

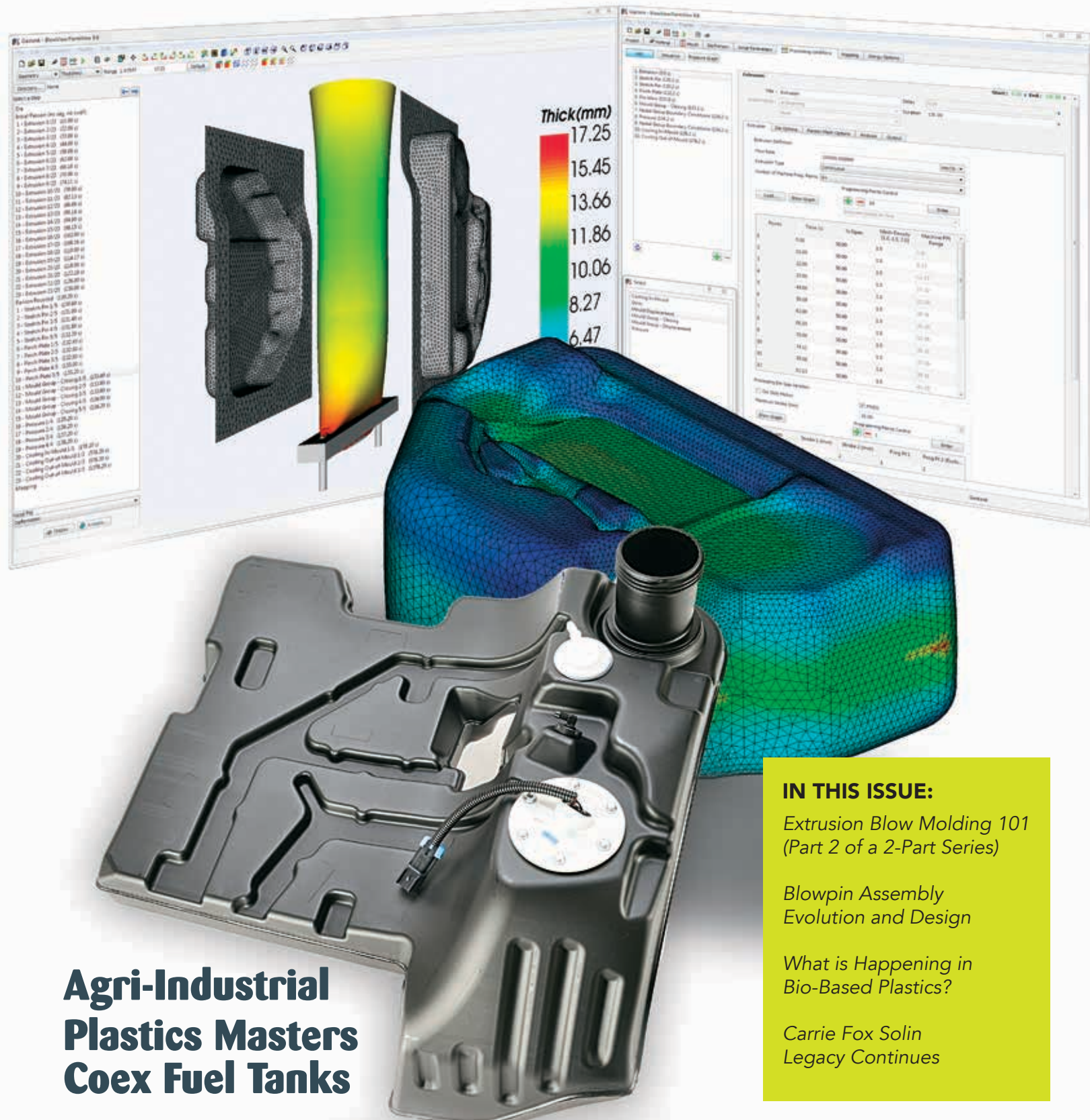


# BLOW MOLDING

QUARTERLY

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

Third Quarter 2017  
Volume 01 | Number 03



**Agri-Industrial  
Plastics Masters  
Coex Fuel Tanks**

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(Part 2 of a 2-Part Series)*

*Blowpin Assembly  
Evolution and Design*

*What is Happening in  
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Legacy Continues*



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[www.blowmoldingdivision.org/conferences/conference-2017/](http://www.blowmoldingdivision.org/conferences/conference-2017/)

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**for 2017 Copy and Ads**

**FEB 15** Spring

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**AUG 01** Fall

**NOV 15** Winter

All artwork to be sent in .eps or .jpg format  
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**Cover Photograph:** Lawn tractor gas tank courtesy of  
Agri-Industrial Plastics Company (AIP) in Fairfield, Iowa.

*Cal Becker*



## Summer 2017– ABC Conference “Value”

Our 33rd Annual SPE Annual Blow Mold Conference (ABC) is set for October in Chicago. Great effort has gone into planning the conference and we anticipate delivering superior content and value to all the attendees. The planning for this conference really started a couple of years ago by securing a location that helps to promote participation and value. The value derived—our ABC “value target”—is different for each participant, including; conference focus, speakers, papers delivered, education, parts competition, exhibitions, and networking opportunities. I personally value new or rediscovered learnings that I can apply to my career.

The board strives to improve our conference every year. So, how do we improve value YOY? First, we utilize a SWAT team approach with conference and topic expertise. With full board participation, this team includes our conference coordinator—Deirdre Turner—who is spectacular at what she does. Her guidance along with board Director Ron Puvak, plus two to three additional yearly rotating board members that meet regularly throughout the year, are the core of our planning structure. Next, we invest a full BOD effort to help solicit and drive quality presenters with pertinent papers (not just company advertisements!). Also, the conference location is key as it needs to be practical/affordable to get to.

We target our agenda to be available ten weeks prior to the conference. Early preparation allows our members and sponsors to communicate any changes to the planned schedule. Always at the forefront when planning for a conference is our Mission Statement and ensuring value for all members.

Recently on the chain4spe.org, I read that SPE National has a newly-elected VP of events, Jamie Gomez. Mr. Gomez is asking for input to revitalize SPE ANTEC starting in 2019. Not an easy task! I have only seen a few responses to date, although they seem spot-on. Since we all want to see ANTEC continue for another 75 years, your input and support is critical. Remember if you identify an issue, please offer a solution that could remedy. I believe this is what Honest Abe meant about “criticism”: “He has a right to criticize, who has a heart to help.” (Abraham Lincoln)

For those that attend ABC 2017 please give us your feedback as this will only help us to improve our 2018 ABC in Pittsburgh!

“Promote, communicate and disseminate knowledge relating to the Art and Science of Blow Molding technology.” ■

*Cal Becker*

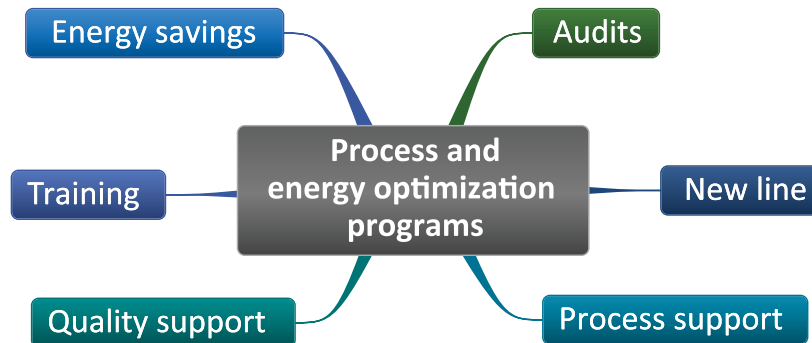


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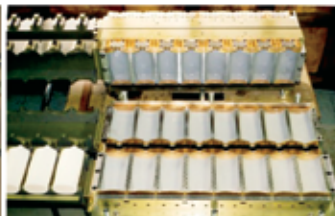
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## The Shale Revolution's Staggering Impact in Just One Word: Plastics

By Christopher M. Matthews

*Petrochemicals, once simply a cheap byproduct, are powering a U.S. manufacturing boom and export bonanza*

When new parents in Rio de Janeiro buy baby food in plastic containers, they are bringing home a little piece of the U.S. shale revolution.

That boom in drilling has expanded the output of oil and gas in the U.S. more than 57% in the past decade, lowering prices for the primary ingredients Dow Chemical Co. uses to make tiny plastic pellets. Some of the pellets are exported to Brazil, where they are reshaped into the plastic pouches filled with puréed fruits and vegetables.

Tons more will be shipping soon as Dow completes \$8 billion in new and expanded U.S. petrochemical facilities mostly along the Gulf of Mexico over the next year, part of the industry's largest transformation in a generation.

The scale of the sector's investment is staggering: \$185 billion in new U.S. petrochemical projects are in construction or planning, according to the American Chemistry Council. Last year, expenditures on chemical plants alone accounted for half of all capital investment in U.S. manufacturing, up from less than 20% in 2009, according to the Census Bureau.

Integrated oil firms including Exxon Mobil Corp. and Royal Dutch Shell PLC are racing to take advantage of the cheap byproducts of the oil and gas being unlocked by shale drilling. The companies are expanding petrochemical units that produce the materials eventually used to fashion car fenders, smartphones, shampoo bottles and other plastic stuff being bought more and more by the world's burgeoning middle classes.

"It's a tectonic shift in the hemispherical balance of who makes what to essentially feed the manufacturing sector," said Dow Chief Executive Andrew Liveris, referring to the growth of production in the U.S. His company now plans to double down on its U.S. expansion with a \$4 billion investment in a handful of projects over the next five years.



*The shale boom has lowered the price for the raw materials used to make plastics.*



*A new petrochemical facility in Freeport, Texas, on the Gulf of Mexico is part of Dow Chemical's \$8 billion investment.*

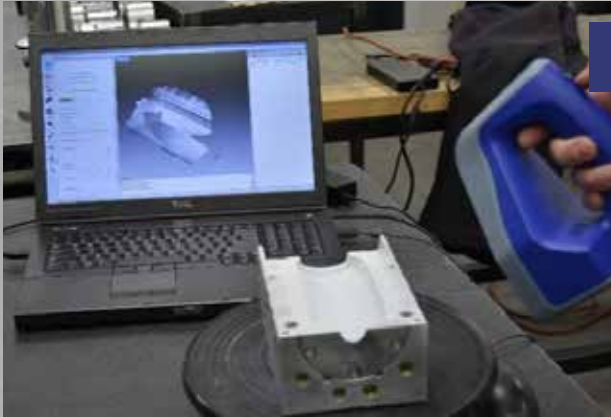
PHOTO: SCOTT DALTON FOR THE WALL STREET JOURNAL

Companies are eagerly launching new U.S. petrochemical projects—310 in all according to the Chemistry Council—because at a time of uncertainty over when demand for transportation fuels may peak, due to electric cars and ride sharing, the world's appetite for plastics is expected to rise for decades to come.

That demand typically grows at least 1.5 to 2 times as fast as global gross domestic product, according to industry analysts. That theoretically makes petrochemicals one of the safer fossil fuel investments, though skeptics question whether the margins on U.S.-made plastics can last.

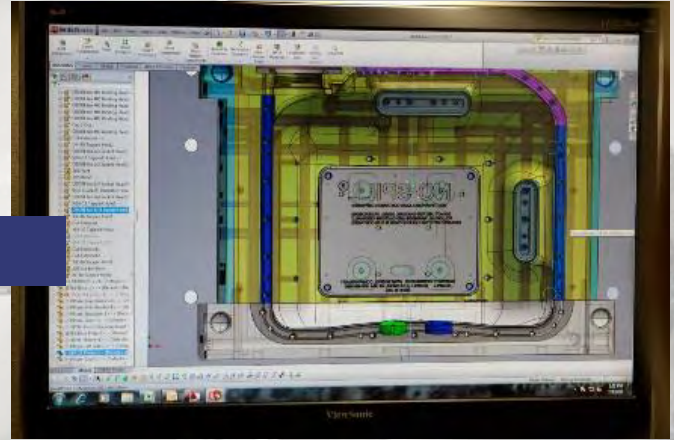
The new investment will establish the U.S. as a major exporter of plastic and reduce its trade deficit, economists





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# The Business of Blow Molding

say. The American Chemistry Council predicts it will add \$294 billion to U.S. economic output and 462,000 direct and indirect jobs by 2025, though analysts say direct employment at plants will be limited due to automation.

For energy companies, the build-out creates a new market for byproducts they previously had little use for. Drillers have been flush for years with the raw materials but have left them in the gas stream to be burned off, because no one wanted them. A spike in demand in coming years could make drilling more profitable.

Petrochemical companies are betting the price of the feedstocks—their most costly expense—will remain low for years due to shale drilling. As a result, net U.S. petrochemical exports, which include plastic as well as products such as fertilizer, adhesives and solvents, will grow to \$110 billion a year by 2027 from \$17 billion last year, according to IHS Markit. That would come close to the value of Saudi Arabia’s current annual oil exports.

“There’s no other industry that comes close to that level of growth,” said IHS economist Thomas Runiewicz.

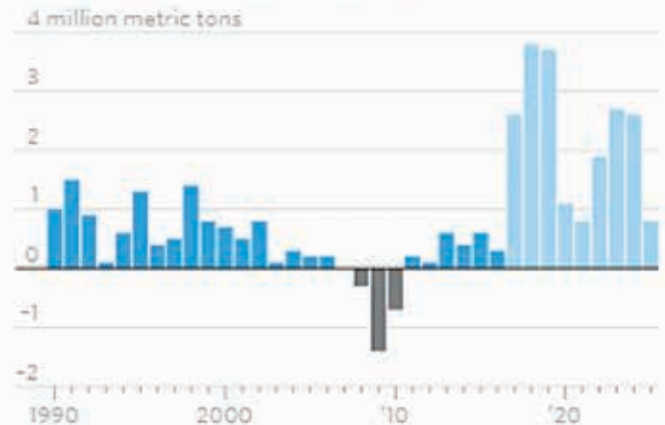
Many of the companies investing in the U.S. are foreign, including Saudi Arabia’s state-owned chemical company and some of the largest petrochemical companies in Brazil, Japan and Thailand.

