according to *PCW*'s Barry and RTi's Chesshier. The key driver was lower-cost benzene, with spot prices by June's end as low as $2.79/gal vs. the June contract price of $3.55/gal. Barry ventures that a PS price decrease of 5¢ to 6¢/lb was possible for July. Chesshier ventured that within July-August, there was the potential for an overall decrease in PS prices of 10¢ to 12¢/lb.

Barry notes that benzene values were pressured by high Asian import volumes and weak downstream demand. Both sources characterized PS demand as significantly down with plant operating rates in the 50% range.

PVC PRICES DOWN, THEN FLAT

PVC prices dropped by 2¢/lb in May and were set to drop by another 2¢/lb in June, and projected to be largely flat in the July-August time frame, according to Paul Pavlov, RTi's v.p. of PP and PVC and *PCW*'s senior editor Donna Todd. The latter reported that industry forecasts changed in the third week of June, with projections of flat pricing for July, up 1¢/lb for August, flat for September and October, and down 2¢/lb for November and down 1¢/lb for December. "Market participants were scratching their heads over the prediction of a 1¢/lb price increase for August, because traditionally demand is moribund in both the domestic and export markets during August," Todd offers. She notes that these participants expected domestic downstream demand to rebound in the September-October time frame, and would have expected any price increase to take place at that time.

PVC Price Trends

Pipe	
JUNE	JULY
↓ 2¢/lb	◀▶

Gen. Purpose	
JUNE	JULY
↓ 2¢/lb	◀▶

Pavlov states that demand was showing a bit of a rebound as housing starts looked better, indicating there was some drawdown of high supplier inventories. However, plant operating rates had been throttled back to the 60% range for most of the second quarter.

PET PRICES FLAT

PET prices were flat in June, after falling by 2.5¢/lb in May, and were expected to be flat in July, based on raw material formulation contracts, according to Mark Kallman RTi's v.p. of PVC, PET and engineering resins. He ventures that prices in August could follow suit, though there was some potential for a decrease. He characterized demand as continued sluggish with resin availability on the high end, despite lower production rates. Moreover, there have been some even better offers for imported PET, which are ample and typically lower cost. Also, several attractive offers could be had in the spot market. PT

PET Price Trends

Bottle Grade	
JUNE	JULY
◀▶	◀▶

Index Still Searching for Growth

But the good news is that June's results were nearly a point above May's.

The Gardner Business Index (GBI): Plastics Processing closed June at 46, roughly a point above May's 45.1 results. The index is based on survey responses from subscribers to *Plastics Technology*. Indices above 50 signal growth; below 50, contraction.

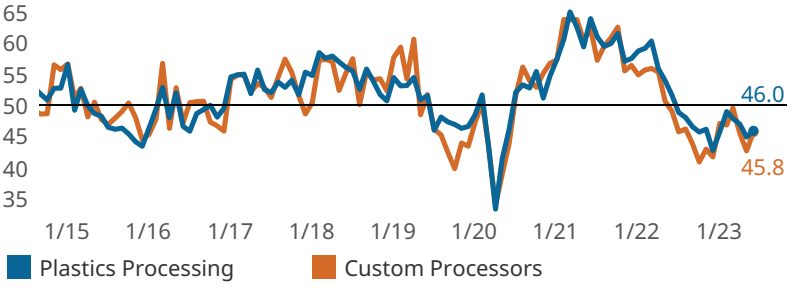
By Jan Schafer

The exports subindex has stabilized; it's been about the same for four months straight. Backlog, new orders and production all contracted again in June, and at slightly faster rates than May. Employment and supplier deliveries slipped ever-so-slightly in June.

As part of our subscriber survey, we ask our audience to share their sentiments about future business conditions. While not part of the GBI calculation, June's responses revealed that more processors believe business will be better for them over the next 12 months compared to those who indicated otherwise.

