Borealis PEX pipe solutions

Exceptional performance for the competitive edge

BOREALIS

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Reliable and committed industry leader with a global reach

Global population growth and ageing infrastructure have increased the need for durable, dependable, and sustainable plumbing and heating pipe systems. As a leading global innovator with a track record of over 50 years in the industry, Borealis offers breakthrough polyolefin solutions that have revolutionized the piping sector. Our high-performance resins are based on proprietary technologies and offer unparalleled production efficiency, easy installation, and peace of mind to end users. Our collaboration with Borouge, a joint venture with the Abu Dhabi National Oil Company (ADNOC), enables us to supply a broad portfolio of high performance resins for the full range of pipe applications to customers around the world from our state-of-the-art, ISO 9001:2015-qualified production facilities.

The Borealis hot and cold water resin family consists of two main product groups: polyethylene for crosslinked polyethylene (PEX) pipe production; and polypropylene for PP-RCT pipe and fitting production.

PEX pipe production

Crosslinked polyethylene, or PEX, results from the chemical or physical joining of individual polyethylene (PE) molecules to produce a matrix of interconnected molecules. PEX pipe is typically produced using one of three primary crosslinking technologies: peroxide, Silane, and irradiation.

Designation	Crosslink Technology
PEX-a	Peroxide crosslinking
PEX-b	Silane crosslinking
PEX-c	Irradiation crosslinking

Table 1: Industry Designations according to Crosslinking Technology

When properly produced using one of these primary methods, PEX pipe offers exceptional toughness, durability, and temperature resistance. It provides for long-term serviceability in hot and cold potable water applications. PEX pipe is deployed widely in both residential and commercial construction thanks to its inherent flexibility, ease of installation, and overall cost-effectiveness.

PEX piping can be used across a very broad range of service conditions. Applications include hot and cold potable water distribution; hot water recirculation systems; hydronic heating systems; and snow and ice removal, to name only the most common. Larger diameter PEX pipe has also been utilized more recently for demanding applications in especially aggressive conditions (environmental, service temperature, wear, types of fluids etc.) in oil and gas, industry, and mining.

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Borealis PEX materials made to last for generations

Tailored solutions for PEX pipe production

Because each of the main production technologies requires specific resin types, and because each has clear advantages and disadvantages, pipe extruders themselves normally decide which method is the most suitable to meet their own production needs and budget.

Borealis has developed a family of feedstock PE resins for PEX pipe and fitting production for the most widely used PEX production technologies. The final performance capabilities and characteristics of PEX pipe are largely dependent on the quality of the pipe production process itself. In the case of PEX-a, this includes not only the quality of the pipe extrusion but also the final combination of feedstock resin, crosslinking agent, and additive package. In the case of PEX-b, this includes the quality of the pipe extrusion and the effectiveness of the irradiation process. Borealis PEX-grade resins offer the ideal combination of processability and long-term performance, based on the specific PEX technology employed. All Borealis PEX-grade resins are designed to meet or exceed the performance requirements of ASTM F876, ASTM F877, or CSA B137.5, when properly extruded using the PEX technology for which they are designed.

Benefits of Borealis PEX pipe resins

The Borealis family of PEX pipe grade resins offers distinct benefits to the producer, designer and end user:

- Over 30 years proven experience producing PE resin formulations for the PEX pipe industry
- A family of PE resins optimized for each respective PEX production technology
- Formulations designed to be fully compliant with globally recognized standards such as ISO, ASTM, CSA, DIN and NSF/ANSI Standard 14
- Superior long-term performance capability
  - Hydrostatic strength
  - Resistance to slow crack growth
  - Chlorine resistance
- Uniform consistency ensuring optimal processability
- Consistent crosslinking response
- Availability of fully formulated version
  - Ready-for-extrusion simplifies production process, inventory requirements
- Industry-leading technical support

Resin	PEX Technology	Nominal Melt Flow Rate [1] (g/10 min)	Nominal Base Resin Density [2] (kg/m³)	Form	Processing
HE1878	PEX-a	3.0	955	Natural powder	RAM extrusion
HE1878E	PEX-a	10.0	951	Natural powder	Twin screw extrusion
HE1878E-C2	PEX-a	9.0	952	Fully formulated mini-pellet	Twin screw extrusion
HE2591	PEX-a	10.0	944	Natural powder	RAM or twin screw extrusion
HE2590	PEX-c	8.5	944	Natural pellet	Single screw extrusion
HE2595	PEX-c	7.5	944	Fully formulated black pellet	Single screw extrusion
ME2592	PEX-c	10.0	936	Fully formulated pellet	Single screw extrusion

[1] In accordance with ISO 1133 (190 C/21.6 kg)
[2] In accordance with ISO 1183 (base resin density)

Table 2: Borealis Family of PEX Pipe Grade Resins

Borealis HE1878E-C2: The benchmark for performance in PEX pipe

Crosslinked PE and PEX piping systems have been established for some 40 years, yet crosslinking technologies, pipe production equipment, and pipe performance requirements have evolved extensively over time. This is why Borealis continuously refines its product offering for PEX pipe. Each iteration in the evolutionary cycle is enhanced to provide optimal performance. Borealis HE1878E-C2 PE resin is the state-of-the-art feedstock resin for PEX pipe production.

