SPE®

# BLOW MOLDING QUARTERLY

*A Journal of the Blow Molding Division of the Society of Plastics Engineers*

Second Quarter 2017
Volume 01 | Number 02

Photography by Mark Richardson, Series One, LLC

# Lew Ferguson accepts grand prize for FGH at ANTEC 2017

**IN THIS ISSUE:**

BLOW MOLDING DIVISION

CHICAGO 2017

## October 2nd to 4th, 2017 Chicago (Oak Brook), Illinois

# *Innovating, educating and sustaining the future of Blow Molding"*

**Plan now to attend The Premier event in the Blow Molding industry!**

This year the Blow Molding industry will meet at The Doubletree by Hilton Hotel Chicago Oak Brook. While it is the 33rd Annual Blow Molding Conference, this event has proven to be the event for innovation and latest technical developments. Featuring industry leaders who will offer insights on topics in packaging, automotive and industrial applications, machinery and design innovations, business trends, market opportunities, advanced materials and processing.

Chicago is a convenient and business friendly location for the ABC 2017. Put these important dates in your calendar now! Access our web site for regular updates and agendas.

Click here for the ABC 2017 website.

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- Overview of North American resin markets
- Technical and business overviews
- Industrial and automotive materials and applications
- Packaging machinery optimization
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## Conference Venue:

Doubletree by Hilton Hotel Chicago Oak Brook
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Phone: (630) 472-6000

Attendees and participants receive a discounted room rate of $159 USD. Click here to make your reservation now: ABC 2017 Hotel Reservations

For more information, to register, or to make reservations visit the Division web site at: www.blowmoldingdivision.org

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## DEADLINES for 2017 Copy and Ads

FEB 15 Spring
MAY 15 Summer
AUG 01 Fall
NOV 15 Winter

*All artwork to be sent in .eps or .jpg format with **minimum 300dpi resolution**.*

SPE BLOW MOLDING QUARTERLY

**Second Quarter 2017 | Volume 01 | Number 02**




***Cover Photograph:*** *Lew Ferguson accepts the Plastics For Life Grand Prize on behalf of Eric Hohmann of FGH Systems during ANTEC 2017.*

Cal Becker

# Spring 2017– Our Glass is Half Full

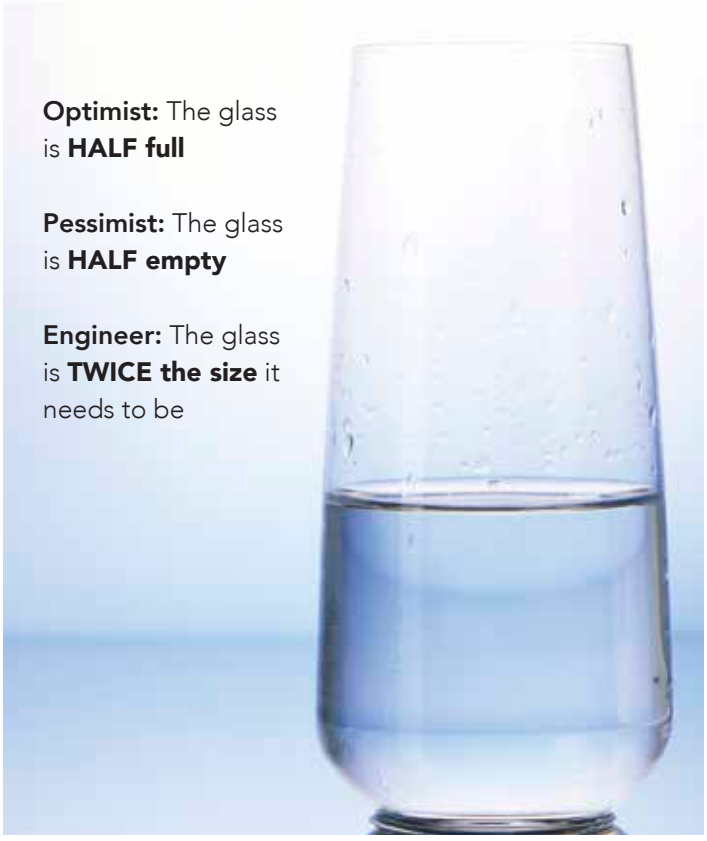
We are well into 2017 and we have much to accomplish to stay aligned with our mission: *Promote, communicate and disseminate knowledge relating to the art and science of blow molding technology.*

The winter meeting in Atlanta, Ga., was well attended and our goals were met. The winter meeting is where we challenge each other to deliver new technical topics for our October Blow Mold Conference as well as take care of board business including our budget and board positions. I'm very pleased to announce that Dr. Geoff Ward has been elected Chairman elect. Geoff's election will significantly support the mission of the Blow Molding Division. Geoff has lead our divisions education Committee, now known as our Knowledge & Technology Group, for several years. Please congratulate and support Geoff for his voluntary effort. Also, we have two new blow mold board members; Todd Hogan and Sam Crabtree. Soon, Mark Heitker will be moving to an Emeritus member and Dr. Mohammad Usman will serve as a Brand Council member.

By the time this Journal is published the 75th SPE ANTEC in Anaheim Ca. will be history and I'm hoping I will have connected with many throughout all of the SPE divisions. I'm very excited and pleased that two of our long standing board members were awarded for their numerous SPE and blow molding accomplishments. The first is Ben Lopez as he was recognized as an SPE Honored Service Member. This SPE National honor is well deserved and not easy to qualify for or to be chosen by the SPE National committee. Those who know Ben recognize the Honored Service Member status was earned and well deserved for his many years of service and blow mold accomplishments. The second is John Rathman who was recognized as an Honored Service Member a few years ago and is now awarded as a Fellow of the Society. John was sponsored by Don Peters also a SPE Fellow, Honored Service Member and Blow Mold Emeritus board member. The amount of effort it takes to nominate a person doesn't measure up to the list of life accomplishments to become a Fellow of the society. Please take the time to congratulate both Ben and John for their past and future effort along with their new National SPE status.

Our Spring Board meeting is in Chicago, Illinois. where we begin the final work for our 2017 October Annual Blow Mold Conference agenda while holding the meeting at the same location. My ask? Please feel free to offer ideas to any Board member on how we as SPE volunteers can effectively deliver our blow mold mission whether it is done via sponsorship or thru high quality content for our ABC or Blow Mold Technical Journal. ■

*Cal Becker*



# SPE Names Honored Service Members and Fellows at ANTEC 2017

**Anaheim, Calif.** — The Society of Plastics Engineers named members of the Blow Molding Division honored service member and fellow during the society's ANTEC 2017 conference in Anaheim.

The newly elected honored service members and fellows were recognized at a May 7 dinner:

Photography by Mark Richardson, Series One, LLC

Benjamin Lopez was elected honored service member of the society. Only 325 members, including the current inductees, have received Honored Service Member recognition since the honor was established in 1992. To be chosen, a candidate must have demonstrated long-term, outstanding service to, and support of, the Society and its objectives. Benjamin was nominated by the Blow Molding Division.

Benjamin has a 30-year career in blow molding machinery, working for the manufacturers of Kautex, Battenfeld Fischer, Uniloy Milacron and Bekum machines. He joined the board of directors of the SPE Blow Molding Division in 2004, and has served as chairman, secretary and treasurer. During his time as chairman and past-chairman, the Blow Molding Division has increased its recognition in the industry considerably and raised attendance and the number of exhibitors at the ABC conference, SPE said.

Plan now to attend the **33rd Annual Blow Molding Conference and Exhibits October 2–4, 2017** at Doubletree by Hilton Hotel, Chicago, Illinois
Visit www.blowmoldingdivision.org for updates!

Lopez implemented, directed and worked on a special education committee of the division board to develop a blow molding training class as a technical community college, and establish a blow molding training program.

John Rathman was elected fellow of the society. Only 325 members, counting the newest inductees, have been elected Fellows since the honor was established in 1984. Candidates for the Fellows honor must be sponsored by an SPE Division or Special Interest Group. The SPE Fellows Election Committee considers eligible candidates based on personal history as well as written sponsorships from two SPE members. John was nominated by the Blow Molding Division.

Photography by Mark Richardson, Series One, LLC

John is a principal blow molding specialist at Chevron Phillips Chemical Co.'s Plastics Technical Center in Bartlesville, Okla. Over a 40-year career, he has worked in various technical areas of blow molding, including the development of automotive fuel tanks, use of barrier technologies for fuel tanks, moving-section molds for blow molding irregularly shaped parts, improvement of natural color of polyethylene through additives, and the development of high-performance PE resins.

Rathman has five U.S. patents and more than 20 publications and conference presentations. He has been an active director for the SPE Blow Molding Division since 2003. ■


**Bethel, CT U.S.A., May 12, 201** — During this week's ANTEC® 2017 plastics technical conference in Anaheim, CA, SPE (Society of Plastics Engineers) honored plastic products that meet the ultimate test of value by making our lives better in some way. The annual ANTEC is SPE's largest event and the world's leading plastics technical conference. A panel of judges selected the winners of the 4th annual Plastics for Life™ Global Parts Competition from among a wide range of parts that had already won in competitions at previous SPE events during the past year. In addition, a People's Choice award was presented to the part that received the greatest number of votes from ANTEC attendees.

**GRAND PRIZE**: FGH Systems-1000ml PleurX Drainage Bottle—automatically helps patients safely and efficiently drain fluid build-up from recurrent pleural effusions and malignant ascites at home in only 5 to 15 minutes without the need for gravity.
*Competition Winner: 4th Annual SPE Blow Molding Division Parts Competition, Pharmaceutical Category 1st Place, Packaging Division 2nd Place*

**SUSTAINING LIFE**: General Motors-2016 Chevy Equinox & GMC Sierra Engine Cover Insulator—under a General Motors developed resource conservation and job creation program called "Do Your Part", 1.2 million water bottles from General Motors' Michigan facilities as well as 2 million bottles generated by the Flint Michigan contaminated water crisis were recycled through a complex supply chain. The recycled PET was processed into fleece used in the 2016 GM Equinox Terrain V-6 engine covers. Other uses of this material include air filters for GM plants and insulation in coats that double as sleeping bags for the homeless manufactured by formerly homeless people as part of a jobs training program.
*Competition Winner: SPE Automotive Division Innovative Awards Gala – Environmental Category Winner*

**PROTECTING LIFE**: Profile Plastics, Inc.-Surgical System Cover Set – Front Cover Assembly & Top Cover—A pressure formed housing for a surgical waste management system used in hospital operating rooms. Manufactured using negative tools, resulting in high cosmetic appearance with many molded in features to reduce assembly time. The front cover has seven vacuum-formed and three pressure-formed parts, with a total of seven pneumatic slides. The top cover has five pneumatic slides. All tools are machined aluminum and temperature controlled. Both molds have in-mold, acid-etched texture. The top and front covers are formed from Kydex-T acrylic/PVC sheet. The clear windows are polycarbonate.
*Competition Winner: SPE Thermoforming Conference –Heavy Gauge Pressure Formed-Gold, People's Choice Award.*

**QUALITY OF LIFE**: Plastic Technologies Inc./Yumix LLC-Clasper Bottle—a combination of two polyethylene terephthalate (PET) containers and a shrink label. The bottom holds 50 ml of premium alcohol and features a heat-applied aluminum-foil seal. The main bottle holds 6.5 ounces of hot-filled, shelf-stable juice and is topped by a 38-mm polypropylene closure. To use, the consumer simply separates the shrink sleeve at the seam between the top and bottom containers, via a perforation, unsnaps the bottom container from the base of the primary bottle, removes the heat seal and closure from the bottom and top components respectively, and pours the alcohol into the juice.
*Competition Winner: 4th Annual SPE Blow Molding Division Parts Competition, Beverage Category 1st Place, Packaging Division 2nd Place.*

**PEOPLE'S CHOICE & IMPROVING LIFE**: John Deere-John Deere Backhoe HVAC Under Floor Duct—manufactured in two pieces utilizing the JD VBM process with a foam additive. The two parts are IR welded to

complete a one-piece air distribution system located below the cab of the John Deere Backhoe cab. The foam additive is utilized to create a large bubble structure, creating an insulation barrier from the cooled air. Production of this part resulted in both cost and inventory reduction. *Competition Winner: 4th Annual SPE Blow Molding Division Parts Competition, Industrial Division 1st Place, Industrial Auto/Trans Category 1st Place.* ■


Visit the SPE's website for photos of the 2017 Plastics for Life global parts competition at http://www.4spe.org/Events/Content.aspx?ItemNumber=26725

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# Where do our polymers come from?

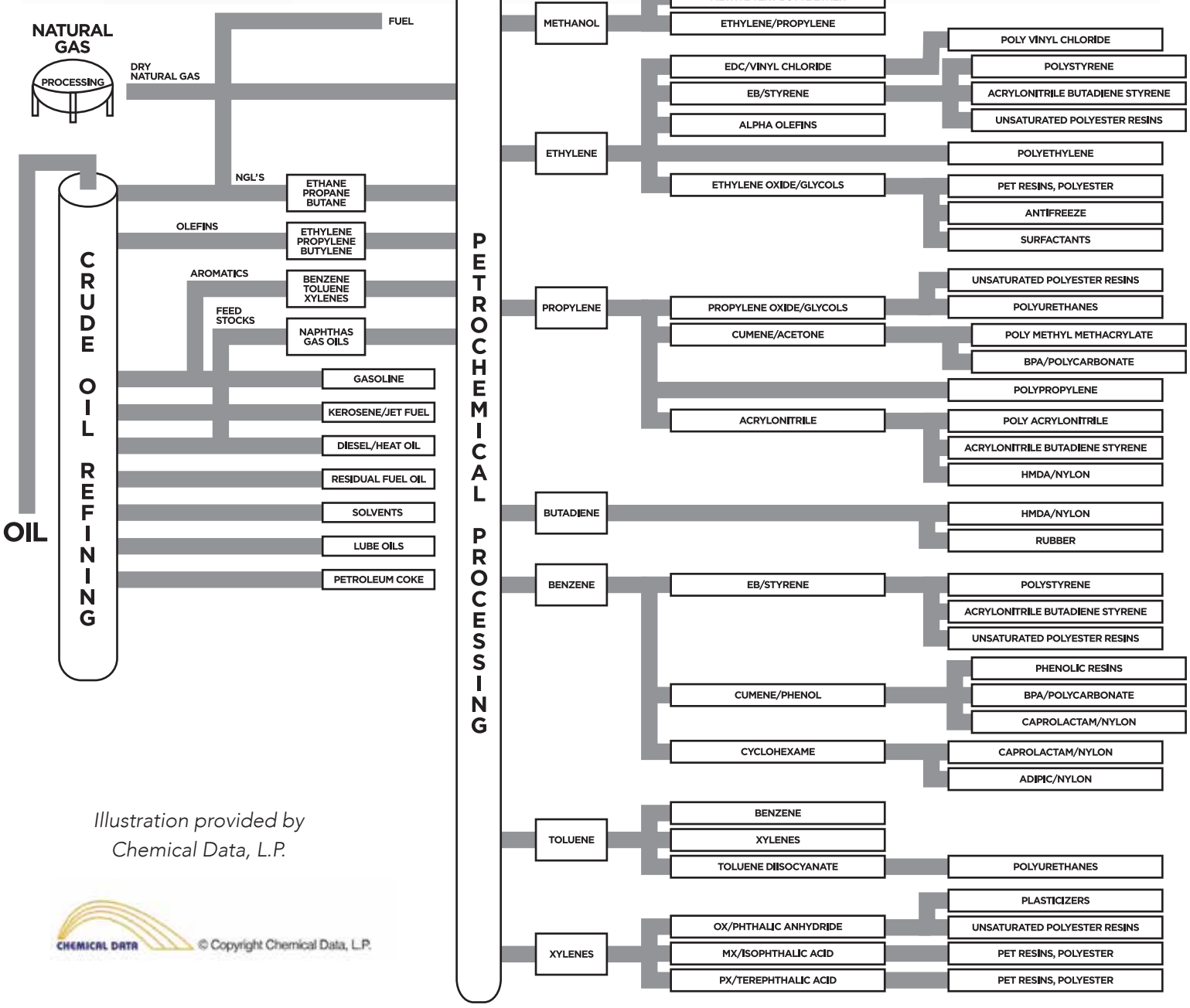



*Illustration provided by Chemical Data, L.P.*

# Survey: 9 in 10 processors say workforce top issue for 2017

By Steve Toloken, *Plastics News*

A new survey says workforce development has shot up the ranking of challenges facing plastics firms in the last five years. Now 92 percent of executives say it's a top issue. That's double what it was in 2012, when 45 percent of executives ranked it as a key challenge, according to the 2017 State of the Industry Report from the Indianapolis-based Manufacturers Association for Plastics Processors. Even with the heightened concern, it's not clear that companies are responding with big increases in spending on workforce development and training. There's some evidence that companies are directing more spending to automation.

The survey, mainly of small and mid-sized plastics processors, said executives rank investments on expanding capacity, automation and continuous improvement as the top three spending priorities, ahead of workforce development.

"I had also anticipated seeing workforce development higher on the [spending] priority list here," said Ashley Turrell Burleson, MAPP's director of industry benchmarking. But she said that association members have "explained it to me this way, 'It is an easy problem to identify, but the solution is very complex.'"

*Figure 1: Adac Automotive hosted 38 students from the Muskegon Area Tech Center at its Muskegon, Mich., plant during Manufacturing Day events in 2016.*

She said, for example, that it's not as easy to calculate return on investment on staff or training as it can be on new equipment.

"With all the advancements and changes happening right now in the industry, there just isn't a one-size-fits-all solution for recruiting or training individuals," she said. "In many of the conversations I have had with members, patience and timing is key here. Recruiting people and changing perceptions about manufacturing isn't an overnight solution."

Still, even if companies are not sure how to address the problem, the association said executives "overwhelmingly" put challenges with workforce development ahead of their second-ranked problem, new business development and sales growth, which scored 27 percent.