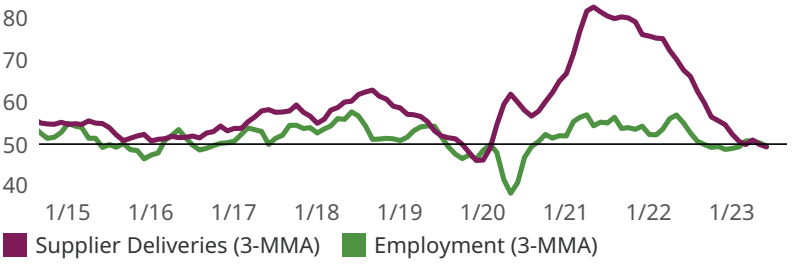
Overall business activity for custom plastics processing contracted again in June, but more slowly, gaining a full 3 points vs. May, putting it back in line with April of this year.

FIG 1 Gardner Business Index (GBI): Plastics Processing



Plastics processing activity contracted in June, but at slower rates than May for both total plastics processing and custom processing.

FIG 2 Employment, Supplier Deliveries Essentially Flat in June



Employment and supplier deliveries dipped their toes on the other side of flat in June. Supplier deliveries have not contracted since February 2020.

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

The unemployment rate in plastics and rubber products manufacturing increased from 1% in May to 1.8% in June. For the second quarter of 2023, the average unemployment rate in this sector was 1%, lower than the total manufacturing average of 2.7%. This is a significant improvement from the 3.7% unemployment rate in Q1 2023.

By Perc Pineda
Plastics Industry Association

The Fed's Industrial Production Index indicates a 2.8% decline in plastics products manufacturing in Q1 2023, following a 3.2% decrease in Q4 2022. There was a slight increase in monthly plastics manufacturing in April and May, but a contraction of at least 1% in May would lead to a third consecutive quarter of decline. The GBI also suggests weaker plastics production throughout the first half of 2023.

These conditions align with the overall macroeconomic situation in the U.S. Despite the Federal Reserve's financial tightening and a less optimistic economic outlook for 2023, the labor market has remained resilient, though there has been an increase in layoff notices in recent months.

Short term, the Fed is likely to raise interest rates, and the resumption of student loan payments will impact personal consumption expenditures. With debt-service payments as a percentage of disposable income increasing, it is expected that economic activity will slow down further in the second half of 2023. This suggests that constraints on growth in plastics production will persist throughout the 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*.

Plastics Technology®

Log On and Learn...For Free

Ensuring Cross-Industry Success: Diversity of Management in Moldmaking

Tuesday, August 15th @11:00 AM ET

PRESENTED BY: Canon CANON VIRGINIA, INC.

It's not easy to find a moldmaking partner who can manage diverse industry needs. But doing so delivers major benefits — from cost savings to reduced time to market — to your business. Canon Virginia Inc. will take you through the expertise and certifications to look for to ensure success across different industry verticals.

PRESENTER
Wayne Daniel, Director of Business Development | Canon Virginia, Inc

REGISTER AT: *short.ptonline.com/Canon-08152023*

Material Selection Techniques to Grow and Improve Profitability

Tuesday, Sept. 12th @2:00 PM ET

PRESENTED BY: GP GENERAL POLYMERS THERMOPLASTIC MATERIALS

Selecting the best polymer for an application can be a daunting task. In this presentation, General Polymers will provide selection guidelines to help narrow down the vast polymer options. The company will review a comparison of physical properties, environmental concerns and final product cost reduction opportunities.

PRESENTER
Scott Knoop | K1 Engineering

REGISTER AT: *short.ptonline.com/GeneralPolymers-0912*

SERIES In-Plant Recycling of Extruded and Molded Scrap for Improved Sustainability

Tuesday, August 1st @2:00PM ET
Tuesday, Sept. 5th @2:00PM ET
Thursday, Sept. 28th @2:00PM ET

PRESENTED BY: Vecoplan®

This three-part series covers the logistics, economics and processing technologies used for reprocessing extruded/molded products, emphasizing the integration of reclaimed materials into the final product and in-house recycling programs.

