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MEDIA CONTACTS
Sean Norton
sean.norton@milliken.com
864-503-6582

Amy Godfrey
AH&M Marketing Communications
agodfrey@ahminc.com
413-448-2260, x370

jARDEN, SACMI and Milliken Collaborate on Sustainable, Lightweight Pharmaceutical Barrier Bottles That Reduce Plastic and Energy Use

Compression Blow Forming™ Technology and Unique Barrier Additive Enable Significant Light-weighting without Compromising Protection against Moisture and Oxygen

Orlando, Fla. – jARDEN Plastic Solutions, SACMI Group and Milliken & Company are jointly featuring here at NPE 2018 a revolutionary new pharmaceutical bottle that promotes sustainability through light-weighting and production efficiency. The high-density polyethylene (HDPE) pharmaceutical bottle, developed for a leading pharmaceutical manufacturer, combines technology advancements from the four companies to reduce plastic content by up to 28 percent compared to standard designs, while delivering excellent barrier performance. More specifically, Milliken's additive solution for barrier improvement, together with uniform wall thickness provided by SACMI's proprietary Compression Blow Forming™ (CBF™) equipment, enabled jARDEN to produce the new thin-wall bottles. These bottles are strong and light, use less energy to manufacture and generate less scrap.

"Our collaboration with SACMI and Milliken represents a major step forward for sustainable pharmaceutical packaging," said Todd Zillmer, director, Design, Engineering and Development, jARDEN. "These thinner, lighter bottles offer drug companies a new way to reduce environmental impact while maintaining or improving the necessary barrier performance. jARDEN is developing a wide array of bottles – both standard and customized – using SACMI's Compression Blow Forming™ machines and Milliken's barrier enhancement technology. We are fully committed to these innovations, which are changing the game for plastic bottle production."

jARDEN, Milliken and SACMI are showcasing the new barrier bottle at their respective NPE 2018 exhibits: jARDEN in room #W231A; Milliken in booth #S26023; and SACMI in the Negri Bossi booth, #W363. During the show, a commercially available 90cc bottle will be produced in the SACMI booth with a jARDEN owned 20-station CBF™ machine and tooling. Each Compression Blow Forming™ station moves the process continuously from resin to finished bottles. jARDEN is also manufacturing a cap from clear resin that is brightly colored with Milliken's ClearTint™ colorants.

CBF™ Ensures High Part Consistency, Cost-effective Production

Compression Blow Forming™, a sustainable plastic production method developed by SACMI, combines compression molding and blow forming into one process. This novel, patented process offers numerous advantages for pharmaceutical companies. First, CBF™ delivers consistent wall thicknesses, avoiding thinner areas that can allow for faster permeation of water vapor and oxygen. This near-perfect

consistency, together with the high-performance properties of Milliken's barrier technology, permits cost-effective light-weighting without compromising protection.

Further, CBF™ offers reduced cycle time and produces less waste compared to other blow molding technologies currently on the market. Cycle times can be up to 30 percent faster with less than 1 percent scrap.

Finally, the CBF™ process runs at a lower temperature thereby reducing energy use which safeguards the purity of the resin against degradation. In addition to the benefits of lower heat, the compression of the preform reduces shear stress, which is important for initial resin processing and for further use after recycling.

"The value of our unique CBF™ technology, which has already raised the quality bar for pharmaceutical bottles, has been further enhanced by jARDEN's manufacturing expertise and Milliken's advanced additive technology," said Allan Andersen, manager, Technical Sales, Closures, Containers & PET Division, SACMI. "By joining forces, we have developed a state-of-the-art packaging solution that can help the global pharmaceutical industry achieve new levels of sustainability, performance and cost-effectiveness."

Milliken Additive Boosts Barrier Properties

Milliken's advanced additive technology can be incorporated in HDPE as a masterbatch to create a passive barrier. This technology alters crystal orientation to create a tortuous path that inhibits passage of moisture and oxygen. In effect, a permeant molecule must move through a maze of crystals that are linear and encircle the side walls of the bottle – a process that slows down permeation significantly.

Depending on specific geometry of the bottles and the resin design, the technology can increase the barrier properties of HDPE by 20-60 percent, leading to significant light-weighting opportunities. Without the use of the Milliken barrier additive, HDPE typically forms large, spherulitic crystals that do little to inhibit the passage of oxygen and moisture. Milliken worked with a leading pharmaceutical company to obtain regulatory approval on a material formulation with improved barrier performance.

"NPE is a great opportunity to see Compression Blow Forming™ at work and learn about the benefits it brings to the high-performance plastic packaging our four companies have delivered," said Deidre Sandrock, Ph.D., global product line manager, Plastics Additives, Milliken Chemical. "The new pharmaceutical bottle we are featuring here demonstrates the importance of bringing together new technologies from different disciplines to benefit customers. This joint project checks a number of key boxes, from environmental protection to quality and efficiency. It offers customers new opportunities to take the initiative on optimizing their drug packaging."

About jARDEN Plastic Solutions

jARDEN is an innovative solutions provider specializing in high-volume, precision, clean spec manufacturing of plastic components. The company offers proprietary engineering processes and extensive manufacturing capabilities to support customers in product design, engineering and contract manufacturing. The company invests in its customers' needs by leveraging extensive research and new technologies to move the industry forward.

About SACMI Group

SACMI is an international group manufacturing machines and complete plants for the ceramics, packaging (beverage and closures/containers), food and automation industries - markets in which it is recognized as a worldwide leader. SACMI's strengths lie in the commitment to research, development and use of the latest technology for the market segments served and to its customers worldwide. Today, the SACMI Group is made up of more than 80 companies, has production plants and support companies in more than 26 countries and employs about 4,500 people.

About Milliken

Milliken is an innovation company that has been exploring, discovering, and creating ways to enhance people's lives since 1865. Working from our laboratories, application and development centers around the world, our scientists and engineers create coatings, specialty chemicals, and advanced additive and colorant technologies that transform the way we experience products from automotive plastics to children's art supplies. With expertise across a breadth of disciplines that also includes floor covering and performance materials, the people of Milliken work every day to add true value to people's lives, improve health and safety, and make this world more sustainable. For more information, visit chemical.milliken.com or www.milliken.com.

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PHOTOS: 90cc HDPE Pharmaceutical Bottles Produced by jARDEN on a SACMI Compression Blow Forming™ Machine using Milliken's Additive Solution for Barrier Improvement

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High resolution photography is available by contacting Amy Godfrey at agodfrey@ahminc.com.