In April, Exxon said it selected a site near Corpus Christi, Texas, for a \$9.3 billion petrochemical complex it is building jointly with Saudi Basic Industries Corp. The proposed facility, the largest of its kind in the world, is expected to be done by 2021 and produce 1.8 million metric tons a year of ethylene, the main component of plastic.

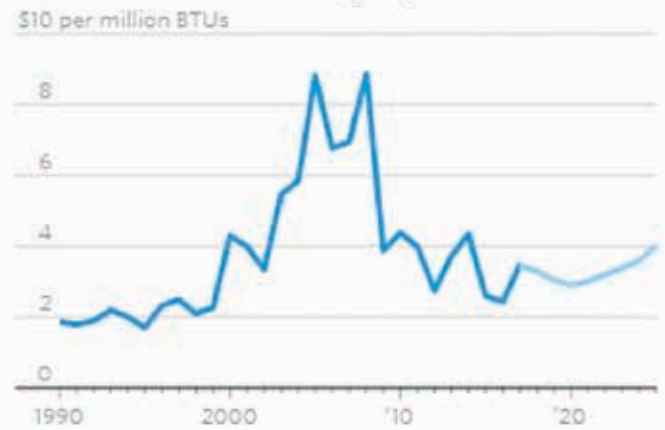
“We don’t see this as a bet,” said Neil Chapman, president of the chemicals unit at Exxon, which is investing a total of \$20 billion in such projects along the Gulf of Mexico. “You’ve got to pinch yourself sometimes and say ‘this is the envy of the world.’ ”

Dow’s plant in Freeport, Texas, when fully operational by the end of the year, will produce 1.5 million metric tons of ethylene annually. The company plans to export at least 20% of the plastic it makes in the U.S. and is particularly eyeing Latin America as a ripe market.

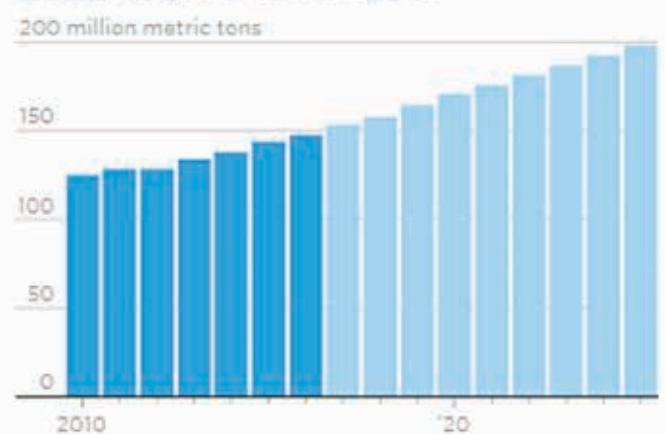
### New U.S. ethylene capacity



### U.S. Gulf Coast natural gas price



### Global ethylene consumption



Dow expects plastic baby food containers will be a booming business in Brazil, where an increasingly career-oriented female population is favoring prepared baby foods in innovative packaging to save time, according to a 2015 World Health Organization study. That is expected to fuel projected annual growth of about 10% in sales of the industry’s flexible and rigid plastic packaging in Brazil, the report said.



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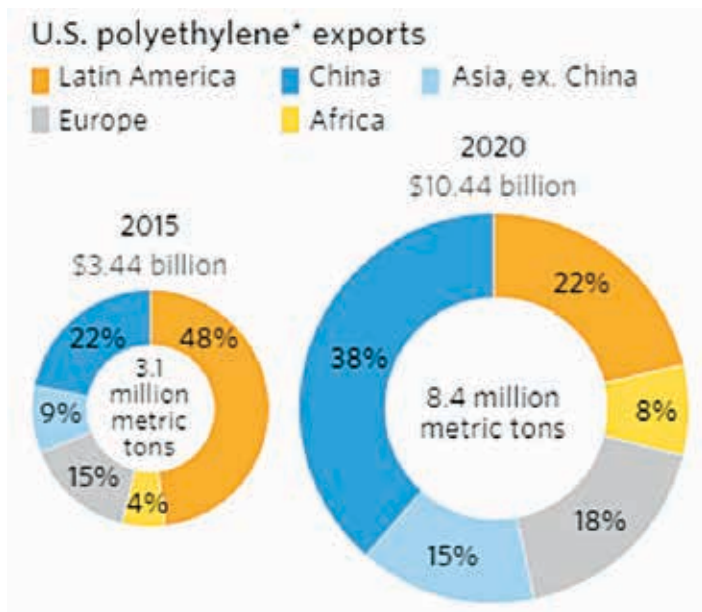


Dow's plant in Freeport, when fully operational by the end of the year, will produce 1.5 million metric tons of ethylene annually. PHOTO: SCOTT DALTON FOR THE WALL STREET JOURNAL

## Plastic Model

While natural gas prices remain at low levels, petrochemical companies have been pouring money into expanding production of ethylene, made from gas byproducts. The world's consumption has soared, and the U.S. forecasts major growth in exports.

"We are taking advantage of population growth, the rising middle class and the on-the-go lifestyle," said Paloma



Source: PCI Wood Mackenzie

Note: Projections begin in 2017. Polyethylene data may not add to 100% due to rounding.

\*The main material produced from ethylene.

Alonso, Dow's vice president of plastics in South America. "The Gulf investment is really essential for us."

The U.S. investments aren't without risk. American petrochemical facilities mostly run on ethane, a byproduct tied to natural gas prices, while counterparts in Asia and Europe primarily use naphtha, a crude oil derivative.

Ethane prices fell when U.S. natural gas prices fell in 2009, while naphtha prices increased as oil prices soared to more than \$100 a barrel in 2011. Since then oil has fallen below \$50 a barrel, making companies that use naphtha more competitive. Natural gas prices remain historically low, but the wave of new ethane demand could drive up prices.

Paul Bjacek, a chemicals expert at Accenture, said diminishing margins might push smaller companies or private-equity investors out of the second wave of investment, but larger operators will move ahead.

"The margins are still good, they're just not as good as they were, which was amazing," he said.

Human beings have been using pliable materials found in nature, such as rubber, for centuries. But when Leo Baekeland, a Belgian-born American chemist, invented the first fully synthetic plastic derived from coal in 1907, it set off the modern consumer era, flooding the market with cheap durable goods almost entirely derived from fossil fuels.

Chemists can take the carbon atoms found in fossil fuels and rearrange them to create chains of atoms longer than those found in nature, which in turn can be used to make everything from nylon stockings to PVC piping.

Oil and gas byproducts, including ethane, butane and propane, are sent to huge furnaces called "steam crackers," which use superheated steam fed at high pressure to break apart molecules. Ethane is cracked into a smaller molecule, ethylene. The majority of ethylene in turn is used to make a plastic called polyethylene, and formed into pellets.

Millions of these U.S.-made pellets will be loaded into 25 kilogram sacks and sent via cargo ships to factories around the world, where they will be melted and shaped into plastic products.

By the end of the decade, energy consultancy PCI Wood Mackenzie estimates the U.S. chemical industry will have increased its capacity to make ethylene by 50%.

The world consumed more than 147 million metric tons in 2016 of ethylene and will need more than 186 million tons by 2023 to meet global demand, according to the consultancy. It said U.S. exports of polyethylene, the plastic pellets, are expected to reach \$10.5 billion by 2020.

China is also rushing to build new plastics factories to meet domestic demand, which is already more than double U.S. demand and is expected to grow 6% annually.



*Employee Tommy Scott examines bottle caps being made at the Dow plant.* PHOTO: SCOTT DALTON FOR THE WALL STREET JOURNAL

The boom in U.S. petrochemicals is a big turnaround from just a decade ago. Following a period of large investment in U.S. projects in the 1990s, U.S. ethylene manufacturers made huge cuts in the 2000s.

Instead, chemical companies invested in large projects in the Middle East and Asia, attracted by cheaper raw materials and closer proximity to manufacturers, who had also fled the U.S. because of higher costs. The tough times were exacerbated by falling demand for plastic as the financial downturn took hold in 2009.

More than a dozen facilities on the U.S. Gulf were shut down in 2008 and 2009. Dow alone closed a half dozen plants on the Gulf and laid off 5,000 employees worldwide. Chevron Phillips Chemical, a joint venture between Chevron Corp. and Phillips 66, temporarily closed two

factories and ran others at lower capacity. LyondellBasell shut down its complex in Chocolate Bayou, Texas, and declared bankruptcy in the U.S.

“The industry was really looking inward and saying ‘it’s not dead but it’s not going to grow anymore,’ ” said Steve Zinger, a petrochemical consultant at PCI Wood Mackenzie.

Then came the fracking revolution. By 2010, as U.S. drillers used horizontal drilling and hydraulic-fracturing technologies to release vast oil and gas deposits trapped in rocks, they also unlocked raw materials for petrochemicals. U.S. production of natural gas byproducts has grown from two million barrels a day in 2008 to more than 3.7 million in 2016, according to energy consultant RBN Energy LLC.

The petrochemical industry was slow to react due to uncertainty about the long-term viability of U.S. shale drilling. Initially, companies invested only in adding capacity to existing U.S. facilities. By 2012, they started building.

Later this year, a new Chevron Phillips facility capable of producing 1.5 million metric tons of ethylene a year is coming online in Baytown, Texas. It covers a plot the size of 44 football fields and is made up of 350 miles of pipe, 40,000 tons of steel and 140,000 tons of concrete. It has taken four years to finish.

During the height of its construction, more than 4,500 construction workers and engineers were on site. Once



*In the U.S., \$185 billion in new petrochemical projects are in construction or planning. Above, the Dow facility in Freeport.* PHOTO: SCOTT DALTON FOR THE WALL STREET JOURNAL



# The Business of Blow Molding

operational, it will only take around 200 employees to run.

"I had told the board the U.S. was not a growth play, but by 2010 I saw things were changing," said Ron Corn, Chevron Phillips' senior vice president of projects. "Of course, once you put in the capital, you have to wait five years."

For Chevron Phillips, the biggest challenge isn't profitably making plastic pellets. It is getting them to market in a crowded Gulf Coast.

Because there is so much traffic in the Port of Houston, and a dearth of shipping containers there, the company has created a fleet of 2,750 railcars to divert many of the pellets north to Fort Worth. From there, they will be sent by train to ports in Long Beach, Calif., and Charleston, S.C., where they will be shipped to Asia and South America. Some exports will also leave from Houston and Freeport, Texas.

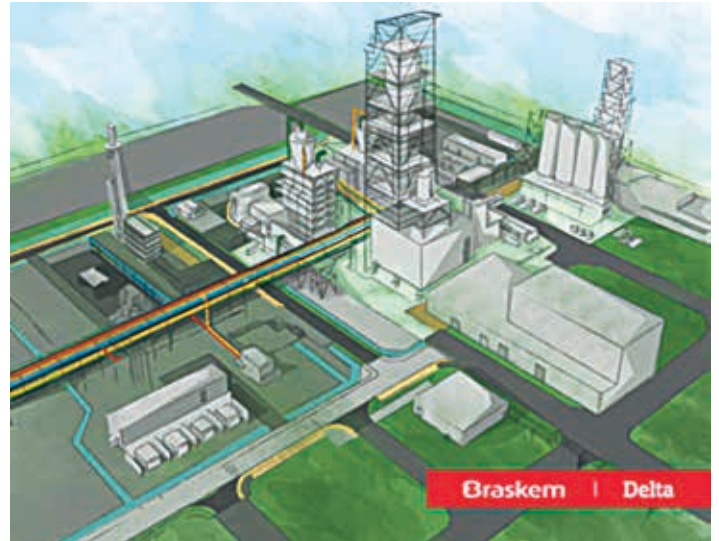
"Everyone has the same great idea at the same time in this industry," Mr. Corn said. "The way you win is on logistics."

## Braskem Approves Construction of Delta, the Largest Polypropylene Production Line in the Americas at Plant in La Porte, Texas

**Construction of the new 450 kiloton production line is targeted for completion in 1Q 2020**

The leading thermoplastics resins producer in the Americas, today announces that the Company's Board of Directors has formally approved the final investment decision to proceed with the largest polypropylene (PP) production line in the Americas. Braskem will commit up to \$675 million in investment capital towards the design and construction of the new facility which will be named Delta and will be located next to Braskem's existing production facilities in La Porte, Texas, U.S.

Fernando Musa, Braskem Chief Executive Officer, stated, "Our approval to proceed with the capital investment in Delta is the latest major milestone in Braskem's global growth strategy. This new world-class petrochemical facility



will bring important new North American production capacity to help us meet the growing demand from our clients, reaffirming our position as the leading producer of polypropylene in the Americas and the third largest in the world."

"Leveraging the success of shale gas energy production, North America has among the most attractive feedstock profiles worldwide in terms of access to low cost sources of feedstock and the depth of suppliers. With no new polypropylene plants added since 2005, North America also transitioned to being a net importer of polypropylene in 2016. As such, our additional investment in the United States is a logical extension of our global growth strategy. By increasing our production capacity in close proximity to customer demand, attractive feedstock as well as established export channels, we believe Delta will serve our clients well and offer an attractive return on our investment for our shareholders. This investment is a true vote of confidence in the future of Braskem and a testament to our commitment to meeting our clients' needs," concluded Mr. Musa.

With the engineering design phase well underway, the new production line will have a manufacturing capacity of 450 kilotons (kt), or the equivalent of approximately 1 billion pounds, per year. Construction will take place on part of the approximate 200 acres of land at Braskem's current La Porte facility footprint which is located 26 miles from Houston. The new line will represent additional production capacity of homopolymers, random copolymers, impact copolymers, and reactor TPOs, building upon Braskem's current polypropylene production plant in La Porte which has a

production capacity of 354 kt annually and will continue operations. Today's announcement also builds upon the momentum of Braskem's recent launch of its new UTEC Ultra High Molecular Weight Polyethylene (UHMWPE) production plant located at the same La Porte site.

