Blowpin Assembly Evolution and Design

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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.

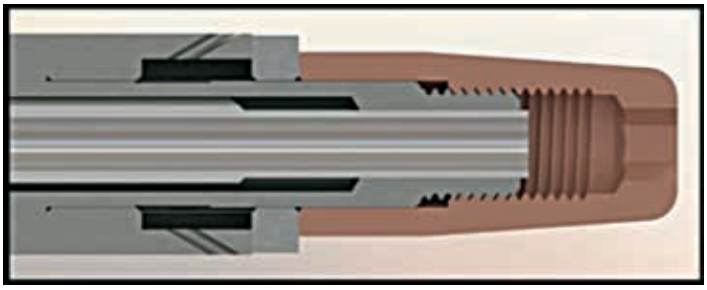

Figure 1: Indirect Water Cooled (water transfer)

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 moil 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!

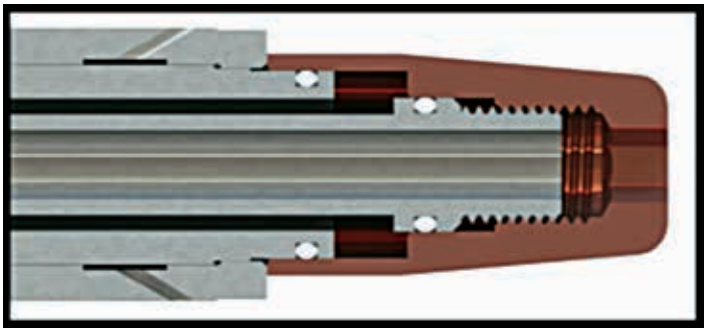

Figure 2: Direct Water Cooling (water transfer)

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.

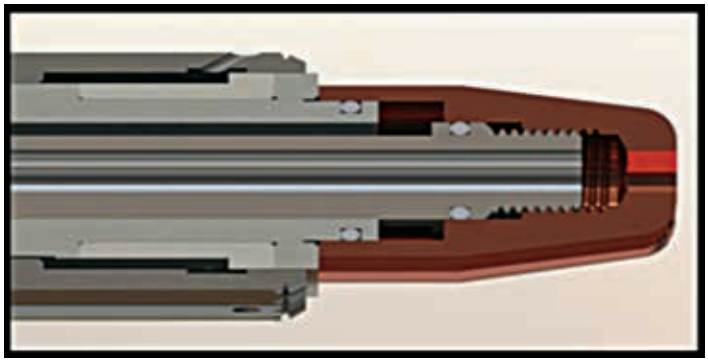

Figure 3: Direct Water Cooled (spring loaded sleeve)

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.

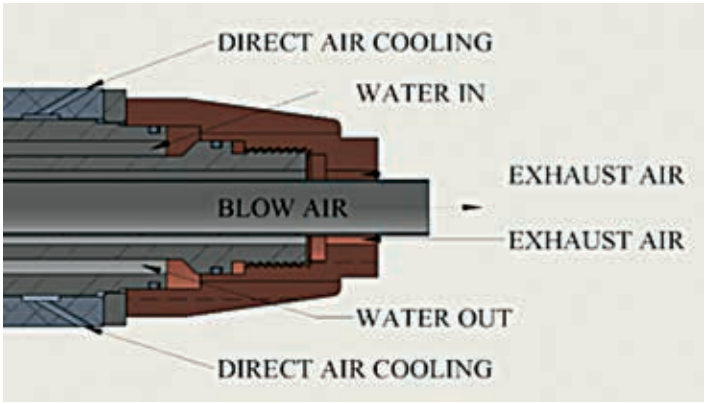

Figure 5: Air / Water flow (Recirculating air)

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 and 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 stoke 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.

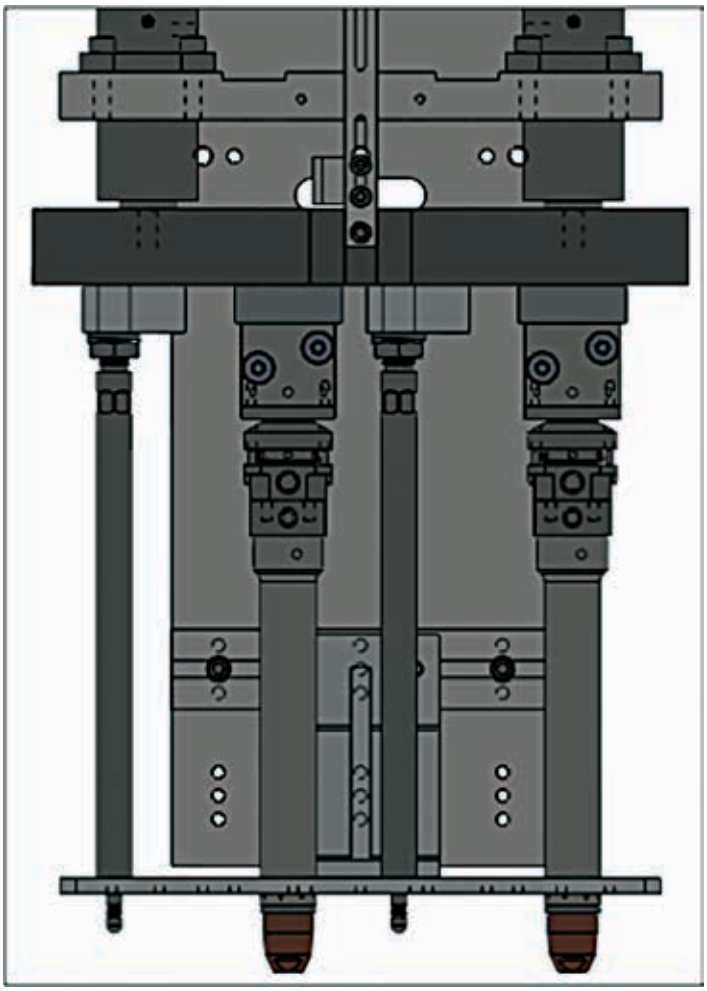

Figure 6: Calibration Assembly; with Stabilizer pins

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) 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."

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