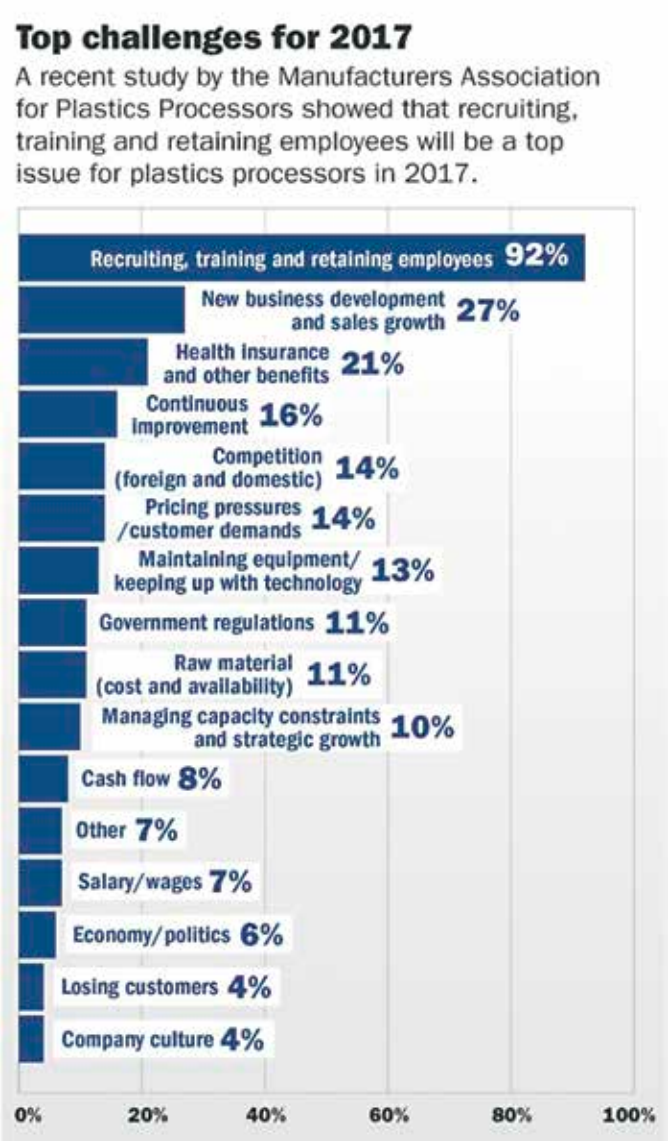
"To no surprise, workforce development challenges trump all others when respondents were asked to identify their top three challenges, issues or problems to be addressed by executive teams in 2017," the report said, noting that workforce has been the top issue for six years.

"The focus on this area has become increasingly high," it said. "In six years, the percent of plastics processors who are focusing on workforce development in some capacity as a top challenge for their company has more than doubled."

Terry Minnick, president of consulting firm Molding Business Services Inc. in Florence, Mass., is not surprised. As business conditions improve, challenges shift from finding new orders to finding workers to meet those orders. "Many people out there who have a reasonable business are doing better than they have in a long time," he said. "In 2008 and 2009, no one talked about how difficult it was to find workers."

MBS, which advises plastics clients on both recruiting and mergers, said companies can have problems recruiting skilled staff, he said.

"A lot of people have had so much trouble finding people they have turned to other things," including more automation, Minnick said. "In the plastics space, there is full employment now."




Another plastics industry recruiter said the survey reflects that companies are identifying workforce issues as a need, but it may not have risen to critical levels.

"Managers are saying, 'This is what I need, workforce development, but I'm not ready to pay for it,'" said Dennis Gros, president of Gros Executive Recruiters Inc. in Franklin, Tenn. "I don't mean to be critical. … It's a function of profitability. Profitability is hard to come by."

Pressure on profit has kept wages down, he said, even as companies report problems finding workers, which should push salaries up. But he does see pressure growing in 2017 for "slight upward" wage pressure.

Gros said the MAPP poll results also may reflect the experience and more limited resources available to small and mid-sized companies. He noted that 83 percent of the respondents came from companies with $50 million or less in annual sales.

"If you're in the plastics business, it's obviously capital-intensive," he said. "You put another machine on the floor, you've made a significant statement of growth. It may impress the next customer.

"When you make an investment in the workforce, it is an intangible investment that the bank won't recognize and your customers may not recognize," he said.

The survey also reported on economic conditions, with a general sense that "plastics manufacturers are anticipating increased or steady business activity and sales," according to the report.

More than 90 percent of the respondents said they expected first-quarter business activity to either remain the same or increase.

## Have an idea for an article?

### Submission Guidelines

- We are a technical journal. We strive for objective, technical articles that help advance our readers' understanding of blow molding (process, tooling, machinery, ancillary services); in other words, no commercials.
- Article length:1,000 - 2,000 words. Look to past articles for guidance.
- Format: .doc or .docx Artwork: hi-res images are encouraged (300 dpi) with appropriate credits.

Send all submissions to George Rollend, Editor, at grollend@dakamericas.com

# Closing the Skills Gap: Creating Workforce-Development Programs that Work for Everyone

By Martha Laboissiere and Mona Mourshed,
McKinsey & Company

*Editor's Note: We are pleased to offer our readers this reprint from McKinsey & Company's Social Sector Practice.*

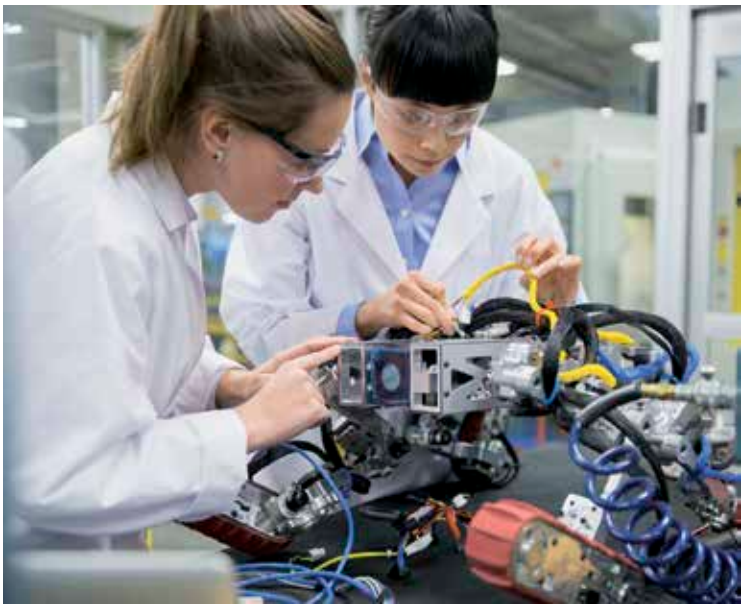
The "skills gap" in the United States is serious. Here is how to do better.

"The land of opportunity"—that is the promise of the United States. And one of the reasons the country has been able to deliver on that promise is that it has been able to develop the talent it needs to create wealth and to adapt to ever-changing economic realities. But there are concerns that the United States can and should be doing better. This will require policies and actions on many fronts, for example on trade, taxation, regulation, education, and fiscal and monetary policy. In this article, we focus on a single subject: preparing people without college degrees for jobs with promising career paths. The need, for both business and society, is clear.

On the one hand, almost 40 percent of American employers say they cannot find people with the skills they need, even for entry-level jobs. Almost 60 percent complain of lack of preparation, even for entry-level jobs. On the other hand, this "skills gap" represents a massive pool of untapped talent, and it has dire consequences, including economic underperformance, social unrest, and individual despair.

The skills gap takes different forms. In some cases, it is a matter of youth struggling to enter the workforce; in others, it is midcareer learners who have lost their jobs because of factory closings or layoffs, and who now must adapt. Whatever the circumstance, when people are disconnected from the workplace, they often disconnect from other social institutions as well. This is not healthy—neither for those left out nor for the societies in which they live.

Recognizing the importance of this subject, McKinsey & Company has done extensive research on global workforce-development programs and economic strategies.[1] We have also worked with a number of state, local, and national governments.



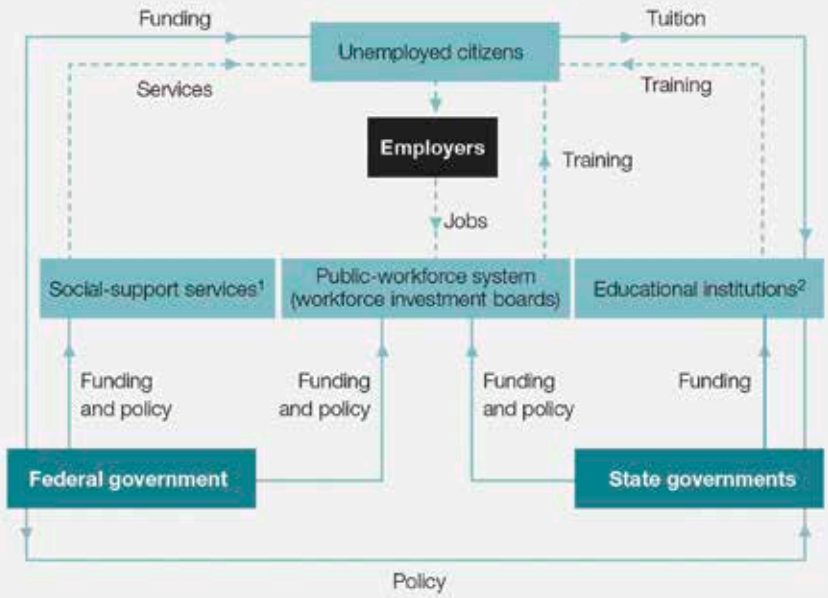
So based on our research and experience, we have identified five principles that we believe should be the foundation of workforce-development programs—for funders, participants, and employers (Exhibit 1).

***1. Define geographic assets and identify target professions.*** To get where they want to go, state and local agencies need to know where they are starting. Even at the local level, economies are complicated.

The most promising approach, then, is to identify sectors with high growth potential where there are shortages or a high turnover of workers. Governments should conduct job-market analyses to identify each area's distinctive attributes and supply-and-demand dynamics, as well as the current state of the workforce. This means looking at posted job vacancies, public infrastructure investment, demographics, local university-research commercialization, venture-capital spending, and regulation. The analysis should be done at the city and regional levels, and then buttressed by interviews with major companies in the area.

We have found the best workforce-development solutions happen when leading employers come together to address the talent problem for an entire sector. Assuming there are no antitrust issues, such collaborations can be attractive to

**Exhibit 1** **The US workforce-development system involves numerous stakeholders.**




[1]Such as child care and transportation.
[2]Including universities.

industry competitors because the training costs are shared and the risk of poaching is limited. Such efforts typically take three forms: down a supply chain, with an anchor company taking the lead in encouraging its suppliers to participate; by a functional profession (for example, mechatronics) that is in demand by employers in different industries in the same location; and by sector, with competitors collaborating because they all face the same talent problem. One example of the latter is the Automotive Manufacturing Technical Education Collaborative, which includes 19 automotive companies and 26 community colleges in 13 states.

In addition, government must ask itself whether it has the capabilities to meet the needs of businesses. This can be done simply—ask. Then, based on the responses, work with industry leaders, education providers, government agencies, and trade associations to identify the highest priorities on which to focus.

Successful economic-development efforts develop long-term strategies and make investment decisions based on hard data. A clear-eyed view allows decisions to be made based on a region's actual strengths, and avoids chasing economic development fads where there is no basis for competitive advantage. The advice is ancient, but pertinent: know thyself.

***2. Deliver ROI to employers and workers.*** Hard evidence of return on investment (ROI) for workforce-development programs is scarce, for both employers and workers. That lack of proof is why many employers are reluctant to participate in workforce programs, much less to pay for them. Therefore, metrics that link such programs to business performance should be tracked, including the cost of program recruitment and training, employer productivity and quality outcomes, retention, and speed to promotion.

Recent federal legislation, known as the Workforce Innovation and Opportunity Act (WIOA), aims to make the workforce-development system more outcome driven and to emphasize training that leads to jobs. Gathering employer ROI data is not only important for employers but can also help local agencies meet WIOA requirements.

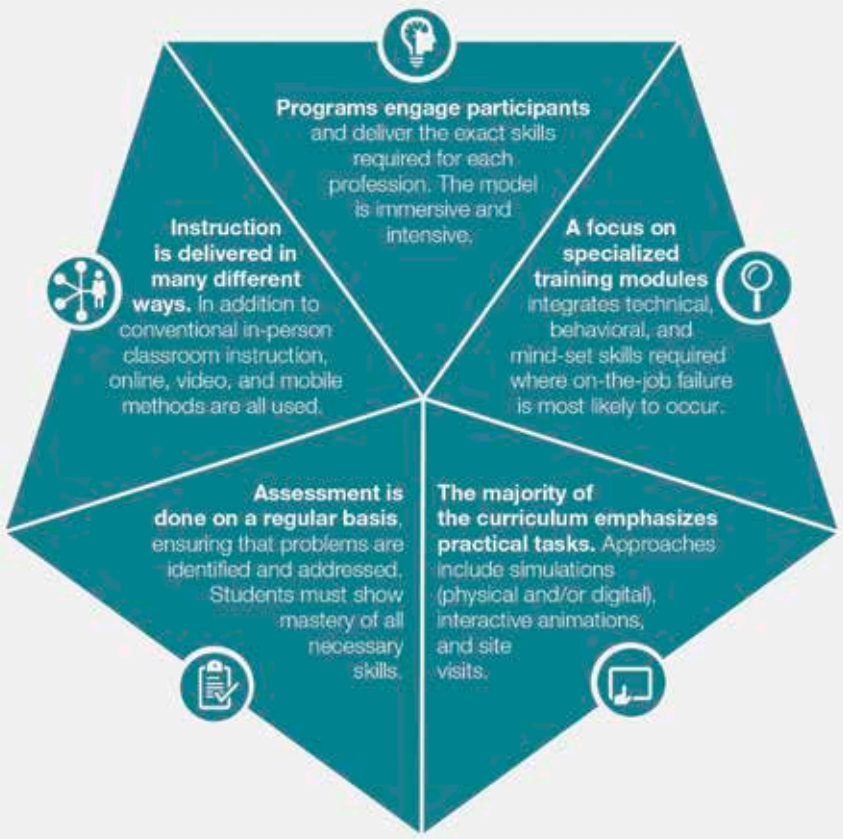
If the ROI case can be proved, our research and experience shows that employers are willing to pay for training programs— up to 15 percent (or roughly two months) of the employee's annual salary, on average. In areas of extreme scarcity, they will do much more. Apprenticeship 2000, a consortium based in Charlotte, North Carolina, comprises eight manufacturers that collaborate with the local community college on a mechatronics apprenticeship. It costs members $175,000 per candidate over four years.

With respect to participants, few employment programs gather evidence of effectiveness. Some track job placement at completion, or retention after one to three

months. Few programs, however, follow a range of metrics to show potential participants that their investment in time and effort will pay off with personal and financial wellbeing. No wonder many job-training candidates are wary. Successful programs, in contrast, can show candidates evidence that the program will place them in jobs with a future after finishing the course.

Once on the job, metrics to track include the income of program graduates before and after completion, continued employment, job promotion, and reliance on public support. These findings can help reveal what works—and just as important—what doesn't. Programs that fall short can then be cut in favor of those that succeed.

Exhibit 2 **Effective training incorporates five components.**




***3. Support comprehensive, demand-driven training methods.*** Local, state, and federal agencies have made numerous efforts to work with businesses, regional groups, education providers, and other stakeholders to deliver effective job training. Some training programs are excellent— others, not so much. Evidence does exist, however, of models that work in a variety of industry and regional contexts (Exhibit 2).

In successful programs, employers are involved from the start and guarantee interviews for graduates. Once providers decide which sectors and which high-scarcity or high-turnover professions to pursue, the next step is to shadow employees on the job in those professions. The goal is to identify which activities most differentiate high from low performers and to translate this insight into training for the right technical, behavioral, and mind-set skills which include attributes such as punctuality, diligence, and follow-through). Such observation is important, because our experience is that many employers are unable to accurately describe which skills matter most, leading to errors in program design.

In delivering training, one proven approach is to provide two- to three-month "boot camps." During the boot camp, competency is assessed regularly, based on actual demonstrations. Employers collaborate with the training providers and can offer their staff as trainers. The boot camp must be practical, including in-person simulations, on-site apprenticeships, and "serious games" customized to the workplace, where learners can play virtually and repeatedly. Programs need to have a strong in-person component to deliver the necessary dosage of intensive practice and to build the trust that allows providers to support learners—many of whom face multiple life challenges. At the same time, technology-based solutions, such as online applications, mobile apps that track learner performance, and digital workplace simulations can significantly increase the efficiency and effectiveness of these in-person programs.

To reach the people who need these programs most—

meaning those at risk of being disconnected from the workforce because of background or education—accessibility is critical. Meeting their needs for transportation or child care during the boot camp, for example, helps make it possible for them to succeed. Programs that respond to these needs see higher completion rates. Some go even further, providing postgraduate mentorship for the first few months on the job, which is the period of greatest vulnerability. If individuals can make it through the first three months on the job, the odds of them continuing to thrive professionally and personally rise significantly.

4. Assess and prepare learners before they start training. Programs need to start by ensuring that learners are ready to train for the professions to which they apply. For example, they must be able to meet job-licensing requirements, such as having a high-school diploma, or pass a background check or a drug test; they also need to show jobappropriate literacy and numeracy levels.

Once this basic screening is done, there are ways to improve retention in the program and in the job. One is simple: make sure that people know what the job is before they start the training. This explanation must cover both positive and negative aspects, and might include things such as showing videos, hosting discussions of a "day in the life" with workers, and spending time at the job site. Someone training to be a certified nursing assistant, for example, needs to know that the position can be physically demanding and requires shift work.

When people understand what it takes to succeed at a given job, they are more likely to choose one that is right for them. That, in turn, improves program completion, job placement, and retention. It also ensures that program resources are spent on those who are most likely to benefit.

***5. Coordinate the workforce-development process centrally.*** Estimated spending on US workforce-development programs for those not going to four-year colleges—everything from federal and state jobs programs, workforce training and certifications, community college, and employer training—is at least $300 billion a year.[2] Most programs, however, are deployed in isolation and are not integrated with other services deployed by other entities. For example, a common scenario is that responsibility lies in different places: job training lies with the state's workforce department, child care and food assistance lies with the social services, and mentorship support lies with a local philanthropy or not for profit. All these components are essential to the learner's success in completing the training, finding a job, and then succeeding at it. Such tight complementarity of service delivery to learners, however, rarely occurs.

State governments can deploy three strategies to ensure effective use of resources. First, have a clear view of all funding and efforts available for target learner segments and professions in a given location, and coordinate these to deliver holistic services to learners. Second, establish a set of outcomes and performance-management processes in which learner employment within 30 days of program completion, retention on the job, and income increases lie at the heart. Finally, ensure the provision of human, technology, and data-analytics capacity for program delivery that supports learners.

State and local public agencies want to help their citizens succeed. To do so, one priority is to better use the considerable resources that are available, by coordinating the mishmash of funding that now flows through numerous departments and agencies. A second is to improve job outcomes for program participants and employers in the WIOA context. A third is to do so on a large scale and at reasonable cost. There are proven ways to do this that benefit individual workers, companies, and the economy as a whole. By investing in talent in this way, governments and businesses will also be reinvesting in the American dream.