Delta will benefit from significant existing support infrastructure already in place to accommodate the new line including feedstock and utilities connectivity, rail infrastructure, central control room and testing facilities, emergency response equipment, waste treatment facilities and more.

The construction of Braskem's new Delta PP production line is expected to positively impact economic activity in the region, employing approximately 1,000 development and construction workers to fully construct the facility. Upon final completion, the company expects the new line to bring an additional 50 Braskem permanent full-time jobs to the La Porte community.

Construction is expected to begin mid-summer, with the final phase of main construction targeted for the first quarter of 2020. The facility design is being developed directly in-line with Braskem's commitment to sustainability and attention to eco-indicators such as emissions, water and energy efficiency, as well as recycling and waste reduction.

For additional information on Braskem's new Delta production line announcement and progress, please visit [www.braskem.com.br/usa/delta](http://www.braskem.com.br/usa/delta). ■

## Creativity is a gift to be nurtured

By Christopher Thompson

Have you ever seen an image or some other type of visual work and thought, "Wow, that is unique. I wonder who came up with that idea?"

I find myself asking that question a lot and have always been envious of people who have the ability to come up with ideas and concepts that resonate with those who see them.

In all aspects of business, creativity is a skill that I've found

to be undervalued. In most roles I've been in, I've placed a higher value on other skills, such as communication, negotiation and leadership skills. But over the years, I've recognized creativity as something that encompasses all aspects of business and is an extremely valuable component of a well-rounded skillset.

When it comes to creativity, it's more than just art and the ability to develop visually appealing work. Creativity influences your ability to solve problems. It influences your ability to recognize opportunities. And most importantly, creativity influences your ability to come up with ideas that break through traditional thinking and bring others around you to recognize things they otherwise would not have.

I've never considered myself to be the most creative person in the world. It wasn't a gene I inherited. I can barely draw a stick figure. But that doesn't mean I can't come up with a neat idea every once in a while. And the same is true for you.

Here are a few techniques and habits I've learned and applied along the way that have helped me come up with a few decent ideas over the years.

- Get out of your environment: Most people have a pretty solid routine when it comes to where they do their work. Your office and home are where you spend most of your time, so chances are this is where you spend the most time trying to solve problems and figure things out.

Getting out of the environment that you're used to being in can get the creative juices flowing. Something as simple as leaving your office and going to a coffee shop to work can break your routine thought process and cause new ideas to be born. Being exposed to new places, people and environments can help spawn new perspectives.

- Build on old ideas: In many cases, brilliant ideas simply build on other ideas and make them better. One of my co-workers sent around a picture of a pencil stuck into the middle hole of a ruler and stated that it was the fidget spinner classic edition.

Do you remember doing that? I may be dating myself, but if you're up to speed on the fidget spinner craze, you'll get the point.

# The Business of Blow Molding

How about Apple Pay? Paying for what you buy in a store with a credit card isn't a new idea. But having my credit card stored on my phone and paying with my watch is a recent example of an old idea becoming way better.

- The more brains the better: I've found this to be the most valuable tactic when it comes to really getting the creative ideas flowing. Instead of you trying to come up with the next genius idea on your own, have others help you.

Getting three to five people together in a room and sharing ideas and perspectives is how I've seen some of the best ideas born. This is especially effective when you're trying to come up with ways to solve complex problems, uncover new business opportunities or simply strategizing on how to approach a potential client.

And there are also a lot of other ideas out there to try. Poke around and research how and when people have brilliant ideas pop into their heads. It's different for everyone and interesting to learn more about.

Creativity is a gift that some people naturally have and others like myself have to work a little harder on. But there's no doubt, creativity is an important skill that you can develop and perfect by thinking about how you approach coming up with new ideas. ■



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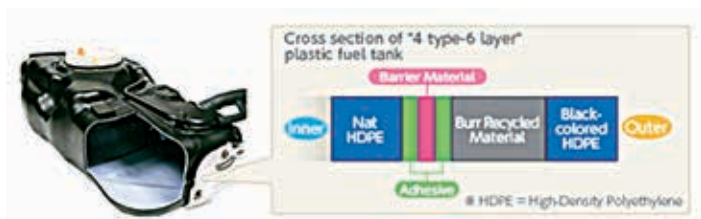
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# Meeting the Challenge Head On, Agri-Industrial Plastics Masters Coex Fuel Tanks With Computer Simulation

EPA compliance standards for controlling VOC (Volatile Organic Compounds) emissions, while putting severe demands on fuel tank performance characteristics, also created opportunity for fuel tank suppliers to adopt innovative technologies, processing and design capability to meet the challenge and assure their economic and competitive market position.

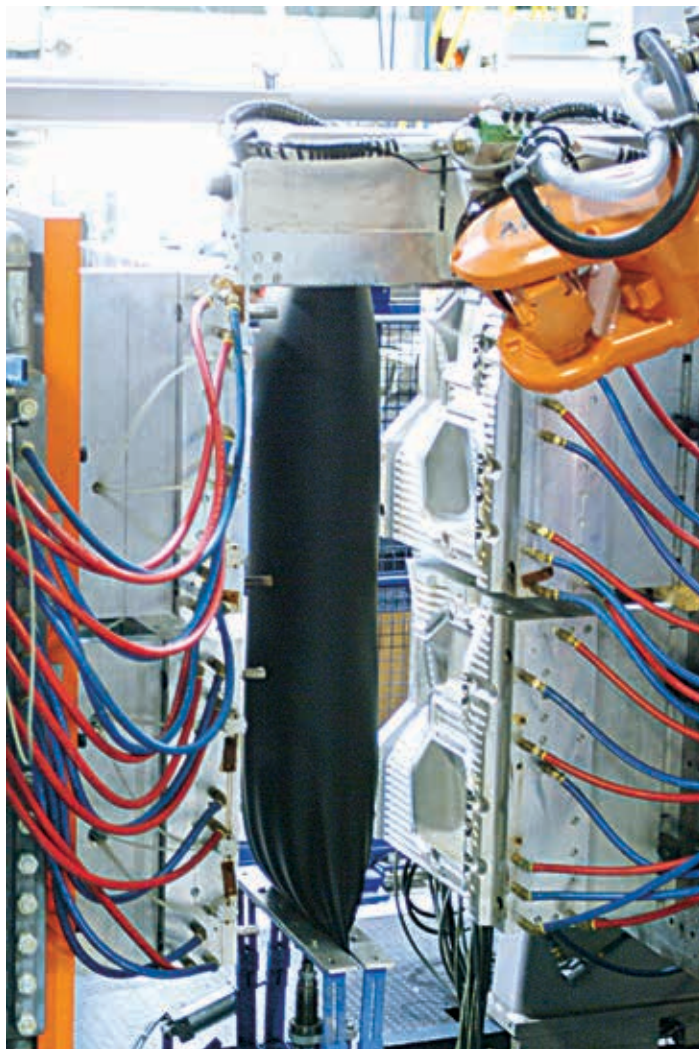
As emissions compliance standards impacting the auto industry evolved to encompass small engine off-road vehicles (powersports and outdoor power equipment), the companies that traditionally supplied these OEM's with monolayer blow molded PE tanks were faced with the decision of how best to help their customers meet the challenge.

One such company was Agri-Industrial Plastics Company (AIP), a family-owned custom molder in Fairfield Iowa. "We basically had to decide if we were going to continue supplying fuel tanks to our customers, or get out of it all together", said Geoff Ward, AIP's Director of Engineering & Quality.



Addressing the new market demands started with evaluating the requirements for VOC barrier and selecting the most enduring solution to meet evolving EPA standards while balancing customer expectations for performance and cost. The common olefin barrier technologies being considered at the time included DuPont's SELAR (R) nylon additive or secondary surface treatment of HDPE tanks with either fluorination or sulfonation. While the automotive industry had adopted multi-layer continuous co-extrusion blow molding (with EVOH barrier) decades earlier, most traditional custom blow molders were skeptical that such an investment

would pay off in the long run for those supplying the power sports and outdoor power equipment industries. In addition to the cost of a new COEX machine, the resource-intensive and time-consuming machine setup process for multi-layer was viewed negatively by most custom blow molders. Most customer blow molders decided to embrace fluorination as their VOC barrier option at the time.



After weighing the options and discussing with key customers, multi-layer co-extrusion was determined to be the most promising long-term solution for AIP and their targeted customers. Being a privately-owned company with principals who were willing to invest for long term – was a key driver in the decision – a significant investment that most publicly traded companies would find difficult to justify. Today AIP's gas tank production capacity is fueled by (6) KAUTEX multi-layer co-extrusion machines, with the 7th COEX machine now in transit from the KAUTEX facility

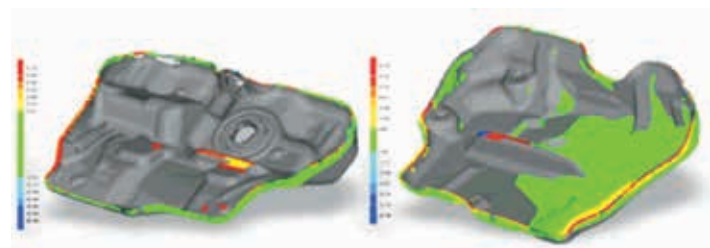
in Bonn, Germany. In addition to the multi-layer COEX machines, AIP has (20) mono-layer accumulator head blow molding machines in operation, making a range of other parts for their OEM customers. The range of blown products can vary from less than one pound to more than 80 lbs., and up to 44 inches wide and 120 inches long. About 80% of the fuel tanks blown currently are multi-layer barrier tanks.

Even though many of AIP setup technicians and operators have years of experience, additional training in the intricacies of operating co-extrusion machines was required. Along with gaining the knowledge to operate the co-extrusion blow molding machines more efficiently, expertise has been developed at AIP for insert molding, over molding, attaching metal fasteners or other assembly components such as fuel-tank fill necks, fuel pump mounts, vent barbs and mounting tabs. AIP successfully overcame the industry skepticism of over-molding while blowing multi-layer parts. Another assembly technique being utilized is hot plate welding.

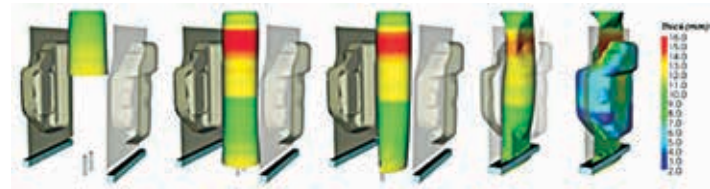
To further enhance manufacturing capabilities the company has deployed several robots. Six axis articulated robots are used both inside the machine for parison transfer, insert loading, and demolding, and outside the machine in the finishing/assembly area for trimming, hole drilling and hot-plate welding. The robotic trimming cells with end-of-arm tooling change capability are frame mounted and can be relocated from one machine to another making production scheduling more flexible. In addition, the company has begun using a collaborative robot or "cobot" for insert loading, which can be programmed with simple repetitive motion. This use of lead-through teaching programming used on the cobot makes set up for new jobs faster and simpler.

Another aspect of the company success is the incorporation of new design capabilities into product development, which speeds time to market by facilitating design review and optimization before committing to a prototype or mold fabrication. New designs are evaluated by the use of blow molding simulation software, BlowView, developed by the National Research Council Canada (NRC). Becoming a member of the NRC's Sigblow – special interest blow molding group, exposed AIP to the experience of other members in using the software and at the same time participate in guiding farther development

efforts to improve the software as well as adding new capabilities.



*Sophisticated software is helping to reshape plastic part design.*



Not only does a simulation point out deficiencies in the design leading for example to thin corners, it also provides a common platform for design review and communication with all involved within the company and with the customers. Running a simulation make it possible to readily assess design ideas. Typical issues addressed are: relocating parting lines, placement of inserts or positioning of blow needles.

Recent evaluation of predicted thickness vs. actual measured on a rather complex tank design, showed agreement between the two. Out of 22 points measured 16 were with 0.2 mm of the predicted wall thickness which ranged from 2 to 6 mm. The greatest thickness difference was 0.6 mm, while at other points the predicted values were dead on. This level of variation is typical of normal production variations. In the not-too distant future it is expected that process simulation will be used for process troubleshooting, to define machine parameters, making start-ups more efficient and speeding the transition to production.

Obviously, none of this could have been done without expanding the capabilities of the employees. While there are many "old timers" with many years of experience in blow molding that have to be introduced to new technologies and equipment, growth and concerns for the future made the company establish an apprentice program, look to local schools for help in reaching students whose studies have included the field of machinery



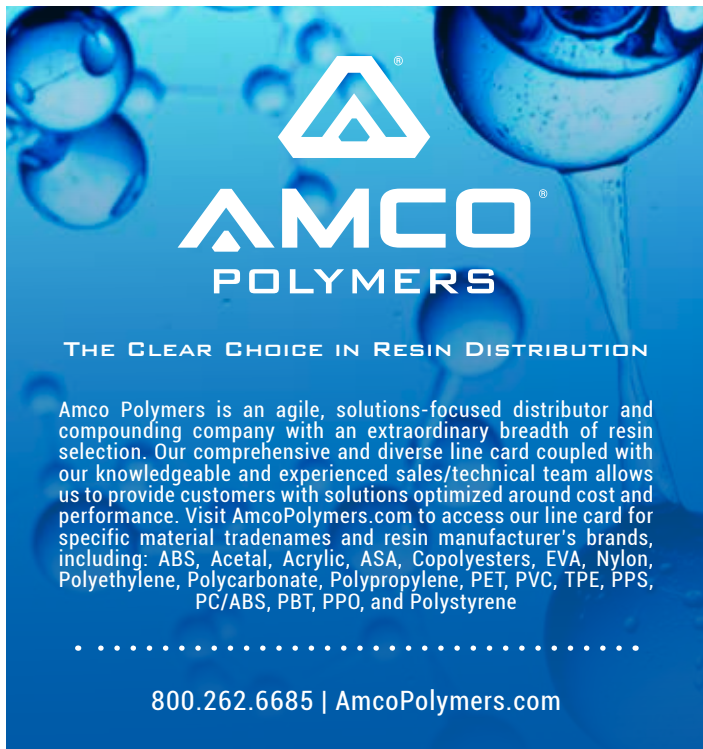
## Lead Technical Article

maintenance, and to the local college for graduates with robotic specialization. As importantly the company has established The Blue Zone worksite for all employees, which promotes healthy living practices.