PRESENTER
Dana Darley, Business Development Manager | Vecoplan

REGISTER AT: *short.ptonline.com/Vecoplan-Series23*

EXTRUSION TOOLING

SPECIAL SERVICES

PT SALES OFFICES

MID-ATLANTIC/NORTHEAST
Lou Guarracino
215/327-9248
Fax: 513/527-8801
loug@ptonline.com

MID-ATLANTIC/NORTHEAST/SOUTHEAST
Madeline Kline, District Manager
513/527-8950
513/488-5040 (mobile)
madeline.kline@gardnerweb.com

CENTRAL US/MOUNTAIN/WEST
Dale Jackman, District Manager
630/345-3469 Fax: 513/527-8801
630/360-5306 (mobile)
djackman@gardnerweb.com

EASTERN GREAT LAKES, INCLUDING CANADA
Jackie Dalzell, Regional V.P.
513/338-2185; Fax: 513/527-8801
216/233-6794 (mobile)
jdalzell@gardnerweb.com

CLASSIFIED/RECRUITMENT ADVERTISING
Becky Taggert, Advertising Production Manager
513/527-8827
btaggert@gardnerweb.com

JAPAN
Toshiro Matsuda , Director of Overseas Operations
Plastics Age Co. Ltd.
03-256-1951

KOREA
Chang-Hwa Park
Far East Marketing Inc.
02-364-4182
Fax: 02-364-4184
femchp@unitel.co.kr

TAIWAN
May Hsiao
J&M Media Corp.
886-4-2296-5959
Fax: 886-4-2293-9730
may@jandm.com.tw
www.jandm.com.tw

CHINA
Erica Chang
Gedy Advertising
86-185-1531-1075
erica@gedyinc.com

INDIA
Paresh Navani
Vogel Business Media India Pvt. Ltd.
91-22-4123-4715
paresh.navani@vogel.de

EUROPE (except Italy/Spain/Portugal)
Simone Mas
Gardner Business Media Inc.
001-856-580-1414
smas@gardnerweb.com

ITALY
Sonia Villani
Globe Trotter sas
39-0532-909396
sonia.villani@gtrotter.it

SPAIN/PORTUGAL
Conchi Aranguren
Neben Consulting
34-600-424223
conchi@nebenconsulting.es

For custom articles, reprints or back issues, email
SClifton@gardnerweb.com

PT Plastics Technology

PLASTICS TECHNOLOGY (ISSN 0032-1257) is published monthly and copyright © 2023 by Gardner Business Media Inc. 6915 Valley Ave., Cincinnati, OH 45244-3029. Telephone: (513) 527-8800. Printed in U.S.A. Periodicals postage paid at Cincinnati, OH and additional mailing offices.

POSTMASTER: Send address changes to Plastics Technology Magazine, 6915 Valley Ave., Cincinnati, OH 45244-3029. If undeliverable, send Form 3579.

CANADA POST: Canada Returns to be sent to IMEX Global Solutions, P.O. Box 25542, London, ON N6C 6B2. Publications Mail Agreement #40612608.

Printed in the U.S.A.

TOBE PACKAGING — SINGAPORE

Flexible-Film Processor Optimizes All-PE Food Packaging

Tobe Packaging's breakthrough was to create its Ecolefin PE multilayer film that could be applied with a specialized barrier coating.

Exceed S mLLDPE is a major part of the Ecolefin all-PE structure as is Aegis's OX2 barrier coating. Photos: ExxonMobil Chemical and Tobe Packaging

By Lilli Manolis Sherman
Contributing Editor

Within the last two years, Singapore's Tobe Packaging aimed to develop an all-PE multilayer film structure for food packaging that would *not* fall short in offering the same kind of protective barrier of multimaterial food packaging and would be much easier to recycle.