**References**

1. Dominic Barton, Diana Farrell, and Mona Mourshed, "Education to employment: Designing a system that works," McKinsey & Company, January 2013, McKinsey.com.

2. Anthony P. Carnevale, Artem Gulish, and Jeff Strohl, College is just the beginning: Employers' role in the $1.1 trillion postsecondary education and training system, Georgetown University Center on Education and the Workforce, 2015, https://cew.georgetown.edu/wp-content/uploads/2015/02/Trillion-Dollar-Training-System-.pdf.

# Loews buying Consolidated Container

By Jim Johnson

Consolidated Container Co. is being sold by one financial powerhouse to another in a $1.2 billion deal that's expected to serve as a springboard for growth for the new owner. Bain Capital Private Equity is selling the Atlanta-based rigid container maker, with nearly 60 locations, to Loews Corp. CCC makes packaging for markets including beverage, food and household chemicals. Loews, controlled by the well-known Tisch family out of New York, likes the stability of packaging and created Loews Packaging Group to delve into the business.

"We have been analyzing the packaging industry for some time because it fits our key acquisition criteria: It's a fragmented industry that generates strong cash flows and we believe it is unlikely to be subject to major technological disruption," Loews CEO James Tisch said in a statement. "CCC is an outstanding company with a highly professional management team that can serve as a platform for growth, both organically and through acquisitions."

Bain Capital is a Boston-based investment firm the acquired CCC in 2012 for $800 million from Vestar Capital Partners. CCC, itself, grew out of Vestar's purchase of Reid Plastics Inc. and the packaging group of Suiza Foods Corp. to become a big player in the blow molding business. CCC, since being purchased by Bain, has added to the company through acquisitions, including a 2014 deal for plastic recycler Envision Recycling Group, the second-largest high density polyethylene recycler in North America.

And it was just late last year that he company acquired the assets of Bottles Unlimited Inc. of Denver, a beverage container maker. CCC also acquired Semopac of Longueuil, Quebec, which primarily makes 3- and 5-gallon polycarbonate water bottles for home and office use, in 2016. CCC is the seventh-largest blow molder in North America with estimated annual sales of $820 million, according to the latest Plastics News ranking. Sean Fallman became CEO of the company in 2014. "I have every confidence that Loews will be an excellent partner for CCC as we continue to invest in differentiated capabilities to best serve our customers," he said in a statement. Bain is a giant investment firm with some $75 billion in assets and was co-founded in 1984 by former Massachusetts governor and presidential candidate Mitt Romney.

Loews has three publicly traded subsidiaries: CNA Financial Corp., Diamond Offshore Drilling Inc. and Boardwalk Pipeline Partners LP. It also owns Loews Hotels & Co. Loews is using about 50 percent cash and 50 percent debt to financial the deal, which is expected to close in the second quarter. "CCC will serve as a robust growth platform for Loews in the packaging industry," the company said.





# Dymotek named Processor of the Year

By Plastics News Report

*Norm Forest of Dymotek*

Naples, FL. —Dymotek Corp., a custom injection molder that specializes in liquid silicone rubber and two-component molding, received the award at a dinner March 29 at the Plastics News Executive Forum at the Naples Beach Hotel & Gold Club.

*Plastics News* ran a profile about Dymotek in the April 3rd issue.

Dymotek, based in Ellington, Conn., prevailed over the other finalists: General Plastics Inc., a Milwaukee thermoformer; Petoskey Plastics Inc., a blown film manufacturer based in Petoskey, Mich.; and Trilogy Plastics Inc., a rotational molder in Alliance, Ohio.

Also at the awards banquet, Plastics News named three winners of the PN Excellence Award. Plastek Industries Inc., a custom injection molder based in Erie, Pa., won the award for industry and public service. The PN Excellence Award for customer relations went to Revere Plastics Systems L.L.C., a custom molder based in Clyde, Ohio. The third PN Excellence Award, for employee relations, went to custom extruder Engineered Profiles L.L.C. in Columbus, Ohio.

Plastics News also announced the winner of its Sustained Excellence Award: Plastikos Inc., a custom molder in Erie, Pa. The Sustained Excellence Award goes to last Processors of the Year. Plastikos won the Processor of the Year Award in 2010.

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## Educational Grants

The SPE Blow Molding Division continues to support all educational institutions seeking funding for the purchase of blow molding machinery, equipment, tooling, controls or educational training resources to benefit students.

**For further details, visit: www.blowmoldingdivision.org**

# It's official: Americans drank more bottled water than soda in 2016

Bottled water has overtaken carbonated soft drinks as the most popular beverage in the U.S., a sign that consumers' desire may finally be turning to nature's original healthy, low-calorie drink option.

Liquid Refreshment Beverages 2016 data collected by Beverage Marketing Corporation indicates for the first time consumption of bottled water is now higher than Carbonated Soft Drinks (CSD). While the consumption of water has been steadily increasing over several years, CSD consumption has been slowly declining.

"Total bottled water volume grew from 11.8 billion gallons in 2015 to 12.8 billion gallons in 2016, an increase of nearly 9%, which marked the third year in a row of accelerating growth," according to the report.

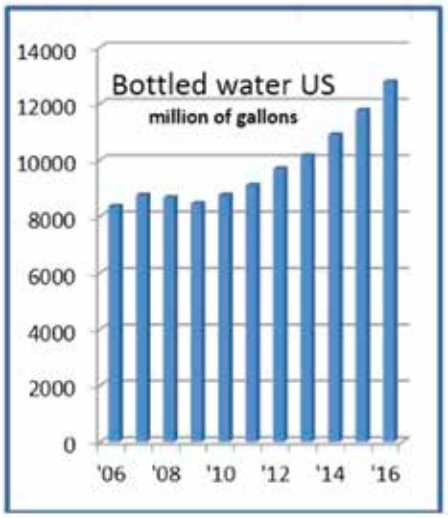



*Figure 1*

As the Wall Street Journal points out, soda was still the big money-maker ($39.5 billion versus $21.3 billion for water) and Coca-Cola and PepsiCo also control the country's two most popular bottled water brands Dasani and Aquafina. You cannot topple Big Soda but you can circumnavigate it.

The 12.8 billion gallons of bottles water sold in the US in 2016 represent consumption of 39.3 gallons per capita. CSD consumption dropped to 38.5 gallons continued in line with the trend of just over 1% decline per year.

The drop in bottled water consumption between 2007 and 2009 is attributed to the effects of the recession when consumers reverted to tap water rather than buying bottled water. This trend has reversed itself since. The consumption

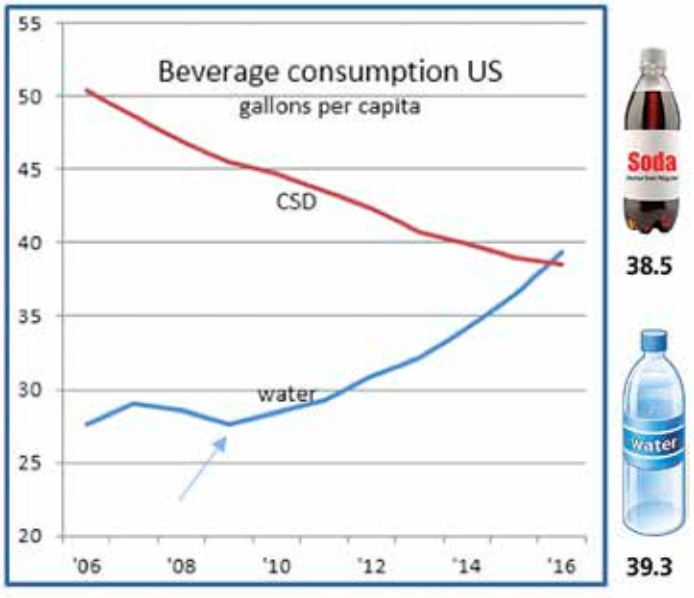



*Figure 2*

of water is driven by the evolving awareness of health and nutritional factors. Water consumption is farther expanded through the many and ever increasing offering of 'enhanced water' containing specific nutraceuticals or cosmeceutical attributes along with flavored, oxygenated and hydrogen water, to name a few. Figure 3 shows that the majority of bottled water consumed in the U.S. is in single-serve PET packaging. (Less than 1 liter)

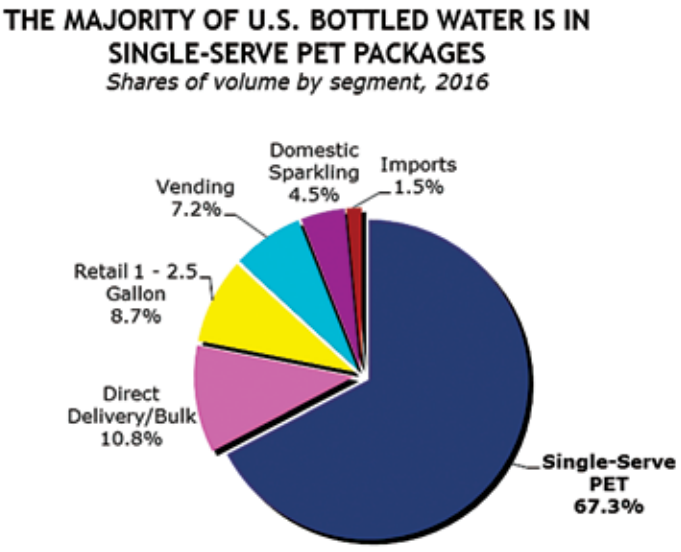



*Figure 3 Source: Beverage Marketing Corporation*

New York City-based Beverage Marketing Corporation is the leading research, consulting and financial services firm dedicated to the global beverage industry.

# Bottled Water Tops Gen Z Beverage Consumption

By Glacier Water

Read the recent results of a survey of college undergraduates from Food Management: http://food-management.com/news-trends/survey-bottled-water-tops-gen-z-beverage-consumption?eid=forward

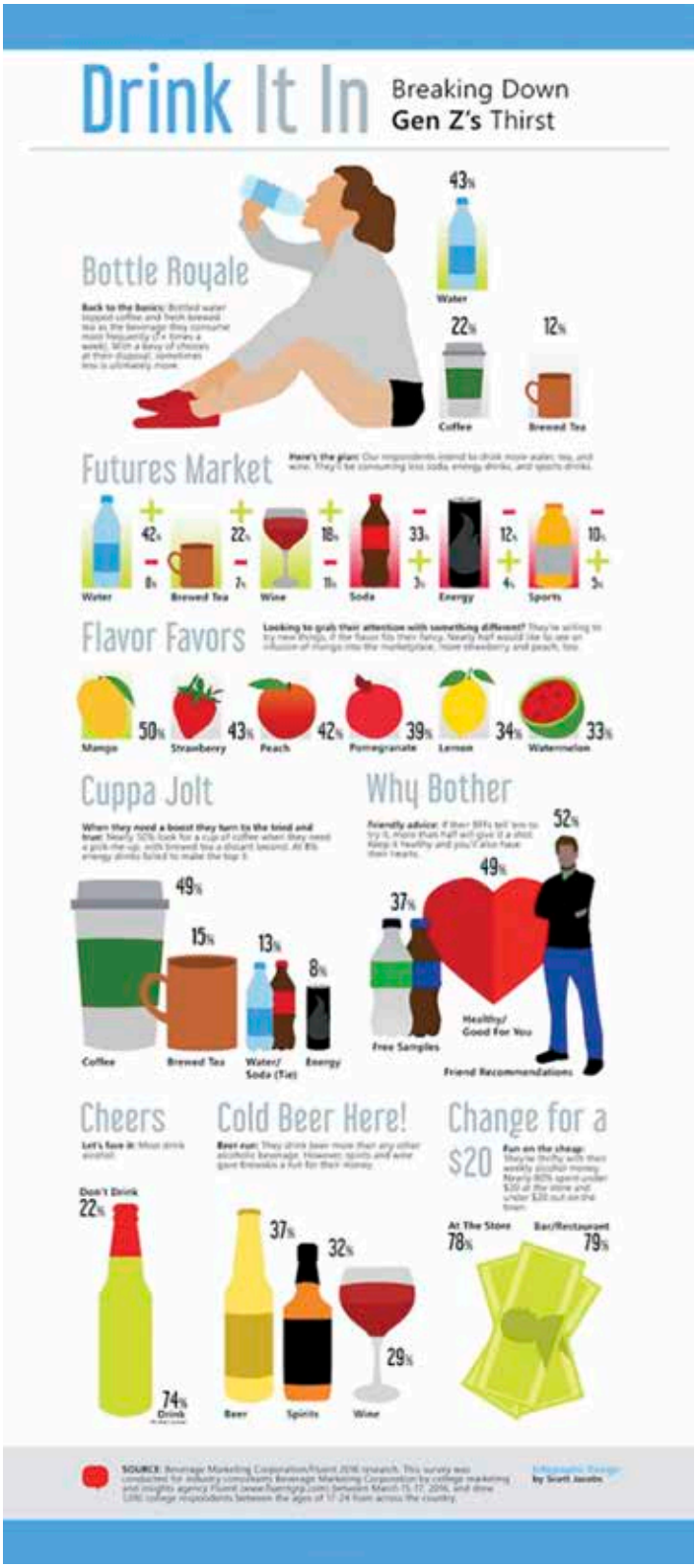
Survey: Bottled water tops Gen Z beverage consumption. A study of over a thousand college undergraduates shows 43 percent consume water over seven times a week, and 42 percent say they plan to drink even more.

Bottled water is hot, while soda is not among Gen Z college undergraduates, according to a new survey from industry consultants Beverage Marketing Corporation (BMC) and Fluent. The survey results were shared with attendees at BMC's Beverage Forum in Chicago this week. The survey of 1,010 undergraduates from across the country was conducted last month and showed that bottled water was college students' runaway top beverage purchase choice, with 43 percent saying they consume it seven or more times a week. Next was hot or iced (but not specialty) coffee, with 22 percent, and brewed tea at 12 percent. Beer was next, with 9 percent, but that number was affected by a third of the respondents being under 21 and hence ineligible to purchase alcohol legally.

**More News & Trends**

Furthermore, 42 percent of students indicated they plan to drink more bottled water in the future, while 22 percent said they plan to drink more brewed tea. Soda was the big loser, with 33 percent saying they plan to drink less. While 20 percent of respondents said they rely solely on bottled water, 59 percent indicated they try to use refillable bottles filled from filtered water systems on a regular basis. Among other findings:

- The top three descriptors influencing purchase are "all-natural" (52 percent), "low-calorie" (37 percent), "organic" (36 percent), "vitamin-enhanced" (31 percent) and "zero-calorie" (27 percent);
- Around half of students say they try to avoid artificial sweeteners, flavoring, preservatives and high-fructose corn syrup, with the sweetener they are most comfortable with being cane sugar;




- The top reasons to try beverages are friends' picks (52 percent), "healthy/good for you" (49 percent), free samples (37 percent), interesting flavors (36 percent) and sales/promotions (25 percent);
- 37 percent of respondents drink sports drinks for

hydration/recovery, 14 percent for taste and 13 percent to quench their thirst, and they are consumed most often while working out (54 percent);

• The top pick-me-up beverage was coffee at 49 percent, followed by brewed tea at 15 percent, while water tied for third at 13 percent and soda at 8 percent, which is ahead of energy drinks;

• 74 percent of respondents say they do consume alcohol and 81 percent of those do drink beer on occasion;

• The top mixers for mixed alcoholic drinks were soda (37 percent), juice (35 percent) and seltzers (10 percent).

## Blow molding system from Sidel has Actis plasma-coating option

Matrix Combi Sidel has upgraded its latest generation of this blow molding machine line with the ability to apply the Actis plasma coating on PET bottles. Also known as Amorphous Carbon Treatment on Internal Surface technology, the barrier coating technology deposits a thin layer of hydrogen-rich carbon inside a PET bottle to extend its shelf life and aid in lightweighting. It's designed for bottles with diameters of up to 3 inches and especially useful for containers that will hold carbonated beverages or oxygen-sensitive substances, such as beer and sauces.
What's new? The availability of the surface treatment technology as an option for the newest Matrix Combi machines.

Benefits Improved bottle performance, and material savings. The Actis coating helps reduce the loss of carbon dioxide from the bottle. It can triple shelf life and contribute to potential reductions in bottle weight of 15-20 percent. Overall, the Matrix Combi line offers process reliability and increased uptime.

## Netstal's preform system targeted at smaller volumes

Preform system Netstal Maschinen AG, Näfels, Switzerland, is now offering a PET preform system that incorporates its 196-ton Elion 1750 injection molding machine and molds from Molmosa Industrial de Moldes S.L., Barcelona, Spain. Machines in the Elion line feature an electronic clamping unit with a centrally positioned five-point toggle lever, closed-loop lubrication system and precise linear


guides. Molds for the system feature up to eight cavities for molding and an equivalent number of cavities for integrated cooling of the preforms. Annual output is up to 18 million preforms.

What's new? The ability to make PET preforms efficiently on a smaller machine using a low-cavitation mold. Previously, Netstal offered its PET preform systems on larger PET-Line and PETForm machines capable of handling as many as 144 cavities.

Benefits Fast, energy-efficient production of small volumes of specialty PET preforms. Also, the integrated cooling feature yields shorter cycle times.

## PTI launches PET preform sampling technology

**Reprinted by permission of *Plastics in Packaging***

Plastic Technologies Inc. (PTI) has added a new injection molding capability for prototyping and sampling of preforms, which is said to reduce cost and lead time, as well as improving speed-to-market.

The technology has been designed for brand owners

interested in conducting package validation testing and small test market distribution before committing to a wider launch. Additionally, converters needing development and production support can also tap into a new resource. Chris White, supervisor of injection molding services, said: "As an independent development resource, PTI works with both brand owners and converters to support launch efforts. Frequently, when the brand owner wants to conduct validation testing or test a PET packaging concept in limited distribution, there is difficulty in finding a supply source that can deliver small quantities. Additionally, bottle makers sometimes need to off load injection-molded preform production due to scheduling or capacity. PTI's new capability can provide assistance in both of these situations."

## Amcor opens $7 million Texas plant

By Bill Johnson

Amcor Rigid Plastics is opening an on-site bottle-making operation in Texas, a move that will allow it to cut freight costs and improve operational efficiencies.

The new facility at a Campbell Soup Co. site in Paris, Texas, is capable of producing about 50 million hot-fill PET bottles each year for the company's V8 brand of drinks.

Amcor Rigid Plastics, based in Ann Arbor, Mich., spent $7 million to create the bottle-making operation in 6,000 square feet of existing space to produce both 46- and 64-ounce containers for various V8 products, the packaging company said.

"We're excited about establishing this on-site operation because it expands our long-time strategic partnership with Campbell and gives us an opportunity to better serve a key strategic customer," said Larry Weber, vice president and general manager of Amcor's North American beverage business unit, in a statement.