While fuel tank applications have fueled AIP's growth, the company continues pursuing other opportunities in custom blow molding. A variety of products for outdoor power equipment, power sports and other sporting goods, heavy trucks, agricultural and construction equipment, traffic safety, defense, furniture, medical, and other industrial items are being routinely manufactured. The company has developed process capability with a range of thermoplastic materials including HDPE, PP, ABS, PC, PC/ABS, nylon, and co-polyester resins.

In today's commercial reality the choice is to meet challenges head on or be left behind. Agri-Industrial Plastics company's formula for success is based on continued re-investment in its facilities, equipment, employees and the community at large.

*This article was extracted for the Journal of Blow Molding from the article High-Tech Blow Molding At Agri-Industrial Plastics by Matt Naitove which appeared in Plastics Technology Magazine, May 2017, with the kind permission of Gardner Business Media, Inc. ■*



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## Extrusion Blow Molding Technology 101: Part II

By Joe Slenk, Applications Engineer, Bekum America Corporation

*Mechanical Systems and Forming a Part*

### Cycle Overview

Once a parison is properly formed, the mechanical system of the machine uses it to form the part. A typical EBM process uses the following steps:

1. Carriage shuttles the clamping system under the extrusion head
2. Clamping system closes the mold around the parison
3. The parison is cut with a knife system to separate it from the continuously flowing parison
4. Carriage retracts with the clamping system to bring the parison under the blowing station
5. Blowing (calibration) station lowers blowpins into the mold
6. Air is introduced into the parison and the parison is inflated/held against the water-cooled mold cavity forming the part
7. Exhaust air from part
8. Clamping system opens and releases the part
9. Process repeats

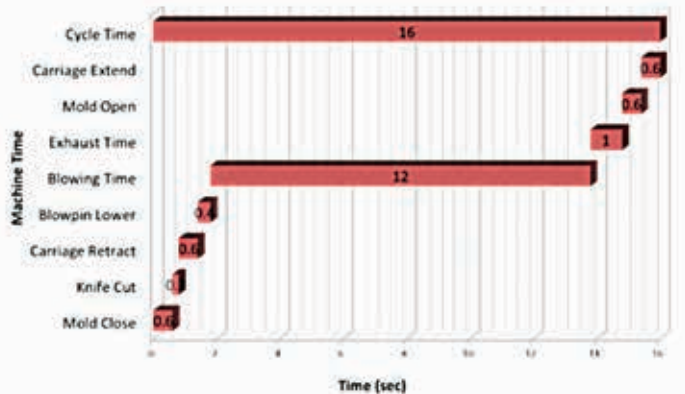


Figure 1: Example of EBM Cycle and Example Timers

### Clamping System

There are a number of varying clamp designs each with their own advantages, however all serve similar purposes in an EBM machine.

First, it holds the blow molds and moves them to open and close around the parison. It also has to provide enough opening movement so that the finished part can be

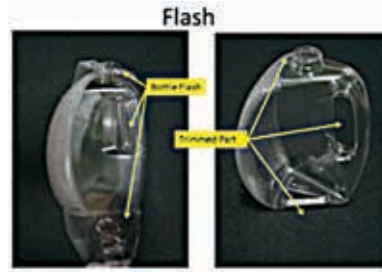


Figure 2: Bottle Flash

demolded. This is referred to as a machine's daylight.

Secondly, the clamp has to have enough force to trim flash. Flash is the leftover material that is used to re-weld the open end of the parison. This requires a certain amount of clamp tonnage that is dependent on the amount of linear flash required to be trimmed. Different material types and part thickness require different amounts of force to properly trim. Typically, this is given as a force/distance factor that can then be used to calculate the required clamp force required to trim a particular application. The formula for clamp force is:

$$\text{Linear Trim Factor} \times \text{Linear Flash} \times \# \text{ of cavities} = \text{Clamp Force}$$

An example of this calculation is as follows;

- Normal wall (.030" - .050") HDPE requires .224 US tons / in. of linear pinch off
- A 1 quart oil bottle has 7.7" of linear flash per cavity
  - 4" top pinch + 3.7" bottom pinch
- The particular machines clamp will allow 6 cavities based on the width of the container
- .224 tons/in. x 7.7" x 6 cavities = 10.35 US tons
- If the clamp has 27 US tons available, we can say it is 38% utilized ( $10.35 / 27 = .38$ ) and the application fits comfortably

Good mold construction and condition are important for proper trimming. Molds are typically made out of aluminum because of its good heat transfer, lower cost, and lighter weight when compared to stainless steel or beryllium copper. Flash pockets are cut to receive the additional material that is being trimmed off. Pinch offs are left to trim flash and designs can vary greatly depending on the mold maker and material being processed. Flash pockets and pinch offs are usually inlaid with stainless steel or beryllium copper to help with wear. A good weld seam must also be achieved on any flashed area to ensure

no splitting takes place at the seam and for drop impact properties.

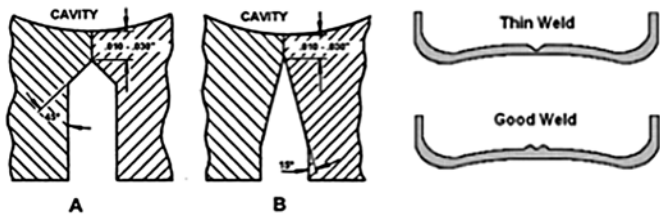


Figure 3: Example Pinch Designs and Weld Seams

Clamp design and force distribution also effect how well flash will be trimmed.

Third, the clamp must be able keep the mold closed during the blowing step by overcoming the force of the compressed air used to inflate the part. This force is determined by the surface area of the part and the blowing pressure making the formula:

$$\text{Part Length} \times \text{Width} \times \text{Blowing Pressure} \times \# \text{ Cavities} \times \text{Safety Factor}$$

Using the same example of a generic 1 quart oil bottle, the clamp force required would be as follows:

- $(9.8'' \times 4.1'' \times 100\text{psi} \times 1.15 (15\% \text{ SF}) \times 6 \text{ cavities}) / 2000 = 13.9 \text{ US Tons}$

In the previous examples, mold cavitation becomes important not only for clamp force requirements, but also for machine output, which is based on cavitation and cycle time. The maximum number of cavities that can be used is based on the platen size compared to the part size. Depending on the part geometry, a minimum distance is required between mold cavities to ensure proper cooling. By adding this dimension to the part width, a minimum distance between cavities can be established. This is referred to as the center line distance or CLD. On a 700mm wide clamp, the common CLD's are 2 x 320mm, 4 x 150mm, and 6 x 100mm.

Machines can be either single or double-sided which influences the total number of cavities per machine and, therefore, output. An additional way to increase cavitation is to run parts in tandem, where a single parison is used to produce two parts. This is typically only done for smaller bottles as platen height becomes an issue. Bottles are

blown either neck-to-neck using a needle and a lost dome, or base to base where a bottom calibration station is used to blow the bottom bottle.

## Carriage System

The carriage is used to move the clamp to and from the extrusion head. Because EBM is a continuous process (we will exclude accumulator machines for this discussion), the mold must be retracted away from the head after the clamp closes to prevent material building on top of the mold. There are two types of carriages used to perform this function. An inclined carriage travels at an upward angle from the blowing station to the parison. Once the clamp closes a knife cuts the parison separating it from the next parison. The carriage then moves at a downward angle away from the head and to the home position. Because it is moving downward, it moves away from the continuously extruding parison and does not require any bobbing from the extruder. A horizontal carriage moves only in the horizontal plane to and from. A bobbing extruder platform is required to lift the extrusion head up to allow the carriage to clear the parison before it lowers back down.

Machines can be equipped with one or two carriage/ clamping systems, which are referred to as single or double-sided machines. Double-sided machines are the most common, since a single extrusion system can supply two molds making the cost per output numbers more favorable.

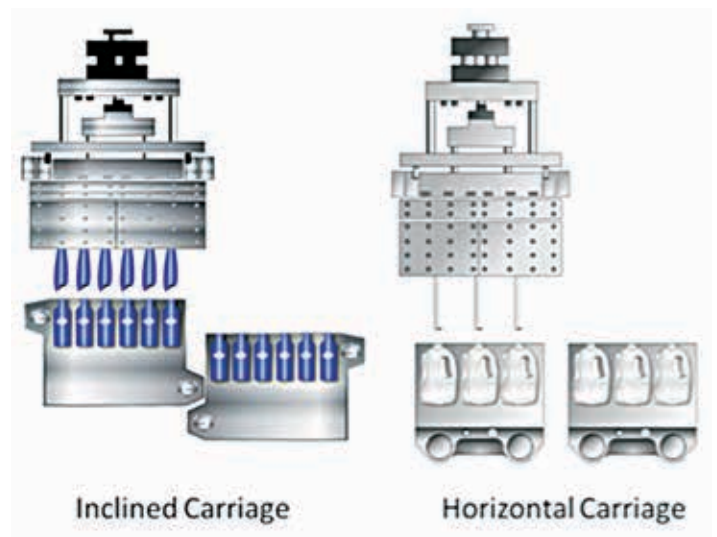


Figure 4: Carriage Types



## Parison Cutting

There are several ways to cut the parison prior to the carriage retracting. Knife choice is dependent on material type, parison size, and process parameters.

A spear knife is a simple system that consists of a beveled edge blade that extends quickly through the center of the parison before quickly retracting. This only allows for an open parison and is limited to smaller parison sizes. Captive neck bottles are a common application for spear knives.

Pre-pinch cold cut knives use overlapping knife blades that cut through the parison like a pair of scissors. Mounted above the blades are water-cooled pinch bars that squeeze the bottom of the next parison forcing it to be sealed. The sealed parison can then be inflated using support air that is introduced through the extrusion head. This is typically used on handleware containers and some technical parts so the support air can influence capturing the handle. If an open parison is required, no pinch bars are used and the overlapping blades simply cut the parison.

Pre-pinch linear knives are similar to pre-pinch knives but use a beveled knife blade that travels in a linear motion through the parison after the pre pinch bars are closed. The linear knife motion allows for a better parison opening on offset neck applications by pushing the parison towards the neck.

Hot knives use electrical resistance through a metal strip or “blade” to heat the blade, which then burns through the parison to cut it. This is used for materials that cannot be cut using a cold blade such as PET, PP, and LDPE.

## Calibration System

With the mold closed, parison cut, and carriage retracted, the parison then needs to be inflated. The calibration station is used to supply compressed air into the parison which inflates it into the final part. The typical execution is done using a blowpin that is inserted into the top of the mold. An advantage of the EBM process is the capability for a calibrated neck finish. The calibration station uses high force to compression mold the neck of a container and at the same time trim off the top flash. This provides better thread definition and a more controlled ID when compared to a blown neck finish.

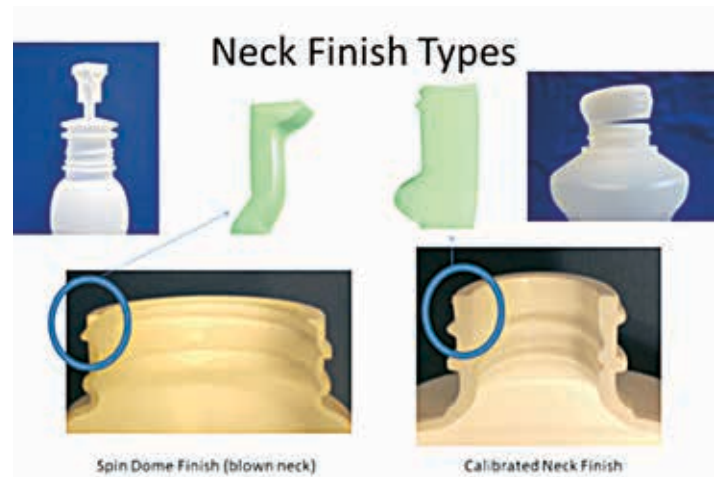


Figure 5: Blown vs Calibrated Neck Finish

The calibration station is also used to hold onto the part for demolding and then either strips the part from the blowpin, or holds it in place for automated machine options.

## Automation Options

After the part is formed, there are a few options for handling it. One option is it can be dropped onto a conveyor, which is referred to as a blow and drop machine. This provides no orientation and typically a packer will be at the end of the conveyor to separate parts from flash and pack the finished parts.

Many EBM machines provide in-machine trimming and automation to finish the part and place it onto a conveyor in an oriented fashion. This is done with different stations in the machine in combination with article-specific handover tooling that is supplied as a part of the mold package. In the calibration station, the part is held in position after demolding. The carriage then shuttles in to capture the next parison. When the mold closes, it also closes the handover tooling that is attached to the mold. Now the part is being held in the arms and the blowpin retracts, releasing the part. When the carriage shuttles back to the home position it transfers the part to the next station which has a punch. The punch extends and knocks off any flash. With the part trimmed, there are three main options used to transfer parts to the conveyor:

**1 Station Transfer** uses a robotic device to grab the part from the punch station and place it onto a conveyor after the mold opens for the next cycle.

