

## Advanced High-Speed IML System for Medical Syringe Barrel at NPE Six-company collaboration results in first-of-a-kind In-Mold Labeling Cell

**Fort Collins, CO – Tempe, AZ:** A 16-cavity pre-fillable 5-6cc medical syringe barrel mold designed and built by **Tech Mold Inc.**, a designer and manufacturer of high-cavitation molds for the medical, packaging and pharmaceutical markets, will be demonstrated in a high-speed automated in-mold labeling (IML) cell innovated, built and integrated by **CBW Automation (booth #3169)**, a leading innovator and manufacturer of automation solutions for the plastics, medical and packaging industries.

Using new side-gate hot runner technology, called Melt-Cube, developed by **Mold-Masters Ltd. (booth #4463)**, Tech Mold designed the 16-cavity mold to accommodate IML technology in cooperation with CBW Automation and **Inland Label (booth #8939)**, a leading label manufacturer for IML applications. Mold-Masters is showcasing its new Melt-Cube side-gate hot runner technology at NPE in this high-speed IML automated cell in collaboration with the supply chain companies. The results of this collaborative are a 16-cavity IML system running a side-gated 5cc syringe with sub 8-second cycles.

In addition to the companies mentioned, the collaborating companies also include **Milacron LLC (booth#2803)**, the supplier of the Roboshot S2000i165B, all-electric injection molding press with artificial intelligence and Fanuc Model 31i-A controller with on-board diagnostics. This press, designed with these features for the IML cell, also features a 1/16,000-second scan time for unmatched repeatability and process control. **PolyOne Corp. (booth#39006)** generously supplied the 13T25A polypropylene material being used at the Cell, due to its easy processing in high cavitation tools, and due to the unique end use requirements for this project.

Tech Mold's Vince Lomax, acknowledged the initial challenge of involving all six North American collaborating companies, which he believes has never been done in this manner in such a short period of time (less than 4 months from conception to completion of the mold and automation). "Both the part and the mold must be designed for the in-mold labeling process from the outset of the project," said Lomax. "However, that also means early involvement of the automation supplier as well as the label supplier."

Perhaps the biggest challenge to the part and mold design, which also impacts the automation and label placement, is the gating location, which is critical due to the fact that the material has to enter and flow into the cavity, and approach the label in a specific way to achieve the quality necessary for a medical syringe barrel used in pre-fillable applications.

It was determined that the parts would be gated into the side of the syringe barrel just above the flange, rather than into the flange itself as is typically done. With the new Melt-Cube side-gate however, the gate is almost invisible on the side of the part. Because the gated area

must have a thicker wall section to accommodate material flow, the wall thickness was increased in the circumference of that area. This is also done so that injection pressure of the material has minimal influence on the core to reduce or eliminate core shift.

The novel Melt-Cube side gating technology from Mold-Masters allows for 20% higher pitch density and easy tip replacement in the press. The patent pending design also enables faster cycles, pristine gates and more accurate IML molding conditions because of an additional temperature control zone at the gate, and greater level of flow balance with its proprietary iFlow manifold brazing technology.

Accurate label placement in the mold cavities was also challenging in the development of the IML cell, and in fact was critical to the success of this application. Typically, the dosage markings on a syringe barrel are either pad or offset printed onto the barrel, or printed on the self-adhesive polymer labels and placed on the barrel as secondary operations. The small outer diameter of the barrel and the need to align the registration dosage markings created a challenge for the label placement. However, the companies collaborating on this project came up with creative and innovative ways to meet all of the challenges to this project.

This particular application demands the most critical cut-to-print and label-to-label size tolerances. The label technology is roll-fed and cut-in-place at the press, an advanced innovative automation technology developed by CBW Automation. The roll-fed labels benefit from thinner gauge label materials – as thin as 45 microns, which was necessary in this application for the small-diameter syringe barrel – to ensure that the label is placed accurately – within +/- 0.010”.

Another challenge for this syringe barrel application was the requirement for a very small label, less than 2”x 2” – yet with the highest quality graphics achievable. Inland Labels’ expertise in the development of specialty inks meant the company was able to produce the high-end graphics required. One of the most important features for a pre-fillable syringe product is the ability to protect consumers/patients from counterfeiting. To show how anti-counterfeiting measures might work, for this demonstration Inland Label imprinted the label with an image using special inks that can only be seen under certain lighting conditions, thus ensuring complete safety and reliability in the product.

“This IML cell requires unique label placement precision using a small diameter wrapping of the label onto the mandrel for accurate positioning,” explains Jim Overbeeke, Vice President of Sales for CBW. “Due to the registration markings on the labels for accurate dosage level, precision placement is critical. In fact, accurate placement of the label is what sets this product apart from ordinary syringes.”

Innovation and collaboration on the automation, mold and hot runner design ensures that labels are placed in an accurate position (to within +/- 0.010”) on all 16 parts for the quality required for this application, and then removes parts molded from the previous cycle, in an extremely short cycle time.

Developing an IML manufacturing cell requires attention to detail and a high level of collaboration by all parties involved. “There were a huge number of challenges to overcome in this workcell,” said Dave Carson, President of CBW. “But each of the partners rolled up their sleeves and helped each other out in many ways. In the end the system exceeded our expectations. It was a true collaborative effort and partnership. However, the effort was worth it.”

Tech Mold's Lomax agreed and advises companies to "involve your partners early and include the moldmaker in the initial part design because they can often offer suggestions to help you minimize cost and maintenance.

"Specifically involve the robot and label suppliers as well at that stage. It has to be a concert among the entire supply chain – you just can't do your own thing and hand it over the wall. The success of a major project such as this is dependent on everything being orchestrated and coming together symphonically."

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