*Amcor Rigid Plastics marks the grand opening of its new blow molding plant in Paris, Texas, making bottles on-site for customer Campbell Soup Co.'s V8 juice brand.*

Amcor Rigid Plastics has been blow molding bottles at Campbell's beverage plant in Napoleon, Ohio, since 2004. The company makes 150 million hot-fill PET containers there each year.

Moving bottle production on-site at Campbell in Texas means 2,000 truckloads of empty containers will be taken off the road each year. Amcor Rigid Plastics previously supplied bottles from its Fort Worth, Texas, site, the company said.

The plastics company estimates that the move is equivalent of removing about 900,000 passenger vehicle miles of carbon dioxide emissions from the road each year.

Amcor Rigid Plastics is a unit of Australia-based Amcor Ltd.

## Lomont adds blow molding with R&D acquisition

By Michael Lauzon, *Plastics News* Correspondent

Lomont Molding LLC has added blow molding to its tool kit through acquisition.

The company recently acquired R&D Molders Inc., a Georgetown, Texas, firm that offers blow molding and injection molding services. Lomont did not disclose terms of the deal.

Lomont, based in Mount Pleasant, Iowa, now has three production plants. In addition to the R&D Molders facility and Lomont's head office plant, it also runs an injection molding operation in Reinbeck, Iowa. And while it digests R&D Molding it will expand its warehouse space in Mount Pleasant.

Blow molding was a key attraction for the purchase but geography also was important, Lomont marketing director Carl Frank said in a phone interview.

"We have some key accounts in [the Georgetown area] and from a logistics standpoint the acquisition made sense," Frank explained.

# Blow Molding In The News

*R&D Molders Inc. got a big strt with its production of canteens, using both blow molding and injection molding.*

Lomont's capabilities now span several plastics processes. In addition to its core injection molding business and recently acquired blow molding assets, it offers structural foam molding, profile extrusion, gas-assist molding and overmolding, as well as in-mold decorating and a variety of assembly and secondary services.

"We will be able to address the logistical needs of our customer base while enhancing our production capabilities through R&D's solutions-based commitment to quality," said Lomont President Jason Bender in a news release. R&D Molders was owned by the Brown family since it was founded in 1974 by Cavett Brown. It takes pride in landing unusual plastics jobs which grew from its initial work molding water canteens for the U.S. Army. That program required both blow molding and injection molding to make the canteens.

Lomont also counts in-mold labeling as an important part of its business. Its IMT division specializes in molding industrial safety signs, equipment tags and related items that face tough workplace conditions. Lomont uses a special copolymer film label that is molded into the part during molding. Unlike conventional label materials, Lomont's labels and special inks stand up to factory environments that quickly destroy most labels.

Lomont's main markets are in various industrial sectors. R&D Molding expands the industrial customer base and adds some consumer products contracts.

Lomont's sales have grown to more than $65 million per year with the acquisition. It now manages 70 injection presses with clamps from 100 to 2,100 tons and 15 blow molding machines. Employment has risen to about 260. Franks said the Georgetown operation will be expanded with several large injection presses and more blow molding machines to be located in another building across the street from the main Georgetown facility.

Lomont has broken ground for new warehouse space adjacent to its Mount Pleasant facility. When the project is done this summer it will have about 75,000 square feet of space for warehousing and parts packaging. The $2.6 million project qualifies for tax benefits approved by the Iowa Economic Development Authority. The expansion will free up space to add more molding machinery but Frank said it is too early to discuss details.

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# Economical Material Alternatives for Extrusion Blow Molding

• BEKUM is focusing on strategies to increase added value and quality at the Interpack 2017
• ePET processing: the newly developed, fully transparent ePET high IV material is recommended for attractive handle containers
• Reducing the cost of materials by using calcium carbonate (chalk) and PCR
• Significantly more performance due to high-tech spiral distributor extrusion heads

BEKUM (Berlin, Germany) will be focusing on the latest extrusion blow molding trends and production processes for packaging at the Interpack 2017. Of crucial importance are the current machine and system solutions for the economic and environmentally-friendly production of bottles, containers, cans, drums and IBCs made of plastic. On the material side, we focus on three aspects:
• The newly developed ePET high-IV materials
• The processing of calcium carbonate (chalk)
• The resource-saving recycling of materials
• A further highlight of our exhibition at the trade fair will be the importance of spiral distributor extrusion head technology to increase performance

As a pioneer in the industry, over the years, BEKUM has been intensively devoted to the material aspects of extrusion blow molding to meet the requirements of the market. The packaging industry continuously tries to keep costs under control on the material side, as fluctuations in the prices of materials can greatly affect unit costing. Likewise, functional packaging, developed in a resource-saving manner, supports sustainability, added value and sets itself apart from the competition through product differentiation. Michael Mehnert, CEO of Bekum Maschinenfabriken Traismauer GesmbH stated that, "As a pioneer and technology leader in blow molding, the requirements and desires of the packaging industry are of crucial importance to us. It is well known that the cost of materials has a decisive influence on the calculations of manufacturers. Our energy-efficient, flexible, high-performance machine and extrusion solutions of the latest generation grant manufacturers the opportunity of improving their added value through the intelligent and resource-saving use of materials, increasing the quality of their articles and, at the same time, achieving the ambitious sustainability targets."

**Fully Transparent ePET Handleware Packaging**

A key concept in the packaging industry is product differentiation. Accordingly, suppliers are constantly looking for innovative or recyclable materials for new product ideas. The fully transparent, newly introduced ePET high IV material is sufficiently stable for extrusion blow molding and is an interesting candidate. High IV ePET materials have intrinsic viscosities of 1.0 or higher, thus these high IV ePET materials actually enhance the IV of PET in the established recycling streams. The typical challenges of PET extrusion blow molding are exceptionally well mastered by the high-quality ePET high IV materials. ePET high IV is comparatively non-abrasive. The material can be completely melted in the extrusion unit without causing excessive wear. In respect to the machine, special requirements must be met to provide a robust, reliable, fully automatic production in around-the-clock operation. Blow molding machines from BEKUM, such as the HYBLOW 407D, have been specially designed for high performance in these demanding ePET applications. The HYBLOW 407D provides reliable production of ePET bottles with flash removal and oriented bottle transfer integrated into the machine. The current 07 series of machines with the C-frame clamping unit, patented by BEKUM, is perfect for ePET processing due to the high closing force per cavity, uniform force distribution, and extremely quick clamp force generation.


*Figure 1: Sparkling and elegant, the high transparency of glass-like ePET containers is influential at the point of sale.*

Michael Mehnert: "BEKUM has numerous references in extrusion blow molding of the most demanding PET and co-polyester materials. Customers have access to a comprehensive knowledge base on blow molding PET materials accordingly. This is particularly true in respect to attractive handled containers made of transparent ePET high IV for innovative new product ideas for our global customers."

**Two Options for Reducing the Cost of Materials**

In order to reduce the cost of materials, two methods are available to the packaging manufacturer: the use of

*Figure 2: The HYBLOW 407 D, with the patented C-frame clamping unit, enables the reliable production of ePET bottles with flash removal and oriented bottle transfer integrated in the machine.*

calcium carbonate (CaCO3 = chalk) and recycled material as substitutes in the middle layer. In addition, the proven multi-layer co-extrusion technology from BEKUM provides flexibility and associated advantages of processing with both material strategies. Even the combined introduction of chalk and PCR material as a multilayer system is possible and has already been successfully implemented by BEKUM.

**Calcium Carbonate for Effectively Cutting Costs**

The use of calcium carbonate (chalk) displays excellent barrier properties. Improved UV protection is also attractive for packaging manufacturers. However, it is in respect to its extremely high cost-effectiveness that the use of calcium carbonate (chalk) is compelling. Michael Mehnert: "With a 20 l canister for the packaging of cooking oil, 24% of the HDPE, based on a total weight of only 900 g, could be replaced by chalk at a far lower price. The cost difference between HDPE and chalk in this specific case was about US $1,000 per ton. At a machine output of 210 items per hour and 6,000 production hours per year, this results in possible savings of more than US $270,000 per year. These are very exciting prospects for a packaging manufacturer."

**Substitution with Recycled Material**

The use of recycled materials (PCR = post-consumer recycled) as a substitute in the middle layer is the other ideal route. The tri-extrusion technology from BEKUM is the right solution for the smooth and efficient production of multi-layer systems. It provides the opportunity of including inexpensive, but varied, recycled polymers (post-consumer plastics) with their differing processing rheologies between the virgin material layers. This option was presented to professionals in the industry as part of the launch of the new EBLOW 37 electric blow molding machine at the K 2016 show. A three-layer 20 liter canister with a combined material layer distribution made of chalk and PCR was shown. The production parameters in Figure 4: an output of 240 20 l canisters/h (918 g net weight, 1,188 g gross weight) has a flash waste of 23%. The potential savings for packaging manufacturers are enormous. The process generated flash reused 100% in production. In addition, 20% of the HDPE new material can be replaced by the less expensive combination with chalk. There are also advantages when adding color. The percentage of color pigment in a single-layer design can be reduced from 2% to 0.5%. The more expensive color pigment (master batch) only needs to be added to the outer layer. The hidden core no longer needs to be colored.

*Figure 3: 24% calcium carbonate can be included in this 20 liter HDPE canister for 'smart' savings in materials.*

**High extrusion quality with high-tech spiral distributor Extrusion Heads**

At Interpack 2017, the focus of our exhibition will once again be BEKUM's spiral distributor extrusion head technology. The unique spiral distributor extrusion heads are characterized by excellent, uniform wall thickness

distribution in the parison and in the end product. This results in a significant potential for packaging manufacturers to optimize single-layer parison quality. However, BEKUM's spiral distributor extrusion heads are even more impressive with respect to articles with a multi-layer structure.

In this regard, manufacturers of packaging products do not need to compromise on user-friendliness. The heads can be easily adjusted by the operator from the front of the machine. In addition, the head design enables faster color change-over times than conventional designs. The resulting significant increase in machine productivity is of enormous interest to packaging manufacturers with respect to flexibility and profitability. The consumption of purging material for cleaning can also be reduced to a minimum by means of spiral distributor extrusion head technology. The compact design of the spiral distribution extrusion heads is a further advantage. Their smaller surfaces mean considerably less energy is required to heat them. All in all, BEKUM's high-tech spiral distributor extrusion heads provide packaging manufacturers with interesting options to increase the quality of the articles, save time and costs during production, and add value. ■

| | | | |
|---|---|---|---|
| 13,0 % | **Inner layer** | 98,5 % | HDPE |
| | | 1,5 % | Colour Blue |
| 65,5 % | **Middle layer** | 30,0 % | Chalk (relation 81 % chalk and 19 % HDPE) |
| | | 34,7 % | Flash Waste |
| | | 35,3 % | Recycling Material |
| 21,5 % | **Outer layers** | 98,5 % | HDPE |
| | | 1,5 % | Colour Blue |

*Figure 4: Typical three-layer structure sysem (tri-extrusion technology) for extrusion blow molding.*

*Figure 5: Significantly more performance in extrusion blow molding due to BEKUM high-tech spiral distributor extrusion heads.*

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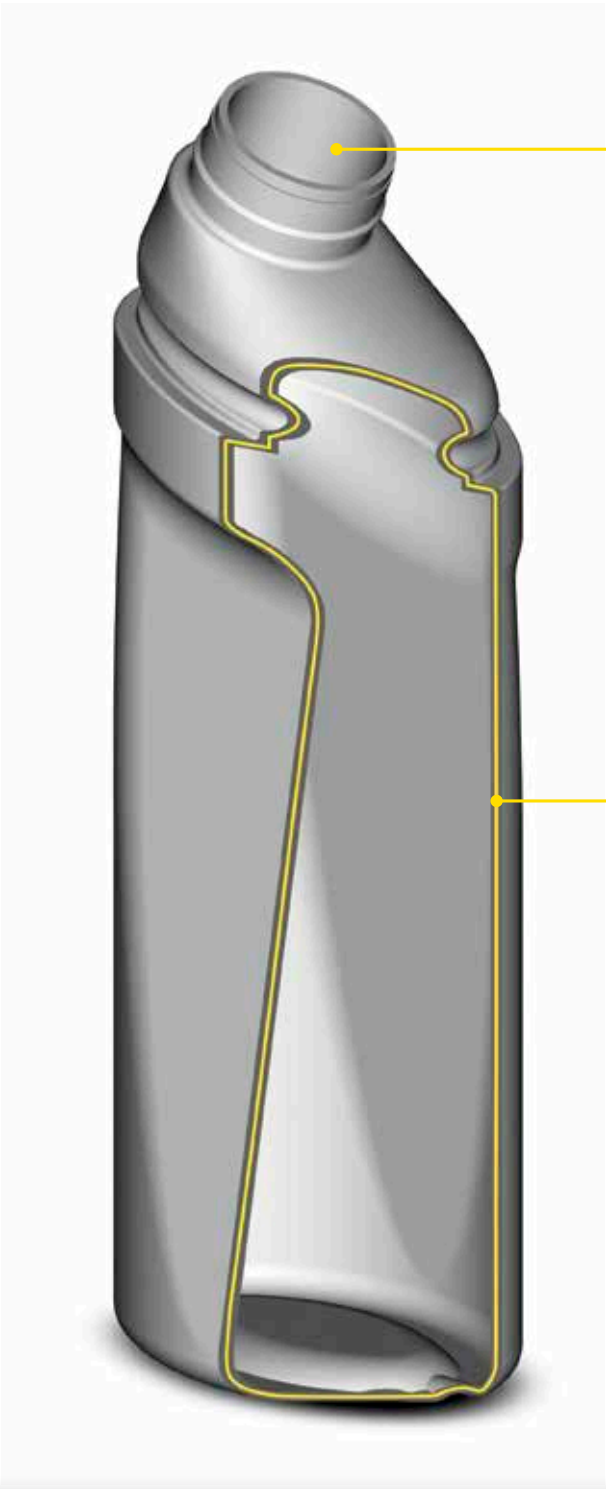

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**Non-destructive layer inspection.** The completely new developed OptoSonix® technology not only inspects the presence of layers, but also measures their thicknesses and positions – time-saving, precisely and above all non-destructively.

# Terahertz Technology: A New Wave in Thickness Measurement

By Daryoosh Saedkia, PH.D., TeTechS Inc., Ontario, Canada

Whether it is food or beverages, shampoos or cosmetics, ensuring consumers receive fresh products is of the utmost importance to the wide array of companies who provide these daily essentials. Aside from providing quality product in the first place, what these products are contained in plays a quintessential role in ensuring freshness and consistency.

Multi-layer plastic bottles and containers are a diverse and popular option for housing consumer goods. Maintaining freshness by way of several layers of plastic, these bottles and containers are often characterized by their ultra-thin barrier layer.

**The Barrier Layer**

The barrier layer within multi-layer plastic containers is essential for quality control. Comprised of materials such as EVOH or PET, the barrier layer is the thinnest layer within the structure while also boasting the highest price tag.

Ensuring that the barrier layer is not only present but consistent throughout the structure is essential for quality control, as even the smallest imperfection can jeopardize the integrity of the product and ultimately cost both time and money.

*Figure 1: A Magna Mike probe can be used to measure* ***only the overall wall thickness****.*

**Quality Testing via Destructive Testing**

Measuring individual layers within multi-layer preforms, bottles and containers enables manufacturers to understand the quality and consistency of their packaging product while meeting testing standards. Typically however, the testing of these plastic structures has been invasive, ineffective and limited.

One such testing technique called the Hall effect, utilizes a Magna Mike probe to measure the wall thickness of a plastic preform, bottle or container. Although non-destructive, this time-consuming technique requires direct contact with the sample under test, is limited to measuring only the overall wall thickness versus individual layers and cannot measure the barrier layer – arguably the most important layer within the structure.

Another common testing technique involves the manual cutting of the preform, bottle or container under test and then peeling and measuring each layer individually. This technique is not only highly destructive, time consuming and prone to human error, it is also limited to a small sampling and extremely wasteful as the plastic preform, bottle or container is destroyed in the measurement process.

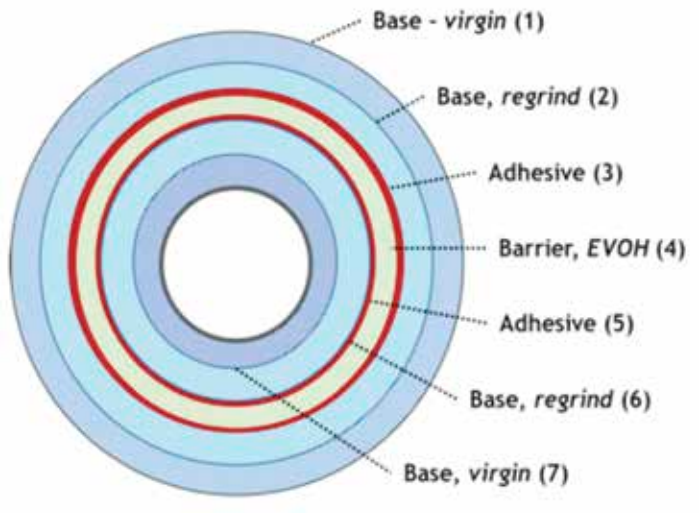



*Figure 2: An example of the several different layers within a multi-layer plastic structure.*

**Cut the Cutting with Terahertz Waves**

In a day and age where time is money and waste reduction is viewed as universally essential, inefficient and ineffective quality assurance practices are a thing of the past; yet

when it comes to plastic thickness measurement, manual cutting has proven to be the top solution for this important task.

Fortunately, terahertz-powered solutions have recently emerged as the new hero in this traditionally wasteful tale; but how?

With the help of terahertz waves, multi-layer plastic preform, bottle and container manufacturers can measure, identify and inspect both the barrier layer and the surrounding base layers in a non-invasive, non-destructive way.

Multi-layer measurement systems such as IMDvista LAYER, are entering the manufacturing scene as the non-destructive answer to a largely destructive problem; and at the heart of the system? Terahertz technology.

Non-Destructive Testing Gauge, Powered by Terahertz Waves™

The core technology behind IMDvista LAYER is Waterloo, Ontario based TeTechS' TeraGauge™, a non-destructive testing gauge powered by terahertz waves™.

Terahertz waves have long been viewed as too elusive for use in the "real" world but their unique properties make them ideal for use in multi-layer plastics thickness measurement. Non-contact and non-destructive, terahertz waves can see through both opaque and translucent materials which other modalities, such as infrared, cannot.