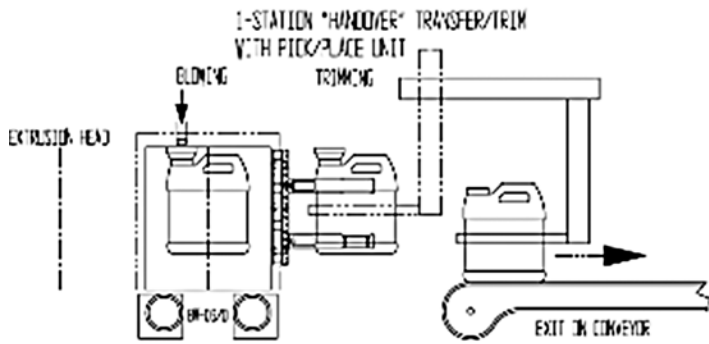


Figure 6: "1 Station Transfer"

**2** Station Transfer uses a post cooling station to lower water-cooled pins into the neck of the part (after punching), which holds the part in place when the holding arms open. When the carriage shuttles in on the next cycle, there is an additional station in the holding arms which grab the part and then shuttles it over top of a conveyor. The part is released when the arms open during the next cycle, or a pre-opening function is added to release it.

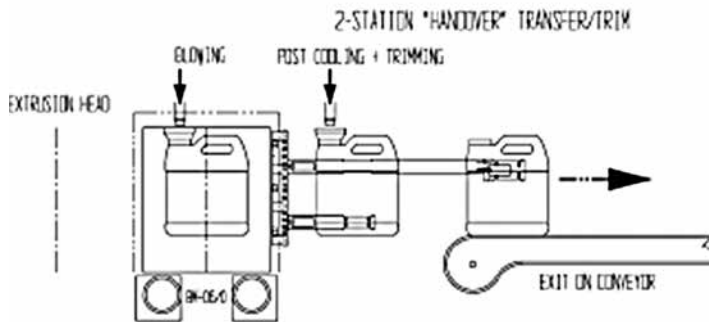


Figure 7: "2 Station Transfer"

**3** Station transfer can be used to add additional post cooling of the part and is often used for industrial type containers such as gas cans and 20L stackable containers to reduce cycle times.

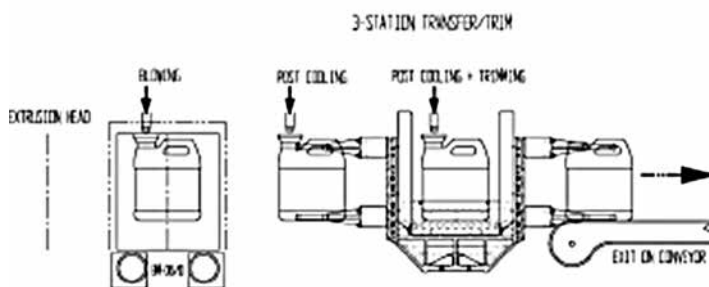


Figure 8: "3 Station Transfer"

Other options are available external to the machine, which can also handle/oriente parts. Un-scramblers are common for blow and drop applications, where tail/moil separation is used. This separates the bottles and flash onto separated conveyors. The bottles are un-oriented and dropped into an un-scrambling machine where they are sorted and placed upright onto a conveyor. Vision systems can also be used where a robot combined with a camera can visually separate flash from parts and pick parts that are un-oriented on one conveyor to pick and place them onto another conveyor in an oriented fashion. Finally, external robotic systems can also be combined with the blow molding machine to grab parts upon demolding and send them to an external trimmer and or downstream handling equipment.

## Machine Movement Goals

Dry cycle time is defined as the sum of the machines mechanical movements' independent of process related movements and timers. Specifically carriage in, mold close, carriage out, and mold open.

The only productive time in an EBM process cycle is when the part is actually being cooled. This happens when the parison is being held against the mold cavity surface during the blowing sequence. Certain movements and parameters are necessary to the process independent of a machines dry cycle movements and will be similar on different machines. An example of this would be knife cut.

For example, if a machine "A" that has a 3 second dry cycle time were to make the same part as machine "B" that has a 5 second dry cycle time, machine "A" would be able to run a 2 second faster overall cycle, while maintaining the same amount of cooling time on the part. To put that in perspective, if both machines had 8 cavities, and machine "A" ran a 14 second cycle, which means machine "B" would have to run a 16 second cycle, the difference is almost 2 million parts per year of potential production.

The goal of the machine movements then becomes that a machine should be able to move as quickly as possible in all movements to minimize dry cycle time. This can also be effected by how the machine is set up by plant personnel and often optimization of movements/timers can be an easy way to reduce cycle time and increase output. ■

# 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.

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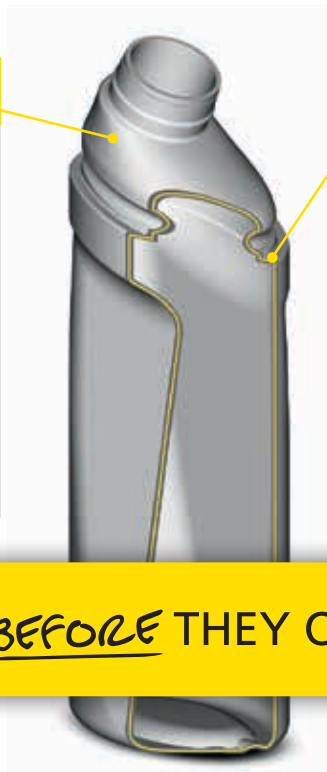
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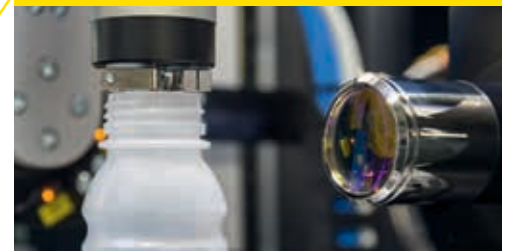
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## Blowpin Assembly Evolution and Design

By Don Maines, Secretary SPE Blow Molding Division, Vice President Triad Precision Products

*A guide to choosing and designing the right assembly for your mold.*

**Blowpin Assembly:** An integral part of tooling that expands the parison in the mold cavity with compressed air, thereby allowing the parison to take shape of the mold cavity.

In our previous journal, paired with Part #1 of 2 of the article by Joe Slenk of Bekum America, Extrusion blow molding (EBM) Technology 101; Brian Spence of Silgan Plastics wrote an article, Extrusion Head Tooling Design. In this article, I'll tie in with Part #2 of Joe's article and discuss the 2nd part of tooling required to process an EBM molded container (part); the Blowpin assembly.



There are three purposes of the Blowpin assembly:

1. Inflate the parison inside the mold cavity with compressed air through the inner channel in the Blowpin stem. Thus, forming the container to the shape of the mold cavity.
2. Form (calibrate) the inside of the container's neck with the Blowpin tip.
3. Cut the top of the neck from the flash leaving a smooth, flat neck finish with the cutting ring contacting the striker plate.

A critical piece to making a quality container, the Blowpin can many times be overlooked. "ah, we have something here that'll work" comes across my phone line too often. Yes, if you are on a tight budget you can blow a container with a 63mm neck finish using a Blowpin made for a

28mm neck finish by using oversized tips and cutters. You will sacrifice neck finish and cycle time, both valuable in production. By investing in Blowpins designed for a specific neck finish and container size, your money will be well spent. Just in hours saved in cycle time, they can pay for themselves in a brief period of time.

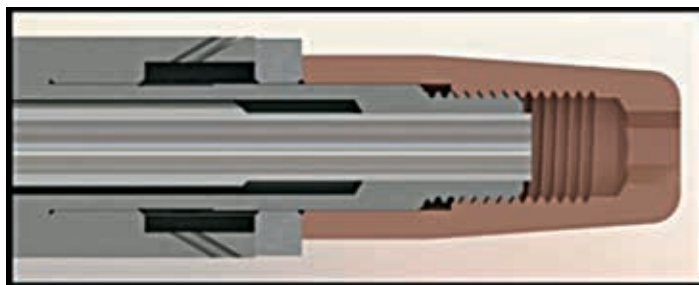


Figure 1: Indirect Water Cooled (water transfer)

There have been many improvements in Blowpin designs over the years. Back 20-30 years ago, most processors utilized **Indirect Water-Cooled** (IWC) Blowpin assemblies. With IWC Blowpins, the cooling water circulates within the Blowpin stem while indirectly cooling the Blowpin tips which is threaded onto the Blowpin stem. In most cases there will be a vented cutter spacer installed behind the cutting ring to vent off a small amount of the compressed air from the mold. The spacer will have holes drill on a 30-degree taper to aim the vented air towards the mold to aid in neck flash cooling. These assemblies can do an excellent job for neck finishes 28mm and smaller with a neck finish not having a tight tolerance, or for a spin-dome finish. But we can do better!

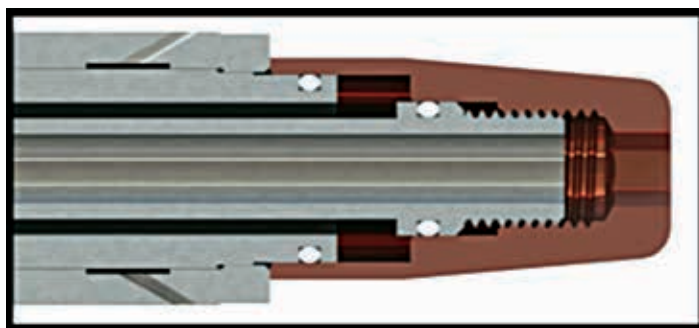


Figure 2: Direct Water Cooling (water transfer)

The next generation Blowpin assembly brought us the **Direct Water-Cooled** (DWC) version. With DWC Blowpins, the cooling water circulates within the Blowpin tip, the water is contained with O-rings, while directly cooling the Blowpin tip which is threaded onto or pushed onto

the Blowpin stem. By having the water directly touching the tip, it draws heat more effectively and quicker from the container neck, concluding with reduced cycle time. Because of the use of the O-rings, there is no exhaust/vent air passing through the tip, so an alternative was called for. Added was a full-length sleeve; with an NPT port in the upper end for an air connection and 30-degree tapered holes on the lower end to add direct air cooling to the moil. In the case of running a mold with a captured neck finish, you may consider incorporating a spring loaded deflashing sleeve. A de-flashing sleeve has serrations on the lower end of the sleeve, that when the sleeve comes in contact with the striker plate, will grab hold of and pull the moil from the molded container cleanly. The moil will dislodge from the sleeve as it passes through the stripper plate, leaving a container that is free of any top flash.

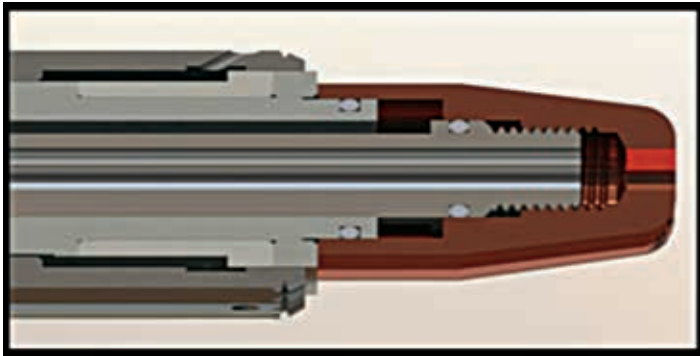


Figure 3: Direct Water Cooled (spring loaded sleeve)

Well, the Direct Water-Cooling Blowpin assembly is a vast enhancement over Indirect Water-Cooling, but there was still room for improvement. The next generation of Blowpin assemblies included the incorporation of **recirculating air**. This assembly consists of adding a thin walled tube to recirculate the blow air within the mold cavity. The cool/fresh blow air will travel through the inner passage of the air tube, while the hot/spent air contained in the mold cavity is exhausted between the outer wall of the air tube and the internal passage of the water tube.

By recirculating the air in the mold, the container will cool and hold its shape quicker and again reduce cycle time; which is the name of the game!

There have been a few aftermarket systems available (i.e. Fasti, but other systems are available) for the control of the air flow while chilling the blow air, without the use of water cooling. In recent years most EBM machines have been



Figure 4: Direct Water Cooled; with Recirculating air

built with controls and timers installed for the recirculating air option. For best utilization, you start blowing at full pressure with the exhaust valve closed (or also blow through the exhaust channel), once the container has been formed and compressed with air, open the exhaust valve to a set regulated pressure for the remainder of the blow time. Recirculating air Blowpin assemblies can be used without the control of the machine (or aftermarket add on) by simply installing a pressure relief valve directly to the top of the Blowpin assembly. There are pros and cons to both schools of thought; with or without water cooling. There have been tests conducted showing without the added system and using water cooling the same cycle times can be achieved with better neck finishes.

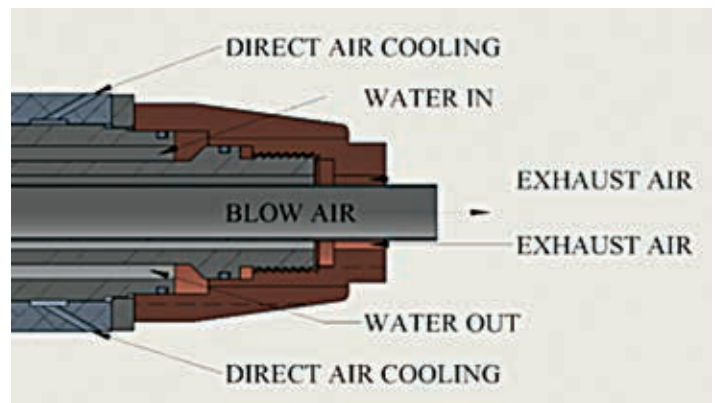


Figure 5: Air / Water flow (Recirculating air)

As stated earlier, you can blow a 63mm neck container with a 28mm Blowpin assembly, but you will sacrifice neck finish quality and profits. All Blowpin assemblies should be

designed to have the thinnest Blowpin tip wall as possible. You can certainly share assemblies within a range of neck sizes; I like to keep them within these variances: 20-24mm, 28-33mm, 38-43mm, 45-53mm & 58-70mm. Anything over 70mm is going to be a pretty exceptional design.

