

CASE STUDY

Electron beam expansion project opens path for PEX-c growth in North America

In partnership with

 MercuryPlastics

 BOREALIS

بورج
Borouge



Mercury Plastics and Borealis share a commitment to innovation and market leadership

Using electron beam (e-beam) irradiation technology is an effective way to crosslink and enhance the performance properties of polyethylene (PE) and a variety of other materials. E-beam irradiation of polyethylene (PEX-c) allows for extrusion or injection molding of complex parts or assemblies with crosslinking as a secondary operation. This allows for PEX-c to be used in many applications across a wide range of industries.

Mercury Plastics LLC, a manufacturer of engineered custom components and complete system solutions for the appliance, faucet, plumbing, water filtration and medical markets, is one of the few companies of its kind in North America to have accumulated extensive experience and know-how with an e-beam processing unit. It has operated a 5 MeV (mega electron volt) Dynamitron® e-beam accelerator made by IBA, the world leader in particle accelerator technology, for over 25 years. For many years, the **Borealis resin HE2590** has been the primary material used by Mercury to manufacture its plumbing and faucet components that require crosslinking. Borealis HE2590 is a high molecular weight, fully formulated high density PE designed specifically for the production of crosslinked pipes for potable water transportation and heating systems.

The combination of Mercury's unique PEX-c capability and Borealis' dedicated e-beam grade material has won over many customers and led to increased demand for PEX-c products. Mercury thus decided to further enhance its e-beam leadership in North America by expanding its irradiation processing capacity. This would enable the company to supply higher volumes, expand into new specialty markets with e-beam crosslinking, and safeguard its innovation leadership.



“The success of our 25-year partnership with Borealis is based on a shared commitment and mutual respect for innovation and quality. Borealis has always provided excellent technical support, including product consultation, and standards and codes compliance. Thanks to the increased capacity made possible by the Rhodotron, we will continue to work together with Borealis to support our growth of our evolving customers’ needs as well as our own.”

Jay Burnett
President, Mercury Plastics LLC

“Cultivating mutually beneficial business partnerships like the one we have with Mercury is integral to creating value through innovation. The winning combination of Mercury’s PEX-c leadership and our material expertise will support volume growth for HE2590 in specialty pipe, tubing, and appliances in North America. We look forward to many more years of enabling life’s essentials, together.”

John Webster
Global Commercial Director Infrastructure, Borealis



Rhodotron® technology to boost PEX-c production capacity and Borealis HE2590 volumes

The high level of satisfaction with the IBA Dynamitron led Mercury to choose another IBA e-beam accelerator, one using the Rhodotron® technology, and installed in its expanded facility at its campus in Middlefield, Ohio. This more powerful accelerator, a 10 MeV, delivers excellent dose uniformity and more processing power. It expands the range of products that can be processed, and also enables the processing of products more efficiently. Mercury is thus well positioned to leverage the success achieved using e-beam crosslinking of Borealis HE2590 to achieve future growth in its core business areas, but also to extend its partnership with Borealis to serve other business segments such as electronics, energy, mobility, healthcare, packaging and sterilization. The combined 5MeV and 10MeV accelerators make Mercury Plastics even more unique with the captive operation of the most powerful irradiation sources, plus extrusion and molding capability in North America.

Borealis' fully formulated HE2590 remains central to the Mercury PEX-c value proposition thanks to its quality and ease of processing. HE2590 is very resistant to hot chlorinated water in potable water applications. When processed into pipe, it meets all relevant industry standards, including NSF/ANSI/CAN 61 and ASTM F876. One key benefit of using Borealis HE2590 in the e-beam crosslinking process is that it allows Mercury to overmold end connections on appliance, faucet, and plumbing components, and allows for the manufacturing of complex parts or assemblies. This capability yields a leak-free monolithic assembly that is an attractive solution across a multitude of applications in these industries. PEX-c is the only crosslinking technology that lends itself to overmolding of complex parts and assemblies for these types of applications.

Explainer: Why use an e-beam accelerator to crosslink polymers?

Electron beam processing, also called electron irradiation, is a cost effective approach to modifying polymers (including polyamides, polyethylene, PVC, and thermoplastic elastomers, among others) that uses a stream of electrons to ionize the molecules of the polymer. The ionized polymer chains connect to each other resulting in a cross-linked polymer matrix. An e-beam accelerator can also be used to sterilize medical devices and pharmaceutical products, and to reduce the bioburden of products with less stringent regulatory requirements.

Image:
courtesy of Mercury Plastics

Some of the performance improvements made possible by e-beam crosslinking include:

- Improved heat resistance
- Outstanding slow crack growth resistance
- Enlarged tensile and impact strength
- Abrasion and wear resistance
- Chemical resistance
- Chlorine resistance
- Creep resistance
- Kink damage resistance
- Extended product life
- Improved compression set
- Enhanced dimensional stability

Engineers at Mercury Plastics work with customers to develop various solutions for the application of e-beam processing. Applications include, but are not limited to:

- Tubing
- Waterways
- Wire & cable
- Heat trace cable
- Electrical components
- Plumbing fittings and components
- Heat shrink plastics
- Seals and gaskets
- Injection molded parts
- Closed cell foam
- Synthetic gemstones
- Sheet film

Borealis and Borouge polyolefin infrastructure solutions for pipes and fittings are enabling life's essentials

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Borealis is one of the world's leading providers of advanced and sustainable polyolefin solutions. In Europe, Borealis employs around 6,000 people. In 2022, we generated a net profit of EUR 2.1 billion. OMV, the Austria-based international oil and gas company, owns 75% of our shares. The Abu Dhabi National Oil Company (ADNOC), based in the United Arab Emirates (UAE), owns the remaining 25%.

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In re-inventing essentials for sustainable living, we build on our commitment to safety, our people, innovation and technology, and performance excellence. We are accelerating the transformation to a circular economy of polyolefins and expanding our geographical footprint to better serve our customers around the globe. Our operations are augmented by two important joint ventures: Borouge (with ADNOC, headquartered in the UAE); and Baystar™ (with TotalEnergies, based in the US).

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