The film processor's breakthrough was an all-PE structure to which a barrier coating can be applied. In August 2022, the company's Ecolefin was certified as 97% recyclable by Germany-based Institute cyclos-HTP, one of Europe's leading and recognized organizations for recyclability testing and certification. A month later, when Tobe launched Ecolefin at the international FHA-Food & Beverage Exhibition, interest was sparked from multinational food companies from the United States, South Korea, Switzerland, Spain and Australia.

Tobe Packaging is initially using Ecolefin for frozen food, chilled food and vacuum packaging, but is aiming to "tweak the material's formula" to better suit different products such as easy-to-open snack packaging.

All this is thanks to its close collaborations with ExxonMobil Chemical, and its specialized PE film resins, most notably its new Exceed S mLLDPE, and Singapore's Aegis Packaging, which developed and supplied a specialized O2X barrier coating. The development was headed by Tobe packaging director Lim Zie Hui, whose father established packaging business Lension in 1976, and acquired Tobe in 2019.

Tobe, which has now expanded its products and services beyond Southern Asia to places like Sri Lanka, currently has blown film extruders, printing machines, lamination machines, slitting and bag making machines. Before the end of 2023, the company will be installing two new machines: a printing machine which can operate using water-based ink and a new coating machine.

Says Lim, "Exceed S is a major part in the Ecolefin solution, which provides balanced stiffness and toughness of full PE-laminated structure. Aside from Exceed S, we also utilize the Exceed series mLLDPE to enhance the film sealing performance and the Enable series mLLDPE to improve the film stiffness."

Ecolefin is said to be well suited for frozen food, chilled food and rice packaging. Ecolefin is used to replace the incumbent multilayer laminated structure, particularly nylon and PE laminated film — more specifically, nylon 6 used as a barrier and LDPE used as sealant. The O2X barrier coating developed by Aegis is applied on the film, and Tobe has invested in its own specialized coating machine.

Ecolefin's oxygen barrier is about eight times better than that of the previous film structures. This translates to longer shelf life for food packaged in Ecolefin. Tobe is currently using a third party laboratory to conduct tests to determine how long the material can prolong the shelf life of different food products.

Lim says Ecolefin is 10% to 15% higher in price than nylon 6/LDPE alternative. However, considering the sustainability advantage it offers, Ecolefin presents the opportunity to achieve multiple benefits. With its ability to be sealed at lower temperature, customers can save on electricity consumption and contribute to reducing their carbon footprint. In addition, its monomaterial composition facilitates convenient recycling, further enhancing its eco-friendly attributes.

Tobe is also aiming to design other packaging options, including stand-up pouches, and to "tweak the material's formula" to better suit different products, such as snack packaging that is easier to open. As it moves ahead with Ecolefin, Tobe is exploring how to further its sustainability efforts and bottom line, including the recycling of food packaging into products such as trash bags, by working with supermarkets and third-party collectors. PT

HOPPER LOADERS
STAINLESS STEEL

AUTOMATIC • DEPENDABLE • PRICED RIGHT

CHECK OUR UPGRADED FEATURES SUPPLIED AS STANDARD AT NO EXTRA COST TO YOU!

TAL-15UFXDS
$845.00

450 lbs/hr
3 lb. Hopper Capacity

TAL-6UFX
$895.00

660 lbs/hr
8 lb. Hopper Capacity

TAL-12UFX
$1,090.00

900 lbs/hr
12 lb. Hopper Capacity

FULLY SELF CONTAINED WITH WIRELESS REMOTE CONTROL STANDARD

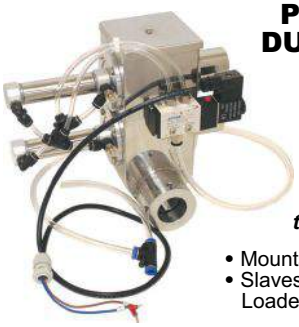
Allows settings from floor level up to 25 ft. distance.