The Blowpin tip is critical to create a form fitting neck finish. With today's neck finishes requiring tighter tolerances, the utilization of Direct Water-Cooling gives you an advantage to achieve a more constant size. The most common material used in Blowpin tips is a Beryllium free copper (i.e. C180, Ampco 940, Moldstar 150). Copper is the best material used to dissipate the heat from the containers neck. There are less expensive options; aluminum cools well but is not durable whereas stainless steel is more durable than both copper and aluminum but does not cool very well. If you're running Poly-Propylene or other "sticky" material highly polished stainless works well. But a better option, if in your budget, is copper with a Nickel/Teflon coating for added lubricity and durability. The plating will show results of a smoother more uniform neck finish as the "sticky" materials tend to pull material and cause wrinkle in the neck finish during pre-lift. With HDPE or similar material, a smoother neck finish can be achieved by adding steps to the Blowpin tip to allow air to blow up closer to the top of the neck. But what do you do if your necks are molded out of round (oval)? The old school of thought was to cut the neck inserts with an oval. A less expensive option is to cut an oval on the Blowpin tips to bring the neck round. This has become a widespread practice that shows terrific results.

Now that you have a Blowpin assembly that will produce a quality, in tolerance neck finish, with a faster cycle time; it's useless with an inadequate Blowpin holder/alignment block. All machine manufactures have their own unique design, and they all do an excellent job. But they all need to be maintained and rebuilt on a regular maintenance schedule. Once they start to show wear, the Blowpin assembly may not remain perpendicular to the mold, once that becomes an issue you will not create a flat neck finish. Some OEM holders are excellent for short run (low volume) set ups in custom molding plants. These can be easy to set-up and align with the mold, but the downside is they tend to drift during production and need to be adjusted regularly. For high volume or long stroke machines, a more rigid holder is desirable. Blowpin assembly size and weight will also come into play when determining a holder to use.

Many OEM's offer multiple options, or aftermarket holders are also available for consideration.

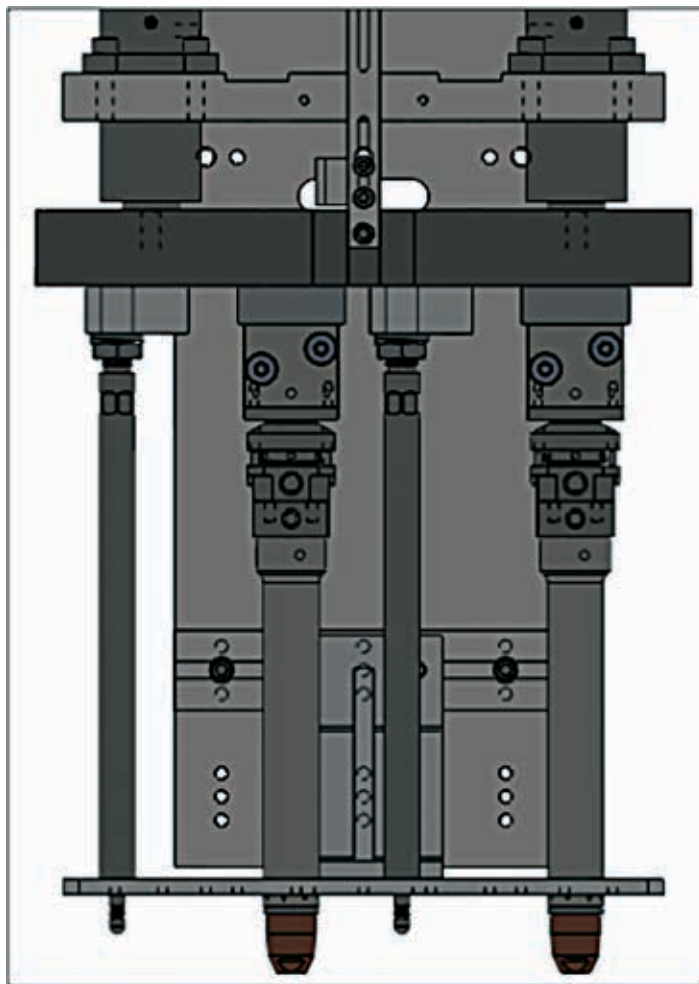


Figure 6: Calibration Assembly; with Stabilizer pins

One last part to consider; if you are producing an offset neck container (i.e. F-style gallon); the use of a stabilizer pin or "dummy Blowpin" The mold will have a small pocket cut in the opposite side of the neck to accommodate this option. The centering or aligning of the stabilizer pin is not as critical as the Blowpin assembly, so a simple block can be used for mounting to the calibration plate. The stabilizer pin is commonly a simple shaft with a grooved or knurled ball end to adhere to the container. Some processors choose to use a water-cooled type. The use of the stabilizer pin will control the container from twisting or tilting upon the mold opening. It also assists the container remain attached to the Blowpin assembly so the mold can shuttle back under the extrusion head without interference.





Figure 7: D.W.C. with Recirculating air

With these design ideas in your back pocket you should be more profitable in your EBM processing. Remember the old saying “it costs money to make money”; the costs of having Blowpin assemblies for each mold set can seem excessive to some, but if designed mold specific, the cycle time reductions achieved should outweigh the up-front cost. ■



## Peninsula Publishing to produce SPE's Journal of Blow Molding in 2018

The Blow Molding Division of the Society of Plastics Engineers has entered into a partnership with Peninsula Publishing LLC, publisher of *Plastics Machinery Magazine*, to produce the division's own magazine, *The Journal of Blow Molding*, beginning in 2018.

Under the agreement, Peninsula Publishing, LLC will oversee all editorial, sales, production and audience functions on behalf of the division's long-time magazine. As a result, the volunteer-driven Blow Molding Division ([www.blowmoldingdivision.org](http://www.blowmoldingdivision.org)) will see circulation of the publication increase sharply to more than 6,000 individuals and will continue to participate in content development through an editorial advisory board comprised of division members.

“We are thrilled to work with a first-class publisher such as PPLLC that has deep plastics industry knowledge and magazine experience,” said Division Chair Cal Becker of Eastman Chemical Co. “Our mission is to promote, communicate and disseminate knowledge relating to the Art and Science of Blow Molding technology, and this agreement will allow us to reach vastly more relevant executives across the global plastics industry.”

Peninsula Publishing was founded in 2014 and launched *Plastics Machinery Magazine* in November of that year. The company also publishes *Plastics Recycling* three times a year jointly with GIE Media. Robert Grace, an industry veteran with more than 25 years of plastics publishing experience, will serve as editor of *The Journal of Blow Molding*. Grace, the founding editor and former associate publisher of *Plastics News*, also currently is managing editor of SPE's *Plastics Engineering* monthly magazine.

“As our organization continues to grow – doubling in full-time staff to 10 since our launch – we're pleased to be able to offer this custom publishing service to the Blow Molding Division,” said J.A. Lewellen, president and CEO of Peninsula Publishing. Lewellen said the plan “is to stay true to the division's approach for its magazine while bringing additional professional publishing resources to the equation to help the division expand its brand.”

For more information, contact:

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 or (330) 657-0013

Brian Spence, SPE Blow Molding Division;  
[Brian.Spence@silganplastics.com](mailto:Brian.Spence@silganplastics.com) or (770) 362-5661

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# What is Happening in Bio-Based Plastics?

By Dan Weissmann, editor for *The Journal of Blow Molding*, SPE Blow Molding Division

Author acknowledgment and thanks: This article is based on my article in *Plastics in Packaging* magazine which sponsored my covering the Bio-Based Re-Revolution of Plastics conference.

While most are familiar with PLA, Bio PE or Plantbottle PET which are commercially being used regularly, there is much more happening in the field of bio-based plastics as was evident from over twenty presentations at the Bio-based Re-Revolution of Plastics conference held earlier this year.

The broad interest in bio-based materials can be really appreciated when mapping the many stakeholders as presented in the figure below taken from the presentation by Ron Cascone of Nexant in his review of the entire field. Beyond the names there are numerous development activities in various aspects of bio-based materials. A reoccurring topic is sourcing bio-based materials from bio-mass. Bio-mass includes scrap lumber, forest debris, crops grown specifically like switchgrass or crop residue i.e. corn Stover and sugar cane bagasse, manure, and waste residues from industrial processing or from solid waste streams. Bio mass supposedly offers a better economic base raw materials as they are plentiful and some can be readily available. Additionally, they are not affected by the perceptions of competing with food crops and in the case of corn of expanding the spread of GMO (Genetically Modified Organism). However, in the meantime corn and sugar cane will continue to be a major bio-source for bio-based products.

Ultimately the discussions centered about each process yield and costs which determine the potential for commercial success. Lacking competitive economic basis might relegate such materials to specialties where only additional factors may justify their use. In such a case, manufacturing facilities would be of smaller throughput resulting in higher manufacturing costs. On the positive side, costs of bio-based raw material, bio-mass or even of targeted crops grown specifically for the conversion into



bio-based plastics, should be significantly less volatile and more predictable than the price of oil.

Completing the development of bio based PET is continuing in two directions. The first is bio-based terephthalate acid while the other is completely new polyesters with similar or better properties than PET. Terephthalate acid is derived from Xylene. In the oil production chain it usually falls into the BTX (Benzene, Tulane and Xylene) group, all important constituents in making of various plastics. Anellotech with the backing of Toyota Tsusho and Suntory and cooperation with other engineering companies is in the final steps of validation of their TCat-8 process to manufacture BTX from Bio-mass. The pilot facility, along with demonstrating the capability of the process, in progress at present, will also provide the needed input for commercial scale up. (There are other companies which are developing technologies for the manufacturing of Bio-based paraxylene. One is Gevo which is developing a process to produce Para xylene from bio-based isobutanol. Another is Virent which developed Bioformpx paraxylene.)

Under development as a bio based alternative to PET is PEF, which started by Avantium and now is part of Synvina (The name stands for SYnergy, VItality NAture), the JV with BASF to pursue bio based chemistry, formed in the fall of 2016. PEF is manufactured through sugar dehydration, oxidation, purification and polymerization to resin, starting from Fructose. Having properties better than PET like higher modulus, higher glass transition temperature and much higher barrier to oxygen, CO2 and water it could fill many performance characteristics which fall short for some applications when packaged in PET. This combination of

properties may make it possible to produce beer bottles/cans which can be pastoralized. It may also provide material that meets carbonation loss limits of small CSD bottles. Commercial scale operations of about 50 Kt per year are expected in 2021 and industrial scale by 2025. While IR sorting can easily separate PEF from the PET stream, evaluation is underway to determine the effect of PEF content on recycled PET. Up to 2% PEF does not seem to affect adversely either color or IV of the recycled PET. In the meanwhile EPBP (European PET Bottle Platform) granted approval for test marketing of up to the 50 Kt PEF per year. Farther developments, both on polymerization and end uses, are being pursued jointly with Mitsui and Toyobo in Japan.

Higher barrier is also the claimed for PFM, a new material being developed by DuPont and ADM. PFM (Polytrimethylene Furandicarboxylate) is one of the polymers derived from polymer grade FDME (dimethyl-2,5-furandicarboxylate) that can be used as building block for various plastics. PFM is derived from FDME and Bio-PDO (1,3-propanediol). PFM is offering better barrier, better chemical resistance, higher HDT, lower moisture absorption and lower fire rating. Relative to PET barrier improvement is reported to be from 8 to 15 times, for both oxygen and CO<sub>2</sub>.

Although PLA has been in use for several years expanding its' performance range of is still a goal of a newly formed JV between Total and Corbion. The use of pure D or L homo-polymers, rather than the D and L PLA co-polymer typically produced, results in higher heat capability as the co-polymer prevents crystallization. Another route to higher heat resin formulations is nucleating PLA with D-PLA which results in higher crystalline uniformity throughout the

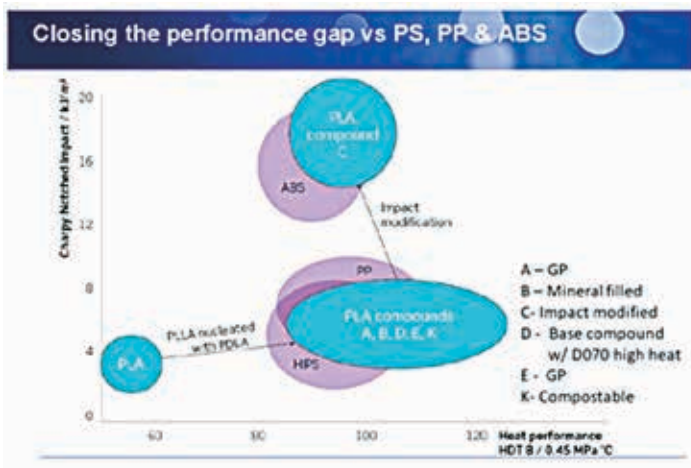
matrix. Other compounds like high impact or mineral filled are also under development. Generally, PLA compounds can now provide properties similar to HIPS, PP and ABS as illustrated in the figure below left.

Natureworks the producer of Ingeo PLA has announced that the company has licensed Plaxica's Optipure® technology to make D-Lactic acid. This will assure Natureworks of greater supply D-PLA and the ability to expand the Ingeo product line with products with a broader range of performance characteristics.

Alterra Holding has been developing formulations combining PLA, PHA and DuPont's Nuvolve. Nuvolve is an engineered polysaccharide micron size spherical particle added into the PLA/PHA compounds. Even at high loading of Nuvolve mechanical properties are affected only slightly. At lower loading it can improve base resin properties like higher elongation and HDT. In land fill environment it accelerates bio-degradation and in home composting it accelerates the degradation process to match composting rates of cellulose.