*Figure 4: IMDvista LAYER is a multi-layer thickness measurement system for cylindrical plastics.*

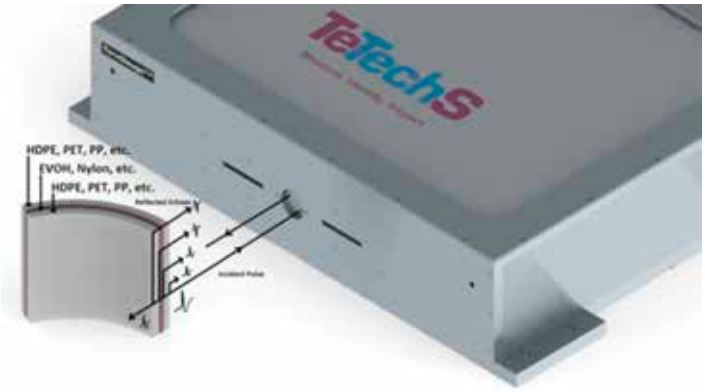



*Figure 5: TeraGauge utilizes the terahertz time-domain principle to* ***measure multi-layer plastics****.*

With the power of TeraGauge™ inside, IMDvista LAYER enables users to conduct quick, accurate and precise measurements of individual layers within both mono and multi-layer plastic structures. What's more, this terahertz-powered system can measure up to 10 layers ranging in thickness from 0.01mm to 5mm in a matter of seconds while enabling users to locate and measure the costly, ultra-thin barrier layer within the plastic preform, bottle or containers.

TeraGauge™ works based on the terahertz time-domain principle to essentially send short terahertz pulses that penetrate the sample under test and reflect back into the gauge at each layer. The reflected pulses then have their time-delay measured which corresponds to the thickness of the layers of the plastic bottle or preform. The difference between the time delay of two reflected pulses, allows for the calculation of the precise thickness of the individual layers within the plastic structure.

**A New "Wave"**

Compared to traditional measurement techniques, terahertz technology such as TeTechS' TeraGauge™, is proving to be the quick, reliable and non-destructive solution to a long-time problem. As a direct result, TeTechS along with its partners are gaining market leadership within the plastic bottle and container manufacturing industry by providing a whole product solution with IMDvista LAYER. By meeting real-world needs while simultaneously providing manufacturers with repeatability, ease of use, and confidence in the quality of their products, terahertz waves are ultimately powering a new wave: effective and efficient thickness measurement. ■

# Quality Assurance without destructive testing

By Kevin Legacy, ZEISS Industrial Metrology

*Case study: Accuracy of a molded container closure*

**Assembly inspection in product development**

Bottles made from polyethylene terephthalate, also known as PET, are the most commonly used carbonated beverage packaging. About one-third of all drinks worldwide are bottled in PET containers. Glass is the second most-popular material for bottles, but only makes up approximately one-sixth of the packaging currently used. The shapes of PET bottles have changed many times since their introduction in the 1980s and become increasingly diverse. Advances in production technology have made it possible to significantly reduce the weight and the quantity of materials used. Customized shapes have helped beverage producers better position their products on the market.

**Measure the important parts**

The closure (cap or lid) is a particularly critical area when developing a new bottle shape because it is vital for the function and safety of the PET bottle. The impermeability must be guaranteed in order to prevent both the beverage from flowing out of the bottle and germs from getting in. An additional security feature is the so-called tamper evident band which is designed to tear open or tear off when the cap is twisted. Thanks to the tamper evident band, consumers know that the bottle has not been opened after being filled.

*Figure 1: The CT scan data displayed using ZEISS software shows if the seal is properly positioned on the bottle.*

**Conventional inspection**

If a CT system is not available, destructive testing is a standard process for inspecting the fit accuracy of the seal and the bottle. The area around the cap on a sealed bottle is embedded in resin. When cured, the resin gives the molded plastic stability, which is necessary for preventing deformations during sectioning. After being cut into many thin sections, the cross sections are checked optically to ensure defect-free contact between the cap and the bottle.

*Figure 2: The Zeiss software uses color to show different parts (densitis) of the assembly. Color transparency is added to ccentuate details further.*

*Figure 3: A single color coded 2D slice of the digital dataset.*

**Disadvantages of destructive testing**

The greatest drawback to the aforementioned process is the significant amount of time required. Moreover, destructive inspection is always incomplete: only those defects which appear on the cut surfaces are spotted. Defects in the areas in between the sections remain hidden. Although the 2D cut makes it easy to identify defects, information about the spatial dimensions of the defects is lacking. It is not possible to know where and how the molding tools need to be corrected without taking further steps. Also during the potting curing process, the heat produced can deform the plastic part. This in turn will distort the inspection results and in in some cases may connect areas which originally had not been joined.

**Inspection using a ZEISS CT Scanner**

An industrial CT scanner (sometimes referred to as a CAT scanner) uses x-rays to nondestructively look inside a molded part or assembly. With a ZEISS CT system, it is possible to quickly examine the quality and function of the cap in its original, screwed-on state without physically cutting apart the bottle. Using the CT data, the closure can be digitally cross sectioned (via a radial or isometric digital knife) to completely analyze the closure: validate the assembled condition; check wall thickness; check for voids and if required perform a first article dimensional inspection report (FAIR). A freely rotatable, semi-transparent 3D view facilitates orientation and interpretation. Materials are color coded by density to help distinguish parts. The complete 3D visualization makes it possible to quickly locate assembly issues that might lead to leakage. Moreover, the different display formats show where and how the tool shapes of the screw top or the bottle must be corrected. While ZEISS offers CT scanners for purchase, they also offer CT scanning as a service from labs located across the country.

# Strength of hair inspires new materials for body armor

In a new study, researchers at the University of California San Diego investigate why hair is incredibly strong and resistant to breaking. The findings could lead to the development of new materials for body armor and help cosmetic manufacturers create better hair care products.

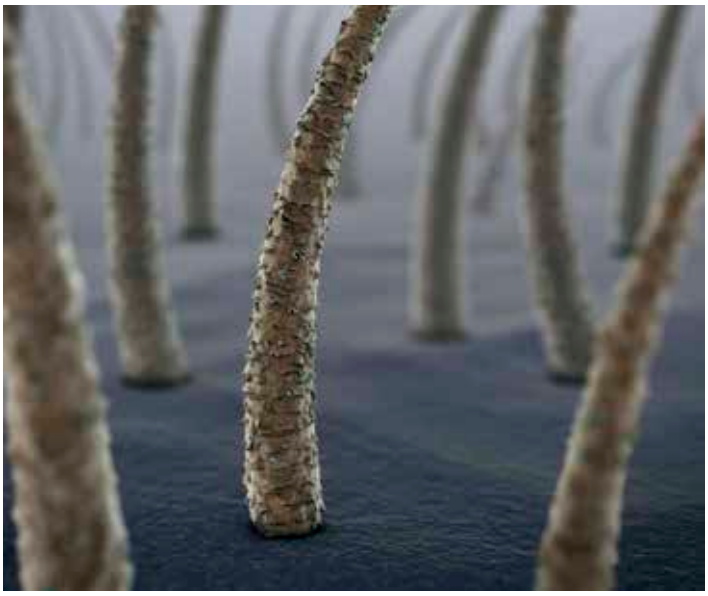
Hair has a strength to weight ratio comparable to steel. It can be stretched up to one and a half times its original length before breaking. "We wanted to understand the mechanism behind this extraordinary property," said Yang (Daniel) Yu, a nanoengineering Ph.D. student at UC San Diego and the first author of the study.

"Nature creates a variety of interesting materials and architectures in very ingenious ways. We're interested in understanding the correlation between the structure and the properties of biological materials to develop synthetic materials and designs—based on nature—that have better performance than existing ones," said Marc Meyers, a professor of mechanical engineering at the UC San Diego Jacobs School of Engineering and the lead author of the study.

In a study published online in Dec. in the journal Materials Science and Engineering C, researchers examined at the nanoscale level how a strand of human hair behaves when it is deformed, or stretched. The team found that hair behaves differently depending on how fast or slow it is stretched. The faster hair is stretched, the stronger it is. "Think of a highly viscous substance like honey," Meyers explained. "If you deform it fast it becomes stiff, but if you deform it slowly it readily pours."

Hair consists of two main parts—the cortex, which is made up of parallel fibrils, and the matrix, which has an amorphous (random) structure. The matrix is sensitive to the speed at which hair is deformed, while the cortex is not. The combination of these two components, Yu explained, is what gives hair the ability to withstand high stress and strain.

And as hair is stretched, its structure changes in a particular way. At the nanoscale, the cortex fibrils in hair are each made up of thousands of coiled spiral-shaped



*Researchers at the University of California San Diego investigate why hair is incredibly strong and resistant to breaking. Credit: iStock.com/natevplas*

chains of molecules called alpha helix chains. As hair is deformed, the alpha helix chains uncoil and become pleated sheet structures known as beta sheets. This structural change allows hair to handle up a large amount deformation without breaking.

This structural transformation is partially reversible. When hair is stretched under a small amount of strain, it can recover its original shape. Stretch it further, the structural transformation becomes irreversible. "This is the first time evidence for this transformation has been discovered," Yu said.

"Hair is such a common material with many fascinating properties," said Bin Wang, a UC San Diego PhD alumna and co-author on the paper. Wang is now at the Shenzhen Institutes of Advanced Technology in China continuing research on hair.

The team also conducted stretching tests on hair at different humidity levels and temperatures. At higher humidity levels, hair can withstand up to 70 to 80 percent deformation before breaking. Water essentially "softens" hair—it enters the matrix and breaks the sulfur bonds connecting the filaments inside a strand of hair. Researchers also found that hair starts to undergo permanent damage at 60 degrees Celsius (140 degrees Fahrenheit). Beyond this temperature, hair breaks faster at

lower stress and strain.

"Since I was a child I always wondered why hair is so strong. Now I know why," said Wen Yang, a former postdoctoral researcher in Meyers' research group and co-author on the paper.

The team is currently conducting further studies on the effects of water on the properties of human hair. Moving forward, the team is investigating the detailed mechanism of how washing hair causes it to return to its original shape.

*Read more at: https://phys.org/news/2017-01-strength-hair-materials-body-armor.html*

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# Extrusion Blow Molding Technology 101: Part I

By Joe Slenk, Applications Engineer, Bekum America Corporation

*An overview and the forming of a parison steps*

**Introduction**

Extrusion blow molding (EBM) is one of the processes used to produce hollow articles from thermoplastic-type materials. The basis of this process is the forming of a hollow tube of plastic, which is referred to as a parison. This process can be defined by three basic stages:

1. Plasticizing (melting) the resin pellets,
2. Forming the plastic tube (parison),
3. Inflating the parison into the shape of the mold.

EBM can be further broken down into continuous and intermittent.

This refers to how the parison is being formed. Both continuous and intermittent extrusion blow molding have several different machine technologies to accomplish the task.

**CONTINUOUS EXTRUSION MACHINES**

- Shuttle
- Rotary Wheel
- Rising Mold
- Parison Transfer

**INTERMITTENT EXTRUSION MACHINES**

- Reciprocating Screw
- Shuttle
- Ram
- Accumulator

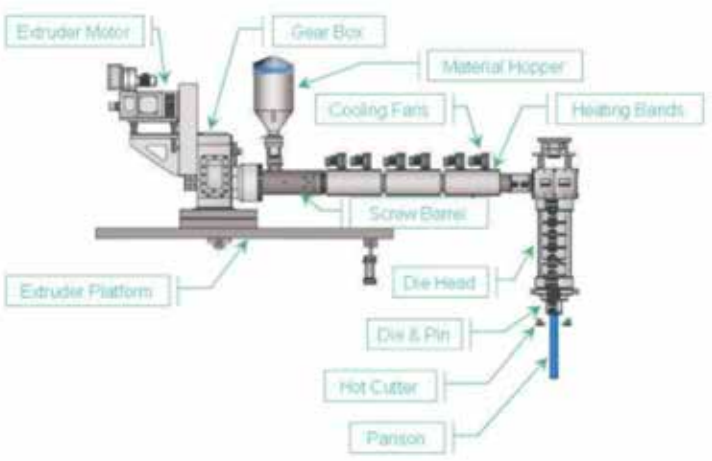



*Figure 1: Overview of the EBM plasticizing and parison forming process.*

For the purpose of this article, we will focus on continuous extrusion shuttle machinery technology.

**Applications and Materials:**

Shuttle machines offer a great deal of flexibility for a wide range of markets including: food and beverage, dairy, personal care, automotive, medical, and technical parts. This requires the ability to process a wide variety of materials. On a pound per year basis, the most commonly used material is HDPE (used for bottles, drums, and tanks). Other materials used include LDPE (squeeze bottles), PP (hot fill bottles), PVC (clear bottles, automotive additive bottles), PET (clear handleware bottles), PC (water bottles), PA (automotive ducts), and Co-Extruded layer structures with EVOH for barrier properties (gas cans,food applications).

**Shuttle Machine Systems:**

A shuttle machine is comprised of a number of mechanical systems or major components, each of which has a specific

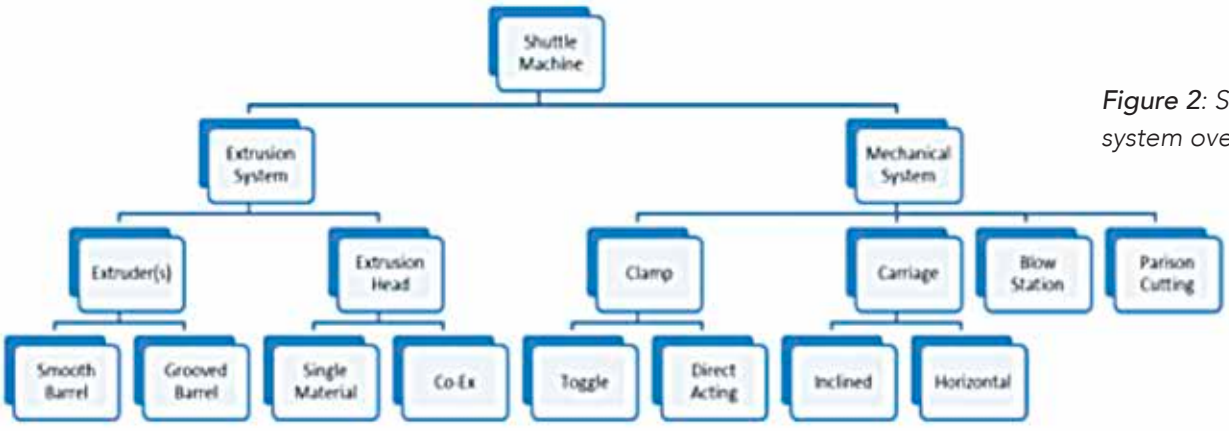



*Figure 2: Shuttle machine system overview.*

purpose in the formation of a final part. At the simplest level, there are two major systems which include the extrusion system and the mechanical system. The extrusion system takes raw material and forms a parison while the mechanical systems uses the parison to form the final part.

**Extrusion System**

*The Extruder*

The purpose of the extruder is to form a parison in a consistent manner. Raw material is typically supplied in pellet or chip form which requires an extruder to melt and convey the molten material to an extrusion head that then forms the parison. Shuttle machines can be equipped with a variety of extruder sizes and feedscrew designs depending on the material being melted and part being produced.

Smooth barrel extruders are the most common extruder design offering a variety of screw designs that vary based on the type of material being processed. Most materials can be extruded using a smooth barrel, including new high IV EPET material with a #1 recycling code. Screw design typically consists of feed, transition, and metering sections. A common length to diameter ratio used is 24:1 with a compression ratio of 2:1 to 3:1.

Grooved barrel extruders can also be used which have a feed section with parallel grooves cut into the barrel. These grooves allow additional material feeding and compression which can increase the output of an extruder. A specially designed screw is also required which typically has zero compression. Only certain materials can be processed with this type of extruder, the most common being HDPE and PP.

The extrusion process is continuous, meaning that the screw runs at a constant rpm with the goal being that it delivers a consistent homogeneous melt output to the extrusion head. It also needs to properly melt the material without overheating and/or causing degradation, both of which can cause defects in parts and lack of end use performance.

Screen changers are commonly used to filter out foreign particles in the melt stream.  All extrusion blow molding processes generate excess material call "flash". To save on costs, the flash is re-ground and reintroduced into the process by blending it with virgin material. During this process there is an opportunity to collect contamination from the material handling issues.

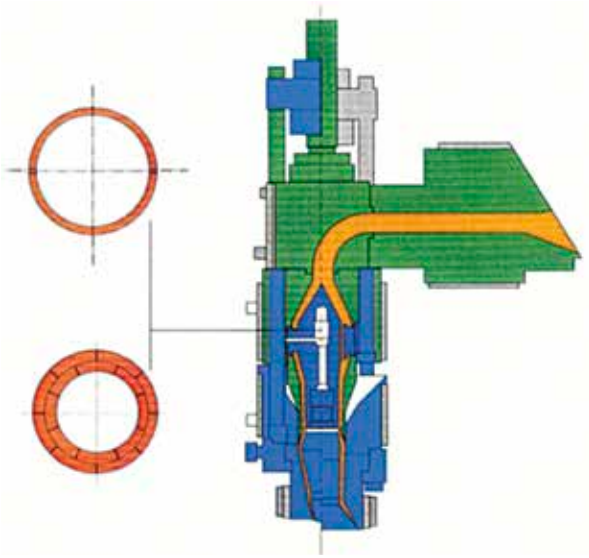
**Extrusion Head**

Once the homogeneous melt stream reaches the end of the extruder, it then flows into the extrusion head which takes the horizontal solid flow and turns it 90° to form a vertical hollow parison that can be taken by the mechanical system and blown into a part. Many machines can make multiple parts in a single mold which requires multiple parisons. In this case, before reaching the head, the melt travels through a divider where it is split into the required number of parisons for the machine. Divider design varies greatly depending on the number of parisons, the material being used, and the head manufacturer.

The challenge of forming a parison is taking a solid melt channel and turning it into a hollow tube. This requires splitting the melt and re-knitting it at some point which can cause weak spots and or visual defects in a part. There are three common head designs, each of which has its advantages and disadvantages.

Center flow heads use a streamlined flow channel that flows over a torpedo that is supported in the head body by "spider legs". The number of legs is dependent on the head size and materials being processed. This head is good for shear sensitive materials such as PVC, but can also be used for many others.

*Figure 3: Center flow head design*



A disadvantage is that there is a re-knit line in the parison wherever the material flows over a spider leg.