TAL-3U-EFXDS
$1,240.00

450 lbs/hr
4.5 lb. Hopper Capacity

NEW 2 Way Sensing
1. At the Loader Sight Glass
2. Or a Remote Hopper Sight Glass

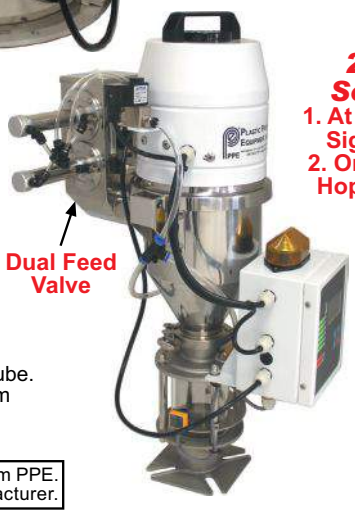
Selector Switch for 2 Way Sensing



PROPORTIONAL DUAL FEED VALVE
TPV-38-CFX
$550.00

Converts all PPE TAL-FX Series Vacuum Loaders to Dual Feed Function.

- Mounts directly onto loader inlet tube.
- Slaves off all PPE TAL-FX Vacuum Loader Control Boxes.



Our PPE Vacuum Loaders are a PPE exclusive only available from PPE. Do not confuse these with any other make, model or manufacturer.

Quality Products, Fair Prices & Best Service since 1974

PLASTIC PROCESS EQUIPMENT, INC.

EAST
8303 CORPORATE PARK DRIVE
MACEDONIA, OHIO 44056
216-367-7000 • FAX: 216-367-7022
Toll Free: 800-321-0562

WEST
6385 MONTESSOURI STREET
LAS VEGAS, NEVADA 89113
702-433-6385 • FAX: 702-433-6388
TOLL FREE: 800-258-8877

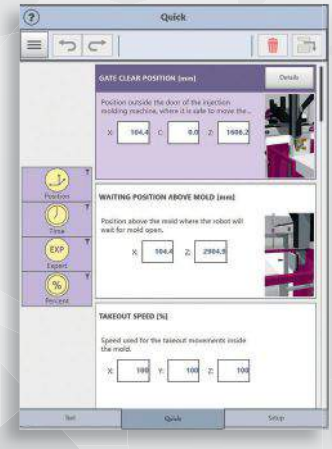
www.ppe.com
e-mail: sales@ppe.com
Toll Free: USA, Canada & Mexico
800-362-0706
Order Fax: 800-223-8305

WITTMANN's New R9.1 Controller

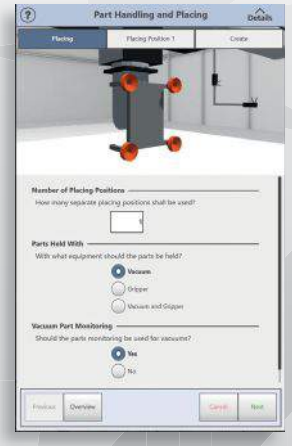
Robot Programming Made Easy

Packed with many features to allow for quick easy programming, cycle time savings and other smart features.

- R9.1 QuickNew Program Wizard. Program your robot by answering simple questions
  - Quick New allows for simple pick and place and more complex programs to be wrote in minutes
- R9.1 QuickEdit allows for easy parameter adjustments with lead through graphics
- R9.1 has many Smart features:
  - SmartRemoval, to help save cycle time
  - Replay, to help troubleshoot robot programming virtually
  - Torque Limited moves, to help reduce robot crashes
  - Safety Areas, to set areas within the robot path to reduce crashes
  - EcoMode, to help reduce and save on energy
  - From 6 to 2250 US TONS



WITTMANN's R9.1 QuickEdit



WITTMANN's R9.1 QuickNew Wizard

Contact Us Today!

@WittmannUSA

WITTMANN USA, Inc
Tel: 860 496-9603 | info.us@wittmann-group.com

Midwest Tech Center
South Elgin, IL | Tel: 847 531-0015

West Coast Tech Center
Placentia, CA | Tel: 860 496-9603

WiConnect! on your side
You can reach us when you need us!

Download our NEW App today

world of innovation
www.wittmann-group.com