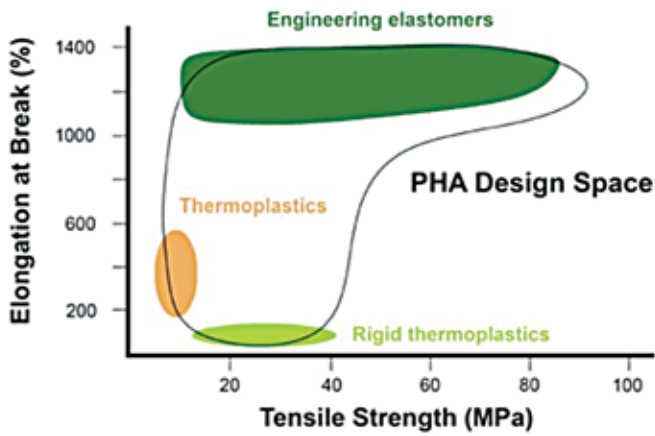
Isophthalic Acid (IPA) is a comonomer used in the production of PET to modify material properties and affects melting temperature and crystallization dynamics. Bio-Amber of Canada has been developing Bio-Succinic Acid (SA), which can be used as a bio-based substitute replacing oil based IPA. The value proposition offered by SA is cost reduction of about 20%. This can be achieved because less Bio SA is used than IPA to achieve the same results. Bio SA can be introduced during PET manufacturing similarly to IPA. It also can replace only part of the IPA. SA farther widens processing window and improving clarity in bottles. Testing of the manufacturing Bio-SA containing PET had confirmed the ability to produce resins with similar characteristics to standard PET and at comparable production rates. Bottles made from those resin compositions met performance requirements for CSD without any changes to tooling. Barrier properties of PIA/bio-SA modified PET for CO<sub>2</sub> dropped slightly while for O<sub>2</sub> improved a small amount.

PHA (Polyhydroxyalkanoates) is frequently the target in the development of bio resins from a variety of bio sources. PHA, which have been introduced some years ago by Metabolix but failed to find wide use in the market, is natural polyester. It is produced by bacteria as means of





energy storage while the bacteria consumes bio-mass during fermentation. PHA appears as white spheres inside the bacteria which are extracted as the first step in processing it, and which later takes the form of powder or pellets. The basic PHA's molecule provides for large variety of configurations and hence of materials with diverse properties from rigid to highly flexible as illustrated in the figure from Mango Materials. The company is developing a process to produce PHA starting from captured Methane gas emissions.



Bio-on an Italian company involved in technology development for both the production of PHA as well as end use applications and formulations, is designing production units with capacity of 5-10 kt per year which will be suitable for integration within agro-industrial plants. Among the applications being developed are resins for the toy industry, cosmetics and bio-meds with unique properties. In the packaging area a milk carton material replacement by coating paper with Minerv PHA EC (extrusion coating) has been developed in conjunction with the University of Tampere (Finland). The new material is fully bio-degradable. Bio-on together with Tecno Alimenti are developing BioBarr – Bio-based food packaging material with enhanced barrier properties, with a grant money awarded by European Union's Horizon 2020 research and innovation program. Another interesting product planned for the Bio-on production plant is Minerv Bio Cosmetics, a bioplastic, biodegradable replacement for microbeads used as exfoliating agents in product like cosmetics, personal care and tooth paste. The use of microbeads has been already banned by some countries because of large quantities end up in the sea resulting in pollution endangering sea life.

Another route to PHA from a completely different waste stream is being pursued by Hydal Corp. Hydal is planning to manufacture PHA starting from waste oil. Creating a demand for used oil will eliminate the need for its disposal, which many times is done by dumping it illegally, and ultimately converting it into various plastics. Compound compositions, 100% bio-based, are being developed to meet targeted performance characteristics combined with controlled degradability.

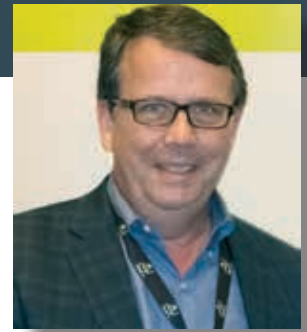
Using bio-mass sources, methane, oil or any other waste streams in the production of Bio-based materials leads to circular economy. Byproducts or waste are turned into usable, durable or biodegradable materials. These bio-based materials address successfully all aspect of sustainability: renewable source, recycling, or bio-degradation, as they blend the materials into natural processes minimizing or eliminating any environmental impact and in some cases possibly absorbing GHG from the environment. ■



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Scott Steele

## Greetings

The summer job on council is mainly to prepare for the fall meeting. This year, we have a special fall meeting celebrating the 75th Anniversary of the founding of SPE. Appropriately the meeting will be in Detroit which is where it all began by a group of sales engineers coming together to create ways to grow the plastics industry. They realized there was a vacuum of knowledge about plastic materials and processing and that an educational group could fill the void. Teaching people how to process was an accelerant to the growth of the industry. It is with some irony that many of us that have managed companies still feel the same void today. It is why many of us put so much time into our board and Blow Molding matters.

Although most of those founding fathers are long gone, I'm hopeful I will get to meet some of the earliest members. Our own Don Peters and Bob DeLong go back to the post war era and are a wealth of knowledge about the industry and always a pleasure to talk with at our ABC's.

Council continues to deal with the reorganization details. There are a host of bylaws adjustments which are minor. There is a group that wants to modify the mission of the society but I do not feel the change is substantive. In our world of lean quality systems that attempt to trace all actions to the mission statement, we probably do need some minor adjustment. It won't change what our division does substantially either way.

There is also a growing debate at national which needs to be sorted out. Our traditional structure has been to encourage members to join a section and a division and divide the rebate payments between the two

groups. A rebate is a portion of your annual membership payment that flows to the division. Since most sections are struggling, it is a growing argument that we should encourage members to concentrate on one group only. As a division member, I tend to agree, why should we split our revenue with a group that is not meeting or providing value? As a Toledo section member I know that cutting off the rebate and potential flow of new members will finally kill our section. I will wait to see how this matter is debated before deciding my vote, but I am the Blow Molding Councilor and that is where my responsibility lies. ■

Scott Steele

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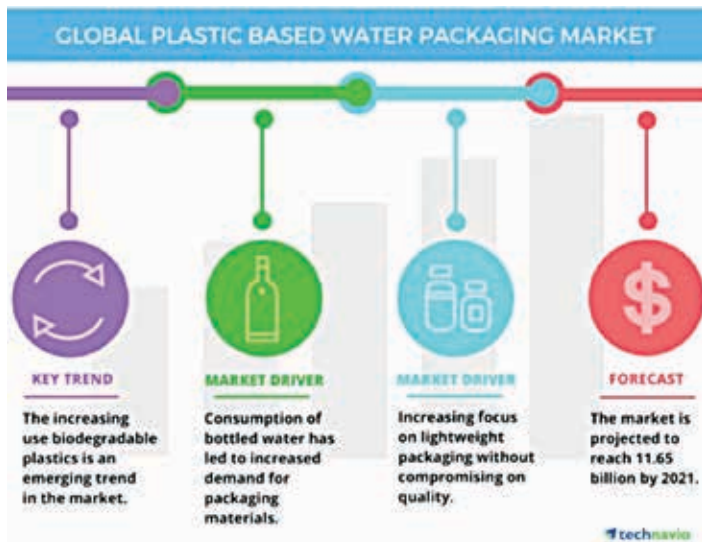
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## Water Market Taps Into Lightweight Plastic Bottles

By *Plastics Today* Staff in Packaging, Packaging, Sustainability on March 15, 2017

Consumers' thirst for plastic-bottled water flows directly into increased demand for those containers. Bottled water market drivers include population growth, increase in the prevalence of waterborne diseases and scarcity of tap water create a high demand for bottled water.



Some locations require water to be boiled for safety, but this inconvenient process is both time-consuming and energy inefficient, compelling users in those areas to turn to bottled water.

Also, bottled mineral water is purified and fortified with dissolved minerals, which provides added health benefits to wellness-aware consumers.

"The need for safe drinking water in developing countries like India and countries in the Middle East has made these regions favorable destinations for multinational bottled water manufacturers," says Sharan Raj, a lead analyst at Technavio (London) for packaging research, referencing the company's new report, *Global Plastic-Based Water Packaging Market 2017-2021*. "The per-capita consumption of bottled water is expected to increase during the forecast period, which will drive the growth of the plastic-based water packaging market."

### Weighty matters

On-trend, lightweighting involves the redesigning of packaging material to reduce the weight without compromising its quality (see Arrowhead water bottles reach recycled content milestone). Plastic packaging vendors' R&D teams develop packaging that is light and easy to carry. Moreover, reducing the weight of packaging material and modifying pack formats to light configurations helps vendors to reduce the cost of transportation.

An average commercial 0.5-liter PET bottle weighs 12 grams, though the PET bottles manufactured by Sidel (Hünenberg, Switzerland), for example, weigh only 7.95 grams. These bottles have 34% less weight than average commercial PET bottles. They offer 32% more top-load performance, saving up to \$13 million per year on raw materials.

"Lightweight bottles require less raw materials for their production, which, in turn, increases the recycling rate of these bottles by 75% and decreases the energy required for production by 23%," explains says Sharan. "It also reduces the greenhouse gas emissions by 26% and the amount of waste entering landfills by more than 20%."

Manufacturers are designing PET-based water bottles using different methods to increase their barrier properties. Innovative technologies are being implemented to increase impermeability and eliminate the risk of harmful substances entering these containers. One such technology is plasma coating, wherein protective layers are applied to PET films have a thickness of 50 nanometers, yet the bottles remain easy to recycle.

## Report: Massachusetts' Bottle Bill Creates Jobs, Adds to GDP

By Jim Johnson

A new report shows Massachusetts' bottle bill creates nearly 1,500 jobs and adds between \$85 million and \$151 million to the state gross domestic product.

The report, commissioned by the Container Recycling Institute, comes out as lawmakers are scheduled to consider a proposal June 13 to repeal or revise the state's beverage container deposit return system, CRI said.



A total of 1.2 billion containers, with a commodity value of about \$19 million, were collected in 2015. And \$62.3 million was returned to consumers at redemption locations that year, CRI indicated.

The system also directly employs 1,480 workers who collected, transported and processed bottles and cans. The report estimates cities and towns save some \$20 million by not having the containers in the waste stream. "Overall, the job creation and other financial benefits enjoyed under the bottle bill in Massachusetts are considerable, and an alternative system would appear to be costly, with no significant or obvious advantages. A repeal of the bottle bill clearly would set Massachusetts back in terms of employment and the economy," CRI President Susan V. Collins said in a statement.

The report was prepared by Industrial Economics Inc. of Cambridge, Mass., for CRI.

CRI has scheduled a webinar to discuss the report for 11 a.m. Pacific time June 14 with Collins and officials from Industrial Economics. The cost is \$59 basic members and non-members of the group.

More information, including the report titled "Massachusetts Container Deposit Return System: 2016 Employment and Economic Impacts in the Commonwealth," is available at [www.containerrecycling.org](http://www.containerrecycling.org).

## Blend of Two PET Bottles by PTI Win AmeriStar Award in Alcoholic Beverage Category

HOLLAND, Ohio— Clasper bottle technology has won



the prestigious Institute of Packaging Professionals (IoPP) 2017 AmeriStar Package Award in the alcoholic beverages category.

### Award Winning Bottle Technology

The Clasper™ bottle—engineered by Plastic Technologies,

Inc. (PTI)—is a combination of two polyethylene terephthalate (PET) containers and a shrink label. The first commercialization of this new technology was the recent introduction of Yumix portable, shelf-stable line of cocktails. 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. Added visual appeal is provided by shrink-label graphics which also include usage instructions.

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. Instant cocktail.

### Clasper™ Blow Molded Bottle Technology

The Clasper™ blow molded bottle technology is now being made available to other brand owners who want to market a product in a package with two separate containers.

- It provides a unique packaging solution for boundary-pushing food, beverage, pharmaceutical, nutraceutical, industrial and household chemical products.
- The Clasper concept enables two different products to be consumed in sequence or mixed together and then consumed.

AmeriStar Package Awards Competition judges considered more than 80 packages for 12 category awards, four student awards and AmeriStar's top three awards. A roster of nearly 20 judges from various segments of the packaging industry evaluated this year's entries in person, examining package innovation, product protection, economics, performance, marketing and environmental impact. ■



## Carrie Fox Solin Legacy Continues Through Blow Molding Division Scholarship Programs

Carrie was a strong supporter of the Blow Molding Division. When her untimely death occurred, the Division and her family felt her greatest gift would be to support the efforts of students.

For over 25 years, the Division has awarded an annual scholarship in the name of Carrie Fox Solin. Since 1991, \$263,500 has been awarded to 40 students enrolled in plastics engineering program in universities and colleges across the country.

Who was Carrie? And, what is the story behind the scholarship created in her name?

In the spring of 1990, the Board of the Blow Molding Division was sadly informed that one of their most beloved Directors had passed away. Carrie had always brought a wonderful energy to their meetings and events and her presence on the Board would be greatly missed.

Carrie was elected to the Society of Plastics Engineers Blow Molding Division in 1987. An active and enthusiastic Board Member, she represented the Division at several ANTEC programs by co-authoring and presenting technical papers on vinyl bottles and moderating technical sessions. Carrie was also the Founder and Chairperson of the Packaging Council of The Society of the Plastics Industry (now Plastics Industry Association) Vinyl Institute, an industry group that promotes vinyl packaging. After completing her B.S. degree in Computer Science from Brown University and an MBA in Multinational Finance from the prestigious Wharton School, Carrie began her career at Rohm and Haas, a manufacturer of specialty chemicals. After working in the Controller and Treasurer's offices, she became the first Plant Financial Specialist at Rohm and Haas and later became the Financial Manager of the Plastics Business Group.

Carrie joined the Plastics Additives Business Team in 1984 as a marketing specialist in new market development

eventually moving on to become the Marketing Manager for Plastics Additives. Her group developed and managed the team's marketing strategy and implementation. Plastics Additives became one of the fastest growing businesses at Rohm and Haas, which soon had a major presence in all four geographic regions. Additives for plastic bottle compounds were a key component of the business.

To honor her memory and her contributions to both the Board and the plastics industry, Carrie's fellow board members established a memorial scholarship in her name. In 1991, the Carrie Fox Solin Memorial Scholarship was the first Blow Molding Division scholarship ever awarded and continues to this day.