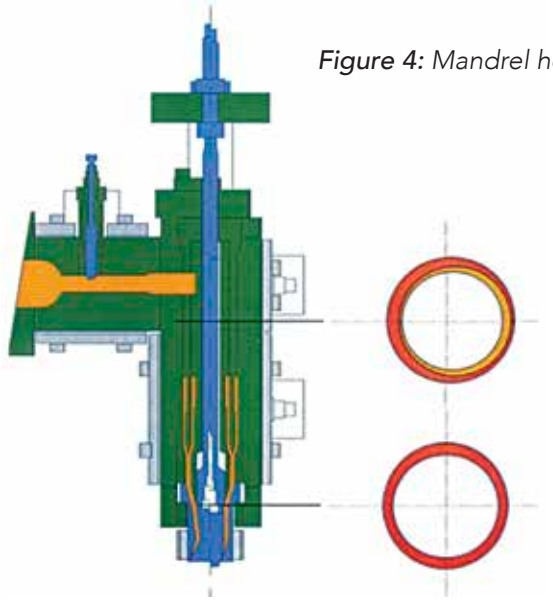


*Figure 4: Mandrel head design*

**Mandrel style heads** split the melt flow channel into separate channels, each of which flows around a mandrel and re-knits via a heart shaped curve that re-knits the material lower in the head body. The re-knit points are opposite to one another which prevents a weld seam from being formed though the entire wall of the parison. These re-knit points are typically visible in the final part, however, they do not cause thin spots and can be hidden on parting lines. A disadvantage is they cannot process certain shear sensitive-materials, such as PVC.

**Spiral flow heads** are the newest head design. From the extruder, the melt is divided into multiple channels which flow into a "spiral". These channels then wrap around the mandrel while becoming shallower, allowing material to begin flowing toward the die. This flow pattern creates an overlapping sickle effect, in which there is no re-knit line. These heads produce very good wall distribution, especially in multi-layer heads. They also tend to be throughput specific making them less flexible. Costs are also higher due to the more complex design and machining.


*Figure 5a: Cross-section of spiral flow mandrel*

*Figure 5b: Spiral Flow Mandrel*

**Parison Programming**

Once the melt channel is hollow for forming the parison, the melt flows through a set of head tooling consisting of a die and pin. The parison diameter is determined by the die size and design. Wall thickness in the parison is determined by the size of the pin and relationship of the pin inside the die. *Parison wall thickness directly influences part thickness.* The relationship between the part diameter and parison diameter is referred to as the blow up ratio. A blow up ratio of 2:1 to 4:1 is preferred. Unfortunately, most parts do not have an even blow up ratio from top to bottom. For a fixed die gap this would result in varying wall thickness due to the parison thinning more as it blows into higher blow up ratio areas. To compensate for this, most heads today are equipped with parison programming that allows either the die or pin to move in relationship to the other. This allows for a changing die gap that alters the thickness of the parison while it is extruding. By programming the parison, material can be placed where required in the part, either where the blow up ratio is higher or where there may be a critical feature. Light weighting can also be targeted by removing material where it is not needed.

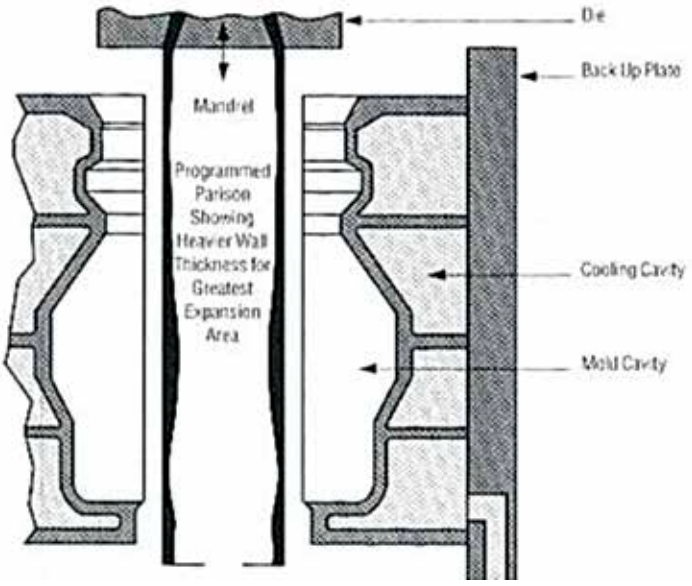



*Figure 6: Parison Programming of a Container*

In addition to parison programming, ovalization can be added to the die. By cutting material from the die in strategic locations, more material is allowed to flow making the parison thicker in those areas where ovalization is cut. This allows more material to be targeted in cross sections of the part with larger blow up ratios such as the corners of square container.

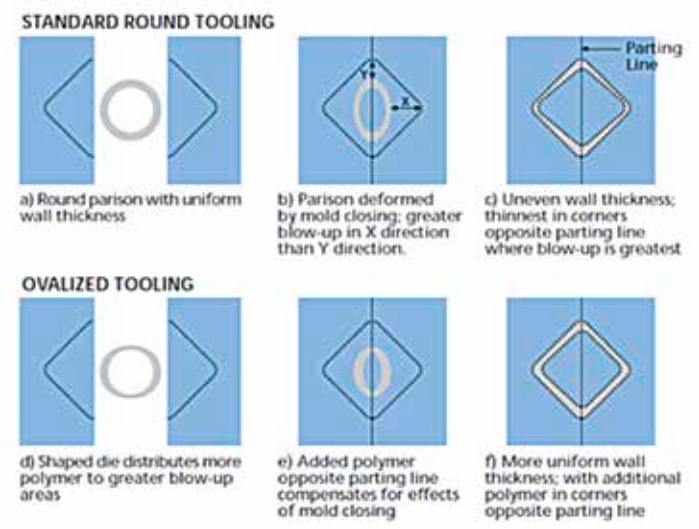



*Figure 7: Examples of ovalization incorporated into head tooling.*

**HDPE/Regrind/Adhesive/EVOH/Adhesive/HDPE**

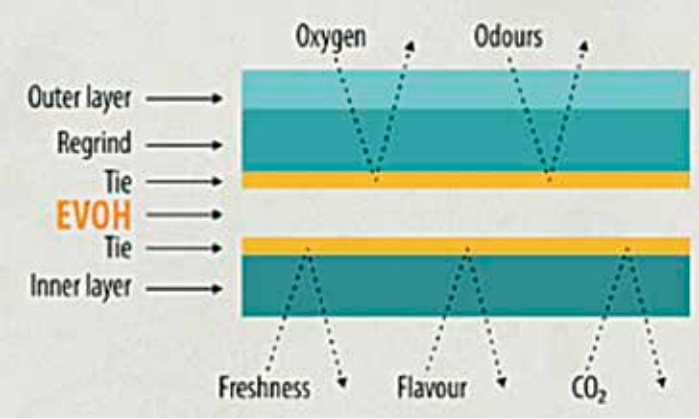



*Figure 8: Typical 3 material-6 layer coextruded wall structure.*

**Co-Extrusion**

Extrusion heads can be made to extrude multiple layers of material into one parison. Layer configurations can be from 2 – 7 layers depending on the end part requirements. Two layers are often used on personal care bottles to add a soft touch outer layer. A 3-layer configuration is commonly used to bury post-consumer regrind into the center layer while maintaining virgin inner and outer layers. Four layers can be used with a nylon inner layer as a chemical barrier for agriculture-chemical (ag-chem) products.

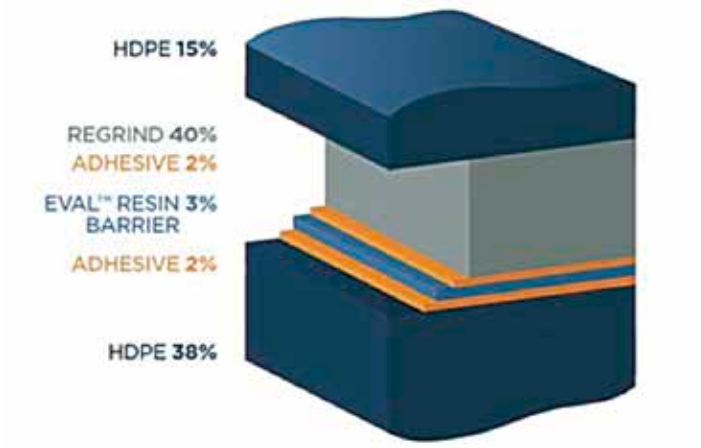
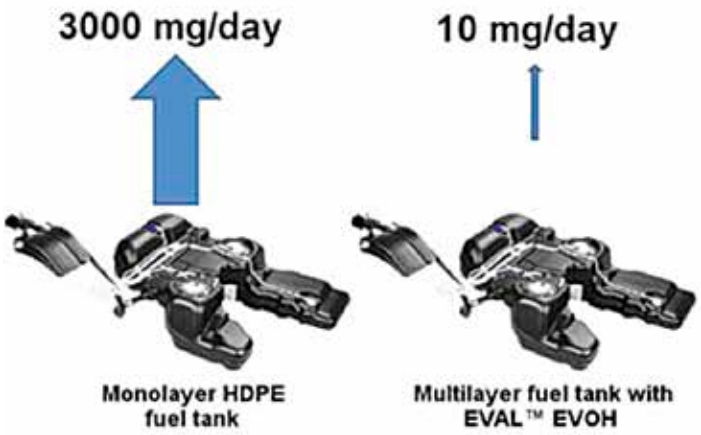



*Figure 9: Cross sectional view of a fuel tank coextruded wall section.*




A 3 material 6-layer system (3M-6L) is used for either an oxygen and or hydrocarbon barrier in food or automotive applications respectively. This can be accomplished with a layer structure such as shown in figure 8.

Many gas cans and automotive fuel tanks use a 3M-6-layer wall structure to achieve the strict hydrocarbon emission standards.

**Forming a Part**

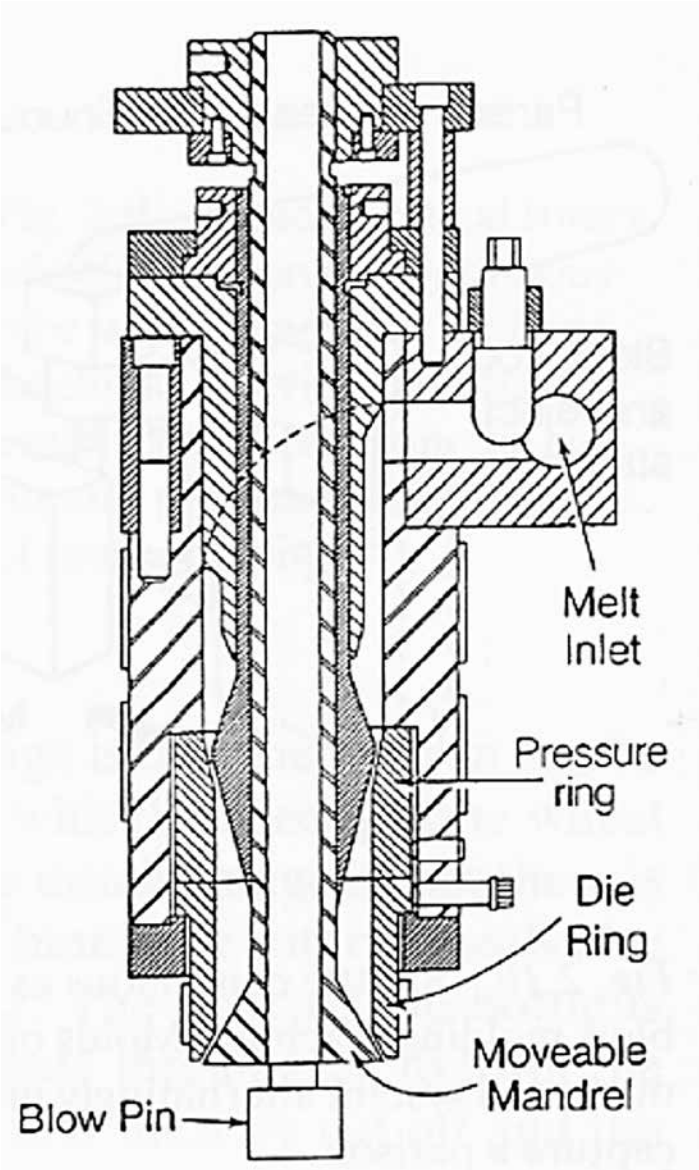
Once the parison is extruded, the next steps of the shuttle machine process is to form that parison into the final part. This process will be covered in Part II of this series in the next *Blow Molding Quarterly*. ■

# Extrusion Head Tooling Design

A short guide to designing custom extrusion head tooling to mold your part.

By Brian Spence, Co-Chair Blow Molding Div., Communications & Networking Group

Extrusion head tooling design is a critical aspect of every new extrusion blow molding project. What size should it be? What material should it be made from? There are no global answers, but if you need to design your own extrusion head tooling, you can follow these tips to make your project a little bit easier.




*Typical extrusion head layout*

To start, you need to gather some background information. What extrusion head will you be using? What material will you be processing? What part will you be molding? Gather all of the drawings you can, including the mold and extrusion head if available. Once you have this information in hand, you are ready to begin designing your own head tooling.

**Tooling Material**

One of the decisions you will need to make is what type of metal to have the tooling made from. Some of the factors to consider are availability and budget, but it is highly recommended to base the metal choice on the plastic material you intend to process; as well as whether or not you want to have the tooling plated or coated (we'll touch on this further on).

Before diving in, let's talk about a term we will reference a lot; "surface hardness". Hardness is the ability of solid matter to resist permanent shape change when a compressive force is applied. So "surface hardness" is simply the ability of an objects surface to resist change from the forces applied to it. For extrusion head tooling, only the outer surface of the tooling is exposed to the forces we need it to resist. This allows us to use softer materials that are easier to machine, but heat treat them

afterward to increase the hardness on the outside of the tooling. We do not need to be concerned with whether or not the finished tooling is hard throughout or if it is only hard on the surface.

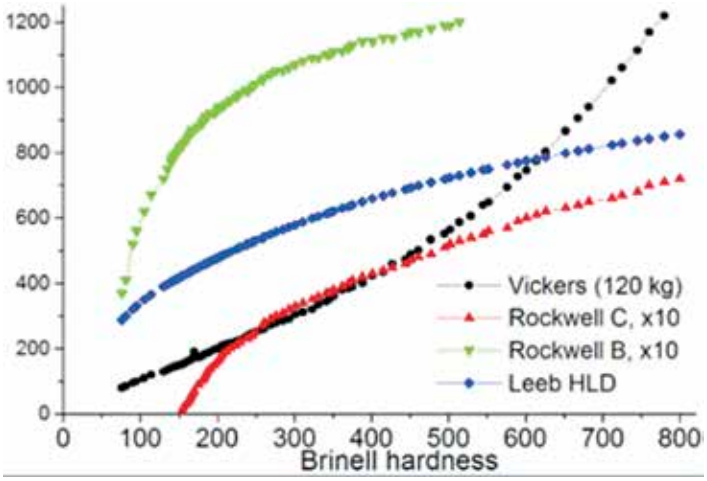
Let's take a look at how hardness is measured and compared. There are multiple standardized methods to measure a materials hardness. We will be referencing the Rockwell method. But some additional terms you may have heard are Vickers, Brinell or Leeb hardness. Each of these is simply its own standardized test method which tests a materials hardness.

Let's get back to back to Rockwell though. To test a material according to the Rockwell method, both a minor and major load are applied to the sample via a probe or indenter of known size, shape and material. The indenter is placed against the sample and the minor force is applied. The point at which the indenter stops is the zero point. Next the major load is applied and the indenter penetrates further. The major load is then removed, but the minor load is maintained. The indenter will retract slightly and settle in a final location. The delta from this final point to the zero point is recorded and used to calculate the result.

The equation used to calculate Rockwell Hardness is HR=N-(d/s); where d is the depth (the delta between zero and the measurement point) and N & s are predetermined scale factors. We are going to reference the Rockwell C scale.

| Scale | Load | N | S |
|---|---|---|---|
| A | 60 kgf | 100 | .002mm |
| B | 100 kgf | 130 | .002mm |
| C | 150 kgf | 100 | .002mm |
| D | 100 kgf | 100 | .002mm |
| E | 100 kgf | 130 | .002mm |
| F | 60 kgf | 130 | .002mm |
| G | 150 kgf | 130 | .002mm |

Now that we have learned all about hardness, let's look at direct recommendations for what metal to use for what application. If you plan to process LDPE or HDPE, these are some of the easier raw materials to work with and



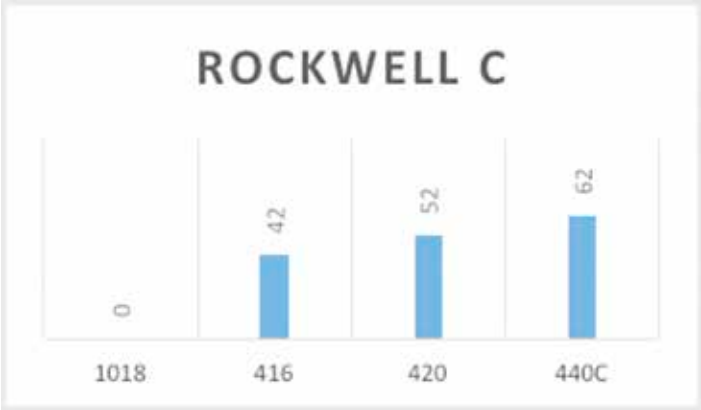


do not require much in the way of surface hardness or corrosion resistance. You can get away with selecting a low carbon steel such as 1018 CRS, especially for large tooling used in many accumulator heads, but I still recommend an option you can heat treat to a surface hardness of about 40 Rockwell C. 416 Stainless Steel does this job well, which heat treats to a Rockwell C hardness of up to 42. This surface hardness will help the tooling retain its polished finish for longer and will help prevent scratches and gouges that tend to occur when the tooling is being cleaned.


For PP (particularly the clarified variant), PET (EPET, PETG), Nylon & EVOH; you should look for something with a higher surface hardness. When processing these materials you will be polishing your tooling more often to remove flow lines and improve finished part quality. You need the tooling to resist wear and abrasion throughout the cleaning and polishing processes. In these applications, look for a material like 420 Stainless Steel to achieve a heat treated surface hardness of up to 52 Rockwell C. For these materials you may want to explore plating or coating for your tooling.

Lastly, if you are processing some more aggressive


| | 1018 | 416 | 420 | 440C |
|---|---|---|---|---|
| HDPE | X | X | X | X |
| LDPE | X | X | X | X |
| PP | | | X | X |
| PET | | | X | X |
| Nylon | | | X | X |
| EVOH | | | X | X |
| PVC | | | | X |
| GFPP | | | | X |
| GFN | | | | X |




materials such as PVC or Glass Filled PP/Nylon you will want yet an even higher surface hardness and carbon content. A good material to search for is 440C. For typical extrusion blow molding, this offers ample surface hardness for almost all applications, which ranks in at a whopping 62 on the Rockwell C scale. It is also highly recommended to have the tooling plated or coated to improve corrosion resistance and/or reduce the coefficient of friction. The downside of 440C is the cost and relative difficulty to machine compared to the previously mentioned materials.