Each year, scholarship recipients are invited to the Division's Annual Blow Molding Conference (ABC) where they are presented with a plaque commemorating the award. Over the many years, Carrie's husband, Dr. Larry Solin, has attended the ABC and personally presented the awards to the student scholarship recipients.

Training the next generation of blow molding professionals and promoting the scientific and educational aspects of the plastics engineering profession is an important objective of the Blow Molding Division. Through the efforts of the Education Committee, the Division has demonstrated this part of their mission by awarding annual scholarships to selected students who plan to make a career in plastics engineering.

Alison Davidson, a senior studying at Pittsburg State University in Pittsburg, Kansas, is the 2017 recipient of the Carrie Fox Solin Memorial Scholarship. Alison is an active member in her Student Chapter of the Society of Plastics Engineers and serves as the chapter's vice president.

For more information about the Carrie Fox Memorial Scholarship, visit Scholarship Information at [www.blowmoldingdivision.org](http://www.blowmoldingdivision.org), where you can see all the past scholarship recipients, including Alison. ■

### MISSION STATEMENT

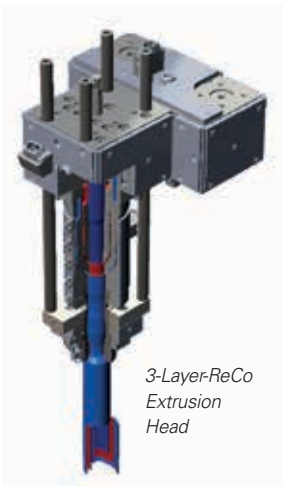
Promote, communicate and disseminate knowledge relating to the art and science of blow molding technology.

Imagination is more important than knowledge. For knowledge is limited to all we know and understand, while imagination embraces the entire world, and all there ever will be to know and understand.  
—Albert Einstein



## 10 Great Truths

1. In my many years I have come to a conclusion that one useless man is a shame, two is a law firm, and three or more is a congress. —John Adams
2. If you don't read the newspaper you are uninformed, if you do read the newspaper you are misinformed. —Mark Twain
3. I contend that for a nation to try to tax itself into prosperity is like a man standing in a bucket and trying to lift himself up by the handle. —Winston Churchill
4. A government which robs Peter to pay Paul can always depend on the support of Paul. —George Bernard Shaw
5. A liberal is someone who feels a great debt to his fellow man, which debt he proposes to pay off with your money. —G. Gordon Liddy
6. Government's view of the economy could be summed up in a few short phrases: If it moves, tax it. If it keeps moving, regulate it. And if it stops moving, subsidize it. —Ronald Reagan (1986)
7. If you think health care is expensive now, wait until you see what it costs when it's free! —P. J. O'Rourke
8. The inherent vice of capitalism is the unequal sharing of the blessings. The inherent blessing of socialism is the equal sharing of misery. —Winston Churchill
9. What this country needs are more unemployed politicians —Edward Langley, Artist (1928-1995)
10. A government big enough to give you everything you want, is strong enough to take everything you have. -- Thomas Jefferson ■



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## DAY 1 Monday, Oct. 2, 2017

8:30 am – 5:30 pm

### Attendee and Exhibitor Check-in and Set-up

3:45pm – 4:30 pm *Plastics 101 Concurrent Sessions*

Todd Hogan, The Dow Chemical Co., **Fundamentals of Polyolefin Structure – Property Relationships in Blow Molding Applications**

Joe Slenk, Bill Sellinger, Bekum America Corporation, **Shuttle Blow Molding Technology**

Ron Gabriele, Jomar Corp., **IBM: Applications, Processing, Benefits**

Craig Burkett, Nissei ASB Company, **Single Stage Stretch Blow Molding**

1:45 pm – 2:30 pm *Plastics 101 Concurrent Sessions*

Jeff Wardat, Jennifer King, Auriga Polymers Inc. of Indorama, **Fundamentals of PET**

Joe Bruchman, Milacron, **Overview of Reciprocating Screw Blow Molding Technology**

Andy Goll, Peter Coll, Weiler Engineering, Inc., **Overview of Blow/Fill/Seal Technology**

Donald Miller, Plastic Technologies, Inc., **Re-heat Stretch Blow Molding**

2:30 pm – 3:00 pm **Refreshment Break**

3:00 pm – 3:45 pm *Plastics 101 Concurrent Sessions*

Lew Ferguson, **Blow Molding Engineering Thermoplastics**

John Headrick, COAST Systems, Mark Abramo, Big 3 Precision Products, Ron Gabriele, Jomar Corp., **Injection Blow Molding Panel Discussion**

Chuck Flammer, Kautex Machines, Inc., **Accumulator Head Blow Molding**

Scott Howland, Graham Engineering Corp., **Rotary Wheel 101**

3:45pm – 4:30 pm *Plastics 101 Concurrent Sessions*

Brandon Chaison, Arconic, **Overview of Materials in Making Blow Molds**

3:45pm – 4:30 pm *Plastics 101 Concurrent Sessions cont.*

John Haddad, Wittmann Battenfeld, **What You Didn't Think Was Possible with Automatic Water Flow Control**

Achim Trubner, Kautex Maschinenbau GmbH, **The Future of Training**

## DAY 2 Tuesday, Oct. 3, 2017

7:30 am – 8:30 am **Registration and Continental Breakfast**

8:30 am – 10:15 am *General Session I*

Cal Becker, Eastman Chemical Company, **Welcome and Chair's Message**

**Keynote Speaker:** Dr. David S. Smith, VP Global Packaging Development, Johnson & Johnson, **Packaging Growth and Innovation at Johnson & Johnson**

Joel Morales, Jr., IHS Markit, **Resin Costs Globally – PET vs. Polyolefins & Impact of Shale Gas**

10:15 am – 10:45 am **Refreshment Break - Networking and Exhibits**

10:45 am – 12:30 pm *General Session II*

Burt Capel, VP, GM, Eastman Chemical Co., **Innovations and Transformation – Growing with Complexity**

Mike Urquhart, Plastics Industry Association, **The Bottle Blow Molding Industry and the Plastics Industry Association**

Achim Trubner, Kautex Maschinenbau GmbH. **Industry 4.0 and The Internet of Things**

12:30 pm – 2:00 pm

### *Buffet Luncheon*

2:00 pm – 3:30 pm **Concurrent Sessions**

#### *Session 1A – Industrial Sustainability*

John Standish, APR, Pedro N. Morales, KW Plastics Recycling, Dr. Mohammad Usman, Ford Motor Company, Kenneth Carter, John Deere, **Sustainability Across the Supply Chain – A Panel Discussion**

Ronnie Little, Holli Alexander, Eastman Chemical Company, **Deseaming Technology – Minimize Waste, Maximize Recycled PET Yield**

#### *Session 1B – Machine and Automotive Innovation*

Celestino Spiga, Magic MP SpA, **Advantages of Full Electric Blow Molding Machines**

Glenn Bartlett, Reliance Products Ltd., **Design and Development of a Triple Opening Drum**

Dr. Mohammad Usman, Syed Ahmad, Ford Motor Company, **Metal to Plastics: Development of Plastics Refueling in Sub-System**

3:30 pm – 4:00 pm **Refreshment Break – Networking and Exhibits**

## DAY 2 Tuesday, Oct. 3, 2017

4:00 pm – 5:30 pm **Concurrent Sessions**

### **Session 2A – Robots and Integrated Blow/Fill Systems**

Denny Stuerzenberger, PHD, Inc., Jomy Vadakumpadam,  
Joe Bardos, FPR Automation,

#### **Integration of Collaborative Robots in Blow Mold Applications**

Siva Krish, Proco Machinery, Inc., **Technology and Progress Collaborative Robots are Making in the Blow Molding Industry**

Thierry Deau, Sidel, **Development of Intelligent Blow Molders**

### **Session 2B – Rotary Wheel and Improved Container Performance**

Rob Schroeder, Graham Engineering Corporation, **Rotary Wheel: Overview, Applications, Urban Legends and Innovations**

Paul D. Tataraka, TOPAS Advanced Polymers, Inc., **HDPE Bottle and Container Enhancements Using Cyclic Olefin Copolymer (COC)**

Steve Stafford, Eastman Chemical Company, **Containers Having Increased Thermal Stability**

6:00 pm – 9:00 pm **Strolling Dinner Reception**

7:00 pm – 7:30 pm **Lifetime Achievement Honoree, Student Scholarships, Parts Competition Awards**

**Conference schedule is subject to change.**

## 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](http://www.blowmoldingdivision.org)

## DAY 3 Wednesday, Oct. 4, 2017

7:30 am – 8:30 am

### **Registration and Continental Breakfast**

8:30 am – 10:00 am **Concurrent Sessions**

### **Session 3A – Technology and Tax Reform**

Stefan Eichelhardt, RIKUTEC Richter Plastics GmbH & Co. KG, **Large Part Blow Molding Technology**

Thorsten Bung, Hesta Blasformtechnik GmbH & Co. KG, **Flexibility and Changeability of Electric Blow Molding Machines**

Michael J. Devereux, II, Mueller Prost CPAs+Business Advisors, **Tax Reform and Tax Incentives for Blow Molders**

### **Session 3B – Improving Performance via Simulation and Modeling**

Sumit Mukherjee, Plastic Technologies, Inc., **Squeeze Performance of Non-Round Containers Explained**

Dr. Arindam Chakraborty, Advanced Integrated Analytics Solutions (VIAS), **Finite Element Based Realistic Simulation for Packaging**

Dr. Zohir Benrabah, National Research Council Canada, **Modeling and Warpage and Shrinkage in Thermoplastic Blow Molded Part**

10:15 am – 10:45 am **Refreshment Break - Networking and Exhibits**

10:30 am – 12:00 pm **Concurrent Sessions**

### **Session 4A – Blow/Fill Systems and Developments**

Michael Gschwendner, Kronen AG, Operational Experience with Kronen Aseptic Blow/Fill Systems (CAB)

Andy Goll, Weiler Engineering, Inc., **Blow/Fill/Seal Technology Process Safety – Challenges of the Future**

Alan Bonanno, Andre Carvalho, Serac, **Blow Molding with Robotic Movements**

### **Session 4B - New Technologies and Automation**

Rama Etekallapalli, Arch Plastics Packaging, **Blow Molding - A Quality Approach**

Scott Heins, INTRAVIS, Inc., **Industry Trends: the Future in Vision Inspection**

Steve Wilson, Cold Jet LLC, **Now You See It, Now You Don't – The Magic of Dry Ice in Blow Mold Cleaning**

12:00 pm – 1:30 **Networking Luncheon**

1:30 pm **Conference Concludes**

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# Blow Molding 101 Session Guide

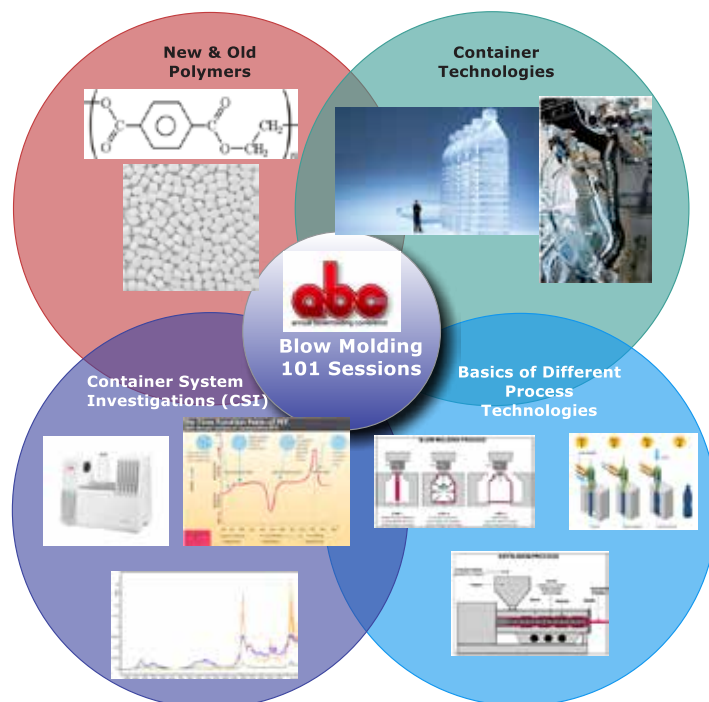
The Blow Molding 101 sessions offered during the opening day of the ABC offers attendees the opportunity to learn about the materials used in blow molding, the main blow molding processes, blow molding applications and other topics such as inspection, colorants, fillers, 3D printing/additive manufacturing 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 reheated, 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.



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# BLOW DIVISION MOLDING



33<sup>rd</sup> Annual Blow Molding Conference and Exhibits  
October 2 – 4, 2017  
Doubletree by Hilton Hotel Chicago Oak Brook



## Fifth Annual Blow Molded Parts Competition

**Submission Deadline: September 11, 2017**

As the premier event for the blow molding industry, the Annual Blow Molding Conference displays the latest advancements and innovations in blow molding design and applications. This year, the SPE Blow Molding Division invites all conference

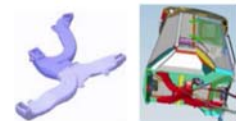
All submissions will be on display at the 33rd Annual Blow Molding Conference, held October 2-4 at the Doubletree by Hilton Hotel in Chicago (Oak Brook), IL.

Entries may be submitted in the following categories:



**Industrial:** Automotive/Transportation  
Consumer Goods  
Industrial Other

**Packaging:** Food, Beverage  
Pharmaceutical  
Packaging Other



Competition Entry Form and Guidelines for Submissions can be found on the Blow Molding Division website :

<http://www.blowmoldingdivision.org/conferences/blow-molded-parts-competition-2017/>

### Don't Miss the 33rd Annual Blow Molding Conference

Visit the ABC 2017 webpage for schedule, travel and registration information at: <http://www.blowmoldingdivision.org/conferences/conference-2017/>

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