**Plating & Coating**

Now that you have an idea of what metal to build your tooling from, let's look at plating and coating options; because your plating or coating can also affect what metal you decide to build your tooling from. But before we can understand what option best fits your purposes, we must look at why we plate or coat tooling to begin with.

There are two benefits to plating or coating extrusion head tooling; increased surface hardness and reduced friction. The increased surface hardness simply allows us to ignore the prior material recommendations and build our tooling from softer and less expensive metals (depending on your budget). Since it is the surface hardness that matters, the hardness of the plating or coating is what will protect your tooling.

You have probably learned more than you cared to about surface hardness by this point, so let's talk about friction. Friction is the force resisting the relative motion of surfaces sliding against each other. In our case, the two surfaces are the extrusion head tooling and the plastic material being extruded. What we want to do is reduce the amount of friction between those two surfaces. Doing so will improve the quality of your finished part by reducing flow lines. It will also reduce the frequency with which the tooling needs to be cleaned or polished. So less friction is a good thing, but how do we compare friction levels of a plating or coating? We use the *coefficient of friction*. It is a dimensionless scalar value which describes the ratio of the force of friction between two bodies and the force pressing them together. It is often symbolized by the Greek letter μ. The resulting measurement will range from zero to approximately one. Rarely is the μ above one, and it will never be equal to or less than zero.

So those are the benefits of plating and coating, but why do we say "plating and coating", and what is the difference? Technically, they are one and the same, but there are two different methods of application that produce significantly different results; so we use the terms plating and coating to help us distinguish the two. For our purposes, "plating" is a surface covering in which a metal is deposited on a conductive surface via a liquid bath. In regard to extrusion head tooling, plating usually refers to either hard chrome or electro-less nickel. Because

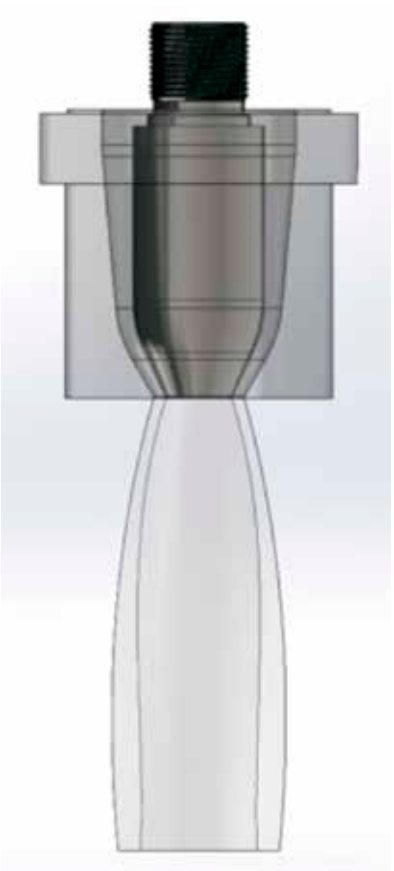
the chrome or nickel is transferred to the tooling through a liquid bath, the plating is quite thick and the finished product has a tendency to chip or peel over time. Think of applying paint via a brush or roller. Through time and use, the paint will peel away from the substrate, exposing it to the elements. Plating is not all bad though; it is easy to have done, it's cheap and many vendors readily include additives to further reduce the coefficient of friction. The overall thickness that the plating adds to your head tooling must be taken into consideration though. Features like threads and mating bores will need to be masked before the plating process can begin. For many years, plating extrusion head tooling with nickel or chrome was standard practice, and it still works. But, technology has greatly advanced in recent years, which bring us to what we will refer to as "coatings".

"Coatings" are how we refer to products that are applied in a vapor state versus the aforementioned liquid state. The result of applying the outer layer as a vapor instead of a liquid is that the size of each individual deposit is drastically reduced, decreasing the overall thickness and improving wear over time and use. Think of applying spray paint versus the brush or roller we talked about earlier. These type of coatings offer a higher surface hardness and lower coefficient of friction than traditional plating. They are also thin enough that no masking is required prior to having the part coated. But they come at a price. The equipment to apply a coating in this method is very expensive and there are a limited number of experienced vendors available, resulting in higher cost and generally longer lead times than the plating alternative.

If you are interested in exploring coatings for your tooling, talk to one of the various vendors offering PACVD (Plasma Assisted Chemical Vapor Deposition) and/or DLC (Diamond Like Carbon) coatings. There are several available and each has its own advantages.

**Extrusion Die Opening**

Determining the extrusion die size is one of the more difficult challenges in extrusion tooling design. It is often referred to as a "black" art because of the wide range of its primary variable, die swell. We are going to apply a scientific method to calculating extrusion die size, but you will still need experience in order to predict the die swell. $DO=[(W\times2)\div\pi]\div S$. This is the equation you will use to determine your die opening size. DO is the die opening. To calculate it you need to reference your finished part / mold drawings and determine the width you want the flash to be (W). Then you need to predict the die swell factor (S). You need to rely on first-hand experience and record keeping to predict your die swell, but let's talk about what die swell is and why it happens.

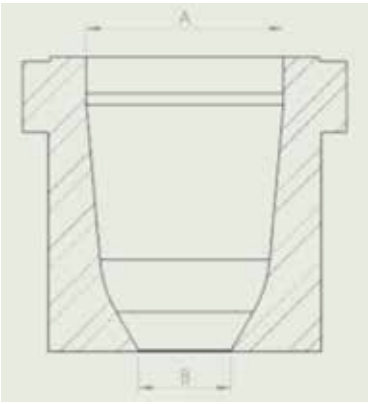


Die swell is the phenomena where the parison diameter changes size upon exiting the extrusion tooling due to the stress contained in the molten plastic. Think of it this way; we are taking plastic pellets and introducing them into an extruder. The extruder heats them as the screw carries them forward to the end of the barrel. As the pellets move to the end of the barrel, the root diameter of the screw increases, compressing the plastic material into a tighter space. As the plastic exits the barrel and enters the extrusion head, the pressure is several thousand PSI. These elevated pressures are simply the result of forcing the plastic into a smaller and smaller volume throughout the extrusion process. With a proper head and tooling design, the plastic will continue to be compressed as the material is extruded through them, further increased the inherent stress until the material reaches the extrusion die opening. Once it exits through the extrusion die opening, there are no longer any physical restraints holding the plastic in its compressed form. So all of the pressure is immediately relieved and the parison swells into its final size. Most of the time this swell is noted as a positive figure where the parison expands

drastically, but in some cases the parison size will actually decrease as it exits the die; we will cover that later. The factors that most affect die swell are the material to be processed and the opening size of the die itself.

Every material processes differently and has a different melt flow ratio, so every material will swell different from its counterparts. This is not limited to comparing one type of resin to another such as PP to HDPE, but even different grades of PP will process and swell differently. To give us an idea of how a resin will swell we need to look at the type of material and the melt flow of that material. An HDPE with lower melt flow will typically swell more than an HDPE with a higher melt flow. The same can be said for all materials and this where your detailed record keeping will help you accurately predict die swell on future projects. If you have no records to work from, you can reference the provided chart of the most common materials. Keep in mind that one grade of PP may swell 20% and other grade from the same supplier may swell 70%. The provided chart is a basic guide to help you understand how die opening size can affect the swell.

We said that the die size affects the die swell. We also said the die swell effects the die size. So which comes first, the chicken or the egg? What you need to do is to compare the entry opening at the top of the die (A) to the exit opening at the bottom of the die (B). A significant amount of compression can happen in the extrusion head tooling, which would increase the swell. So the smaller the die exit is compared to the die entry, the more die swell you will get. The same can be said for the other way around. If your die exit is larger than the entry bore, you will experience less swell. We are providing a chart of the most common extrusion blow molded materials to help you start building your records.




| | A<B | A=B | A>B |
|---|---|---|---|
| HDPE | +25% | +35% | +45% |
| PP | +15% | +25% | +35% |
| PVC | -10% | 0% | +10% |

Armed with this information, we encourage you to begin designing your own extrusion head tooling. There is far more to tooling design than can be covered in a short article; but now you have an idea of what material, plating/coating and size you want your new tooling to be. Take this information and provide it to your tooling vendor when you need a quote, or begin drafting the tooling yourself. Experience is everything, so feel free to experiment and keep detailed records. We hope you are now at least a bit better equipped to develop your own tooling designs.

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# Why Join?

BLOW MOLDING DIVISION

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**The question really isn't "why join?" but …**

# Why Not?

## Not so serious Corner

Two men went into a diner and sat down at the counter. They ordered two sodas then took sandwiches out of their packs and started to eat them.

The owner saw what was going on and approached them. "You can't eat your own sandwiches in here," he complained. The two men stopped eating, looked at each other then swapped their sandwiches.

**Olny srmat poelpe can raed this**

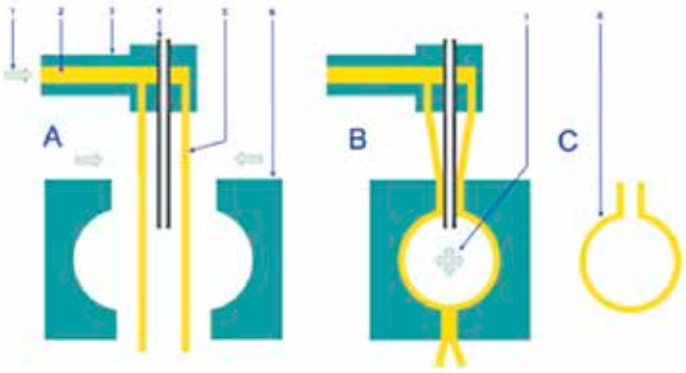
I cdnuolt blveiee that I cluod aulaclty uesdnatnrd what I was rdanieg. The phaonmneal pweor of the hmuan mnid, aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in what oredr the ltteers in a word are, the olny iprmoatnt tihng is that the first and last ltteer be in the rghit pclae. The rset can be a taotl mses and you can still raed it wouthit a porbelm. This is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the word as a wlohe. Amzanig huh? Yaeh and I awlyas tghuhot slpeling was ipmorantt! ■

**REDUCE**
**REUSE**
**RECYCLE**

Get LinkedIn to SPE Blow Molding Division!

**BLOW MOLDING** is a manufacturing process by which hollow plastic parts are formed. In general, there are four main types of blow molding: extrusion blow molding (EBM), injection blow molding (IBM), and injection reheat-stretch blow molding (RSBM) and an emerging technology is compression blow forming (CBF). The blow molding process begins with melting down the plastic and extruding or forming it into a parison (EBM) or in the case of IBM, (RSBM) and (CBF), a preform. The parison-preform is a tube-like piece of plastic with a hole in one end through which compressed air can pass.

The parison-preform is then clamped into a mold and high pressure air is blown into it. The air pressure then pushes/stretches the plastic out to match the cold molding surface and texture features. Once the plastic has cooled and hardened, the mold opens up and the hollow part is ejected.

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# SPE's next president not shying away from international growth

By Bill Bregar

Raed Alzubi of Saudi Arabia is the incoming president of the Society of Plastics Engineers, who will take the reins at ANTEC 2017.

"SPE enjoys a premium reputation and name recognition around the world," said Alzubi, 47.

SPE can bring together industrialists in the Middle East as the region continues important work to diversify beyond just the oil economy, said Alzubi, who is president of SPE's Middle East Section.

SPE held its first ANTEC conference in Dubai in 2014. Last year, the society worked with the Gulf Petrochemicals and Chemicals Association to merge GPCA's PlastiCon conference together with SPE's ANTEC into a single event. And Alzubi said that, on an international level, SPE partnerships with local trade associations will continue.

As SPE gets a new CEO to replace Willem De Vos, a Belgian who is returning to industry after five years at the top job, the society is refocusing on its core U.S. market. De Vos was hired to make SPE more international, and he said that global push will return once SPE finishes making improvements to shore up its home market. So it's interesting timing that, at ANTEC 2017, an industry leader from the Middle East is becoming the SPE president.

"We will always be a U.S.-centric organization," Alzubi said. The United States is a leader for plastics and composites, he said, so, "it's important for us to continue to shore up our core strengths, which is the U.S., and at the same time, not shying away from internationalization. It's not a step back. It's time to kind of re-strengthen your core so you can grow."

Alzubi obtained an undergraduate degree at the University of Jordan in his native country. He earned master's and doctoral degrees at Brigham Young University in Provo, Utah. His mentor: Brent Strong, the SPE activist and an expert in composites, thermoforming and product design. Alzubi's first job was a mechanical design engineer at

OEC Medical Systems, bought by General Electric Co. He worked in the United States. Since then he has worked on some other projects, but Alzubi plans to devote the next year to SPE.

He has technical desires, to be sure. The industry's greatest challenges? Environmental impact. But the solution lies with technology, by "reaching limits of what the polymer chain can deliver in terms of properties and performance," he said.

Alzubi said, however, that people are the biggest issue. "The need for qualified talent is worldwide. The Middle East is no exception. You see it in several fronts" and a big one, he said, is "qualified entry-level positions," jobs where a person needs skills of processing and the types of plastics. Another difficult area is getting qualified local talent.

"The Gulf in particular has invested in schools, technical centers, but it remains a challenge," he said. And the Middle East still plays in a global economy. For proof, Google: "Fracking, impact of…" And so Alzubi said the region has to move to "competitiveness" and even get to a competitive advantage. The Middle East is still working on this, he said.

He is optimistic about plastics, since there are still major parts of the world where plastics consumption is still low. And plastics innovations, as well as composites expertise, are mandatory for the coming driverless vehicles and electric ones, he said.

"We're heading to intelligent products," Alzubi said. "So we're talking about more and more intelligence into the human interaction of the 'internet of things.' Plastics continues to be a versatile material that will allow designers and creative people to be able to present these innovations.

"Plastics will remain a strong medium and a flexible and versatile medium to develop this kind of device between the human and the device interaction," he said. Automation also will keep getting more incorporated into factories, Alzubi said.

He is excited about plastics that are being developed to support media platforms such as televisions, smartphones and textiles, as well as thermoplastic composites.

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# UN Environment declares war on ocean plastics, lobbies for product bans and taxes

By Steve Toloken, *Plastics News*

The environment agency of the United Nations is urging governments to ban or tax plastic bags, restrict microplastic beads in cosmetics and take other actions against single-use packaging.

U.N. Environment kicked off the campaign on Feb. 23 targeting disposable plastics and ocean pollution.

The agency launched the Clean Seas campaign at the World Ocean Summit in Indonesia, headlining its announcement by saying that the "U.N. Declares War on Ocean Plastic." It said 10 countries signed on, including Indonesia, France and Norway.

The high-profile summit drew plastics industry executives like Covestro AG CEO Patrick Thomas, along with government officials and environmental groups, to Bali from Feb. 22-24. It was hosted by The Economist magazine.

The American Chemistry Council, which sent participants, said resin manufacturers are actively engaged in pilot programs to reduce plastics in the ocean and improve waste management in Asia Pacific.

"Scientific and political leaders have identified the need to improve land-based waste management — particularly in rapidly industrializing economies — as the single most important step we can take to reduce the flow of waste into the ocean," said Steve Russell, vice president of plastics at Washington-based ACC, in a statement.

While the U.N. agency may not have much direct regulatory power, it seems intent on using social media and other pulpits in what it called an "unprecedented global campaign to eliminate major sources of marine litter" — microplastics in cosmetics and excessive single-use plastics — by 2022.

United Nations officials said they hoped more countries would make commitments to reduce single use plastic at a U.N. ocean conference in New York in early June.

*UN Environment describes this as the world's largest beach cleanup, on Versova Beach in Mumbai, India.*

"The ocean is the lifeblood of our planet, yet we are poisoning it with millions of tons of plastic every year," said Peter Thomson, president of the U.N. General Assembly. "I urge all [countries] to join the Clean Seas campaign and make an ambitious pledge to reduce single-use plastic. Be it a tax on plastic bags or a ban on microbeads in cosmetics, each country [can] do their bit."

The agency said governments should pass plastics reduction policies and industry should work to minimize plastics packaging and redesign products. It called on consumers to "change their throwaway habits."

At the event, the U.N. said the government of Indonesia outlined plans to reduce by 70 percent the amount of trash the island nation sends to the marine environment by 2025.

It noted that Uruguay will begin taxing single-use plastics bags later this year and Costa Rica plans an effort to dramatically reduce single-use plastics through better waste management.

The U.N. said that 80 percent of litter in the oceans is plastic and the material causes at least $8 billion in damage to marine ecosystems each year. It suggested problems will get worse, saying that plastics production is projected to grow three or four times by 2050.

"Keeping our seas clean and our marine life safe from plastic is a matter of urgency for Norway," said Vidar Helgesen, that country's minister of climate and the environment. "Marine plastic litter is a rapidly increasing threat to marine life, seafood safety and negatively affects the lives of people in coastal areas all around the world.

Russell, who attended the summit, said that while the industry is working to keep plastics from the oceans, he noted that polymers have environmental benefits that contribute to reducing greenhouse gases and food waste.

And he said that 70 plastics industry associations worldwide have signed a formal declaration on ocean pollution and support 260 projects to reduce plastics marine litter.

"We know there's much more to be done," Russell said. "Leaders from the Asia Pacific Economic Cooperation (APEC) forum are now calling for improved waste management, and our industry is partnering with other stakeholders to improve collection, containment, recycling and energy recovery in the region."

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## Greenpeace urges Coca-Cola to stop 'throwaway culture'

Environmental campaigners have urged Coca-Cola Co. to reduce its plastic footprint by stopping the use of single-use plastic bottles.


Greenpeace installed a "piece of art" right to the doorstep of Coca-Cola's European office on April 9 in protest against what it described as "ocean plastic pollution."

"As the world's largest soft drinks company, Coca-Cola has a special responsibility for the plastic that is wrecking our oceans," the campaigner group said on April 9.

According to Greenpeace data, Coke produces over 100 billion "throwaway" plastic bottles every year, which the campaigner group said mostly fail to be recovered.

Single-use plastic bottles, said Greenpeace, make up nearly 60 percent of all the drinks packaging Coke sells around the world.

"And these throwaway bottles are on the rise. Single-use plastic bottles make up 12 percent more of Coca-Cola's packaging than they did a decade ago, while the proportion of refillable containers has dropped from just under a third to just a quarter," the group claimed.

Greenpeace also claimed that Coca-Cola was "less than halfway" towards its 2015 target to use 25 percent of recycled or renewable sources for the production of its bottles. The recycled content figure, said Greenpeace, currently stands at 7 percent on average across Coca-Cola's global plastic bottle sales.

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# Britvic sees the wood for the trees

Soft drinks giant Britvic is continuing to assess the potential for wood fiber bottles across multiple sectors as part of a sustainability strategy introduced last year.

The owner of brands including Robinsons squash, J20 and Fruit Shoot, and the PepsiCo bottler in the UK, has been partnering with Innovate UK and Natural Resources (2000) Ltd to investigate recyclable packaging that is sustainably sourced. The wood fiber bottles form one of a number of potential solutions at this point.

Speaking to Plastics in Packaging, a Britvic spokesperson said: "The bottle is fully wood fiber, and a liner is needed – materials being considered for the liner will be chosen for not only their water resistance, food contact certification and processing ease, but also for their ability to be tolerated in the paper waste stream and their potential to be bio sourced.  At this prototype stage, the final solution is not fully defined. A patent is currently pending."

Clive Hooper, chief supply chain officer at Britvic, commented: "At Britvic, we know that to be a successful business in the long term we must be a sustainable business and this means listening to the needs of our consumers, our customers, our communities, and our employees.

"We understand that packaging and the environmental impact of waste is a major concern and we're committed to working collaboratively with others to explore innovative solutions. The wood fiber bottle is a great example of what potentially can be done and its development has provided great insight into what will and won't work in terms of quality standards and mass production in the future. We're now working hard to take our learnings from the fiber bottle to investigate fiber-based sustainable packaging materials further."

As well as investment in R&D, Britvic's sustainability strategy places environmental initiatives at the heart of the business. Britvic is currently half way through a £240 million ($300m) supply chain investment program to maximize efficiency across its manufacturing sites, reduce waste and improve its environmental footprint.

As part of this program, £25m ($31m) was invested at the Leeds plant, which employs over 200 people, to create a new high-speed bottling line, resulting in a 22 per cent reduction in water use and a 45 per cent reduction in energy consumption relative to production volumes. The upgrades have also allowed the Pepsi bottler to access the latest in packaging technology, allowing Britvic to blow and fill lighter bottles, thereby reducing the amount of plastics packaging needed per year by 155 tonnes, the equivalent weight of over ten double decker buses.

Meanwhile, Britvic has invested in upgrading equipment and processing techniques to deliver greater water efficiency, resulting in a reduction in total water consumption of 0.4 per cent despite a 0.7 per cent increase in production volumes. This saving is equivalent to the volume of water needed to fill five Olympic swimming pools.

Finally, as part of Britvic's commitment to reducing waste, Britvic sent zero waste to landfill in GB, and maintained a recycling rate of nearly 92 per cent. As part of its community outreach, the company also partnered with plastics recycling organization Recoup to encourage 25,000 festival goers at Liverpool's Fusion Festival to recycle their plastics bottles, which resulted in the collection and recycling of over 10,000 plastics bottles, saving the equivalent of nearly half a tonne of carbon.

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*Britvic unveiled its sustainability program last year.*

# SPE BLOW MOLDING DIVISION

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## Upcoming Division Board Meeting

**June 6-7, 2017 • Doubletree-Chicago, Oakbrook, Illinois**

*For more information, contact Deirdre Turner at (248) 505-5136 or deirdremturner@gmail.com*

### MISSION STATEMENT

Promote, communicate and disseminate knowledge relating to the art and science of blow molding technology.

# SPE Foundation reaches out to the next generation

By Jordan Vitick, *Plastic News*

In honor of the SPE 75th anniversary, the Society of Plastics Engineers Foundation has launched its Campaign for Plastics Education to support its mission of promoting the development of plastics professionals through the funding of quality educational initiatives, scholarships, grants and student experiences.

One major program funded by the foundation is PlastiVan, a traveling educational experience for students.

*Society of Plastics Engineers Vitale*

According to Eve Vitale, director of the SPE Foundation, the campaign goal is to raise $225,000 — $75,000 from corporations, $75,000 from SPE Sections and Divisions and $75,000 from individuals.

The SPE Foundation handles between 45 and 50 scholarships each year, worth approximately $110,000, as well as around 15 grants a year with a worth ranging between $50,000 and $75,000.

Vitale said the foundation is also focused this year on getting 3D printers into middle schools and high schools. São Paolo-based Braskem, the United States' largest polypropylene producer and PlastiVan's lead corporate sponsor, has pledged a $30,000 donation to support the campaign. Vitale said Raj Krishnaswamy, Ph.D., director of innovation and technology at Braskem America, is "very passionate" about helping improve PlastiVan and expand it, "in hopes of being able to meet the demands."

"At Braskem, we believe in the functional value and the environmental benefits that plastics provide to humanity. We are also very active in fostering STEM-based education initiatives in all communities where we operate," Krishnaswamy said in an email.

"The PlastiVan program is an outstanding plastics education initiative that reaches out to a broad community," he continued. "The technical and engineering perspectives offered by PlastiVan encourage more students to pursue STEM-based education and careers. It is this shared belief in STEM education and the value proposition of plastics that prompted us to sponsor this activity."

The SPE Foundation's PlastiVan program, which started about 20 years ago, was created as a hands-on approach to educate and excite students about science and the plastics industry through experiments and topics that range from chemistry and history to manufacturing and sustainability. Available to middle school and high school students across the country, PlastiVan has served more than 40,000 students over the last two years in Michigan, Texas, Wisconsin, Mississippi, Connecticut, New Jersey, Rhode Island, Pennsylvania, South Carolina, Ohio, Washington, Massachusetts, Illinois and Oklahoma.

The lab for middle school students introduces them to polymers and plastics, while the high school lab is a more advanced experience that includes career opportunities and college programs in plastics engineering.

*Society of Plastics Engineers SPE Foundation's PlastiVan program was created as a hands-on approach to educate students about science and the plastics industry through experiments.*

Society of Plastics Engineers PlastiVan program introduces students to polymers and plastics and provides information on career opportunities to older students.

Vitale said the cost for PlastiVan is $1,500 each day, which includes everything from presentation materials to traveling expenses for the outreach educators.

"Braskem has been a long-time sponsor of those daily kinds of events," she said. "We were down at the Franklin Institute [science museum] in Philadelphia earlier this year, and they sponsored for us to be there. … They're interested in supporting it more because they realize how important this education is, just to get kids thinking about plastics in a way that's beneficial to our industry."

Vitale stressed that the foundation is looking for more outreach educators to go into the classrooms and expand the program's reach.

"It's a part-time position without benefits, so that makes it challenging. Hopefully, eventually, we can get full-time positions going," she said. "I have a really great educator in the Detroit market, and she handles almost all of that. Since I live here, I'm helping a little bit with that. I have an educator right now in the Oklahoma-Texas market. I'm looking for one in the Northeast. I'm looking for one in the Carolinas. I could use another one in the Midwest."

To be an outreach educator with PlastiVan, candidates must have a college degree, and previous knowledge of science and the plastics industry in a classroom setting are preferred. Educators prepare the materials for classroom demonstrations, schedule PlastiVan visits, maintain a positive public image for the plastics industry and the SPE and occasionally attend trade shows, among other tasks. Anne Cowell, an outreach educator in the Oklahoma-Texas region, joined the team after reading about the program and speaking with Vitale. Cowell said she "learned the curriculum, practiced demonstrations and read up on plastics chemistry."

"I am teaching students about science in their everyday lives and sharing career opportunities that they may not have realized are available to them," Cowell said via email. "It is incredibly rewarding to see students consider these career paths and think more about the items they use in their everyday lives."

**Working with students**

Cowell, who has a bachelor's degree in chemistry and master's degree in teaching, said her favorite part about being an outreach educator is the students.

"The students' energy is contagious as we work through hands-on investigations and they are so engaged in each experiment," she added. "I love watching their eyes light up as they work together, brainstorm what a material might be used for and other types of tests they could perform."

Phread Ayres, a seventh-grade science teacher who is in his 13th year at Schuyler-Colfax Middle School in Wayne, N.J., said he connected with PlastiVan through one of his students, whose mother was college roommates and friends with Marjorie Weiner, who previously ran the program. Ayres contacted Weiner, and PlastiVan has been presenting at the middle school every year for the last few years, he said.

"It is fabulous," Ayres said. "If any school can get the funding for it — I don't want to make Eve [Vitale] go crazy doing these things — but it is such a worthwhile presentation. … The 'wow' factor for the kids really hooks them into how cool science can be and, in this particular case, the chemical engineering of various plastics."

Three students from the Pennsylvania College of Technology, an affiliate of Pennsylvania State University, were invited in 2016 to work with PlastiVan at the SPE Thermoforming Conference in Illinois, where they spoke with students from local school districts and walked them through the convention center to directly talk with plastics companies, according to Shannon Munro, executive director of Workforce Development and Continuing Education at Penn College.

*Society of Plastics Engineers Munro*

While at the conference, Munro said, the staff of Penn College's Plastics Innovation and Resource Center discussed with the SPE Foundation about bringing PlastiVan to the college for a week in February earlier this year.

"We've worked closely with Sekisui SPI, a plastics company from Bloomsburg, [Pa.], over the years, and they also saw the benefit of bringing the program to Penn College," Munro said in an emailed statement. "Having an employer invested in the success of the PlastiVan is critical to making it effective, and we are fortunate to have a company like Sekisui located near us."

Mentioning figures of 550 plastics firms employing more than 32,000 people in Pennsylvania alone, Munro said bringing an awareness to career opportunities in the industry is "vital to creating a continuous pool of employees for these companies and those across the globe."

"Plastics is not usually at the top of the list of career choices for students, largely because they are unaware of the opportunities or the array of potential career paths within the industry," Munro added. "The week the

*Society of Plastics Engineers PlastiVan program introduces students to polymers and plastics and provides information on career opportunities to older students.*

PlastiVan was at Penn College, more than 2,000 students were introduced to plastics. Without this program, we would have a difficult time reaching that many students in such a short time period."

Citing a *Plastics News* article that reported on the 2017 State of the Industry Report, Vitale said workforce development is the top challenge of executives. "Our job at the SPE Foundation is to manage workforce development in a way," Vitale said. "It's really important for all of us to get behind this. … If we all work together, we're going to continue to increase students' interest in the plastics industry. That's really what we have to do to get them into the industry. I just think it's really important."

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## Covestro LLC donates plastics processing equipment to Penn College

A longtime proponent of STEM education in the United States is giving students at Pennsylvania College of Technology valuable hands-on experience through its donation of plastics processing equipment.

As part of its i3 Give corporate giving program, Covesto LLC has donated a complete advanced co-extrusion sheet processing unit to Penn College. Covestro will also provide faculty and students with expert on-site training – including demonstration tooling – to initiate the project.

"We're grateful for the opportunity to help Penn College elevate its curriculum in this tangible way," noted Mark Matsco, director of application development for Covestro LLC. "Giving students access to this equipment not only enhances their skill set, but also helps us continue our mission to support improved STEM (science, technology, engineering and math) education."

Penn College, a Penn State affiliate located in Williamsport, offers a bachelor's degree in plastics and polymer engineering technology and an associate degree in plastics and polymer technology. Participants from both majors are expected to benefit from hands-on experience using the co-extruder.

"Our students learn all the major plastics processes in an effort to provide them with the well-rounded educational experience employers are looking for," said Shannon M. Munro, executive director of workforce development and continuing education at Penn College. "This equipment donation – the first of its kind on campus – will expand our capabilities in the plastics field and provide our students with a unique and valuable training experience that further increases their marketability for future employment."

Covestro is a member of the Plastics Innovation & Resource Center at Penn College, an initiative that serves the education, training, and research and development needs of plastic processors, resin suppliers, mold builders and equipment manufacturers. PIRC offers access to extensive material-testing laboratories, industrial-scale process equipment, world-class training facilities, and a highly skilled training and consulting staff. Covestro has worked with the facility on thermoforming, blow molding and

*Covestro LLC donated a complete advanced co-extrusion sheet processing unit to Penn College, where faculty and students will receive on-site training from company experts.*

testing projects for the past several years.

"Our strong relationship with Penn College gives students the opportunity to work on practical, real-world projects with Covestro," added Philipp Polenz, head of commercial operations for the company's North American Polycarbonates business. "By helping to solve actual problems alongside our own people, these apprentices interested in the plastics processing industry can gain useful and practical experience that will serve them well in their careers."

Find more information about Covestro LLC, one of the leading producers of high-performance polymers in North America, visit www.covestro.com or www.plastics.covestro.com.

For information on plastics majors offered by Penn College's School of Industrial, Computing & Engineering Technologies, visit www.pct.ecu/plastics or call 570-327-4520.

For more about the college, a national leader in applied technology education and workforce development, visit www.pct.edu, email admissions@pct.edu or call toll-free 800-367-9222.

BLOW MOLDING DIVISION

CHICAGO 2017

# Registration Form

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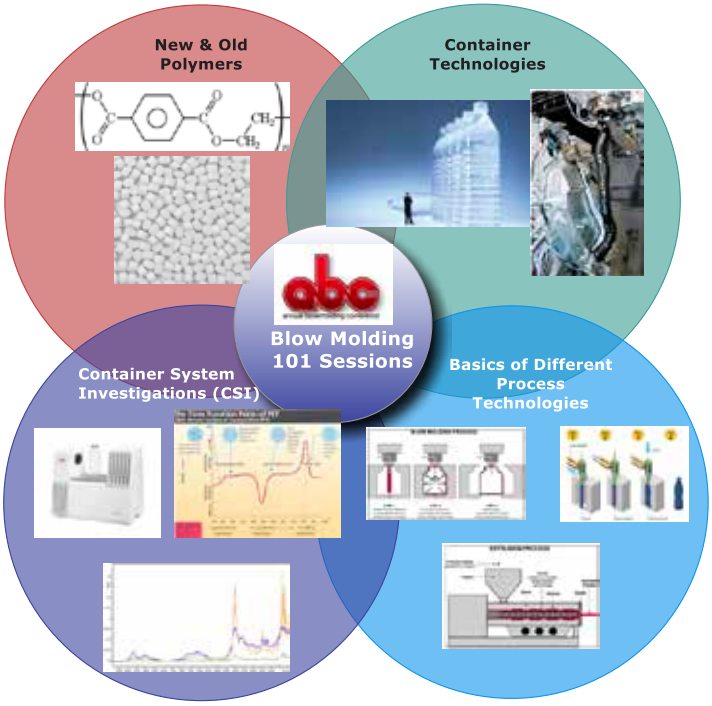
# Blow Molding 101 Session Guide




The Blow Molding 101 sessions offered during the opening day of the ABC offers attendees the opportunity to learn about the materials used in blow molding, the main blow molding processes, blow molding applications and other topics such as inspection, colorants, fillers, 3D printing/additive manufacturing as well as others. These sessions are a great way for someone new to blow molding to learn the basics, or provide an opportunity for anyone to learn about other areas of blow molding. The sessions focus on the following areas:

**Materials**

The three broad classes of materials used in blow molding are Polyethylene terephthalate (PET), polyethylene (PE) and engineering polymers. PET is primarily used in food packaging applications such as single serve beverage bottles, pharmaceutical bottles and is growing in other applications such as juices, teas and others. PET is also used in personal care packaging applications. PE is used in a variety of packaging and industrial applications. High density polyethylene (HDPE) is the largest volume PE used in applications including food packaging and industrial applications. Food packaging applications include milk bottles, household industrial containers (HIC), oil bottles, pharmaceutical bottles, and personal care. HDPE is used for packaging industrial and agricultural chemicals, and large volume containers such as drum, jerry cans and intermediate bulk containers. HDPE is in large industrial, automotive and recreational applications such as pallets, automotive fuel tanks, automotive ducting, kayaks, sheds and others. A variety of engineering polymers (EP) including Acrylonitrile butadiene styrene (ABS), polycarbonate (PC), nylon, alloys and others are used in blow molded applications. Automotive applications for EP's include bumper guards, fuel systems, fluid tanks, seat backs, knee bolsters, instrument panels and others.

**Blow Molding Processes**

Continuous Extrusion Blow Molding (EBM) is perhaps the most broadly practiced form of blow molding and can be further broken down into shuttle machines, long stroke machines or wheel machines. Commonly used to produce bottles, EBM machines can range in capacity from 5 million to 50 million bottles per year. Examples of bottles produced on EBM machines are oil bottles, HIC, personal care, and others. Reciprocating screw machines are also commonly used to produce thin walled bottles such as milk, water and juice but can also be used for other applications. Injection stretch blow molding (ISBM) is the most frequently used process to mold PET containers for beverages. ISBM is a two-step process where preforms are first injection molded, then the preforms are transferred to a blowing machine where they are re-heated, transferred, stretched and blown into bottles. Injection blow molding (IBM) is a process that creates a preform by injection material into a mold in one station, transfers the molded preform to a blowing station to form the bottle then transfers it to an ejection station where the bottle is removed. This process is used most commonly with medical bottles (pills) that require extremely tight neck finishes. Large blow molded parts, such as industrial parts, recreational parts, drums, tanks and IBC's are produced using accumulator head blow molding. The accumulator head machine generally has a fixed clamp with 1 or 2 heads and charges the accumulator with a continuous screw while awaiting the cooling of the previous shot. These machines range in capacity of ½ pound to 600 pounds. Clamp sizes range from 16" x 20" to 10ft x 15ft.

**Additional Topics**

A variety of additional topics designed to complement the materials and process tutorials are also offered. Examples of topics include inspection systems, auxiliaries, colorants, fillers, 3D printing/additive manufacturing, bio-polymers in blow molding, asset management and others.

BLOW MOLDING DIVISION

Scott Steele

# Greetings

The spring council meeting was held at ANTEC in Anaheim. The main activity was the yearly change of officers. The new president, Raed Al-Zubi, took over for Scott Owens. The election results also named a new president elect, Brian Grady. Brian comes from the EPSDIV and has good experience running conferences. The new structure for the management of the society through an executive board is now implemented. The council still has final say on matters but there are clear lines of responsibilities of the volunteers that operate the society in between meetings.

In addition, we met the new executive director Patrick Farrey who replaces Wim De Vos. Patrick is an experienced manager of volunteer organizations and has a track record of building them. He is not a plastics professional but is eager to learn and meet the industry. Several of our board members were able to meet him during an awards program and he is intent on building a relationship with our board.

The business of the society is on the slow side right now. ANTEC will be a financial success although it continues to shrink as does membership. Fiscal year 2016 finished on a slight negative but a manageable loss. SPE signed a significant new deal for publishing journals and the magazine. The signing bonus for the 10 year contract will shore up the financial picture and there will be a significant profit in 2017.

ANTEC continues to be one of the best values in technical conferences. The blow molding session of 6 papers was one of 90 sessions covering all aspects of the plastics industry. The duration has been squeezed into 3 days. It is well worth the time to attend. ■

Scott Steele

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