Optimal processing

The HE1878E-C2 resin is designed for maximum production efficiency. As a fully compounded mini-pellet with uniform geometry, HE1878E-C2 is tailored to PEX-a production using modern twin-screw extrusion equipment, and offers consistent and efficient processing. Because it is already fully stabilized when it leaves Borealis production facilities, pipe producers can focus on the pertinent aspects of PEX pipe production such as peroxide let-down, dimensional control, and irradiation of the extruded pipe to initiate the crosslinking. This unique mini-pellet configuration, in conjunction with the extensively researched Borealis additive package, enables maximum production efficiency for PEX pipe.

Borealis HE1878E-C2 resin

Borealis Innovations Headquarters in Linz, Austria

Hydrostatic strength

The long-term hydrostatic strength of PEX pipe is of critical importance. Properly crosslinked PEX pipe produced using fully formulated Borealis HE1878E-C2 meets, and even exceeds, the rigorous requirements set by the Plastic Pipe Institute's Hydrostatic Stress Board (PPI-HSB) Listing Programme. Its designation as a PEX 5006 pipe compound verifies its long-term serviceability in demanding PEX pipe applications.

Temperature: ° F (° C)	Hydrostatic Design Basis: psi
73° F (22.8° C)	1250
180° F (82.2° C)	800
200° F (93.3° C)	630

Table 3: Borealis HE1878E-C2, PPI-HSB Hydrostatic Listing

Chlorine Resistance

PEX pipe produced using the HE1878E-C2 compound has been evaluated for its resistance to the effects of chlorine in accordance with ASTM F2023. The pipe was tested at external laboratories under the conditions defined in ASTM F2023.

Test Parameter	Test Value
pH	6.8
Chlorine concentration	4.3 ppm
Oxidation reduction potential	> 825 Mv
Test temperature #1	203° F (95° C)
Test temperature #2	221° F (105° C)
Test temperature #3	239° F (115° C)

Table 4: ASTM F2023 Chlorine Test Conditions

Under these demanding test conditions, PEX pipe produced using HE1878E-C2 exhibits exceptional resistance to the effects of chlorine ions at elevated temperatures. What is more, test results support a Class 5 designation in accordance with the ASTM F876 classification system. This means pipe designers, producers and end users can depend on maximum serviceability in potable water applications.

The Borealis quality commitment

HE1878E-C2 manufactured in our industry-leading, ISO 9001:2015-qualified production facilities meets or exceeds all requirements for PEX piping for international markets, including North America.

Pipe produced using the Borealis HD1878E-C2 is compliant with the following North American standards:

- ASTM F876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing
- ASTM F877 – Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems
- CSA 137.5 – Crosslinked polyethylene (PEX) tubing systems for pressure applications

Borealis HE1878E-C2 is listed with NSF International in accordance with the requirements of NSF/ANSI Standard 14 for use in potable water and radiant floor heating applications.

Borealis pipe solutions: enabling life's essentials

As a trusted partner with more than 50 years of experience, Borealis supplies materials for advanced polyolefin pipe systems that help the pipe industry better serve a variety of communities worldwide.

Using its proprietary Borstar® technology as a base, Borealis offers polyethylene and polypropylene materials for pipes used in many different industries: water and gas supply, waste water and sewage disposal, plumbing and heating, and oil and gas, including multi-layer steel pipe coating solutions for onshore and offshore oil and gas pipelines.

By offering more durable and reliable pipe solutions, Borealis' step-change innovations continue to boost the sustainability of pipe networks by making them safer, longer lasting and more efficient by helping eliminate wastage and loss whilst at the same time offering energy savings.

Borealis has been a solution provider and one-stop shop for polyolefins in the oil and gas industry, providing reliable service and quality from one end of the pipeline to the other. Water and sanitation systems can be made more efficient and reliable by using proprietary Borealis materials. While systems made of conventional materials struggle with water losses of up to 30% to 50%, new thermoplastic pipe systems can avoid such leakage. Trenchless technology may reduce installation costs by up to 60%.

Enabling life's essentials | Date of issue: March 2019

About Borealis Borealis is a leading provider of innovative solutions in the fields of polyolefins, base chemicals and fertilizers. With its head office in Vienna, Austria, the company currently has around 6,800 employees and operates in over 120 countries. Borealis generated EUR 8.3 billion in sales revenue and a net profit of EUR 906 million in 2018. Mubadala, through its holding company, owns 64% of the company, with the remaining 36% belonging to Austria-based OMV, an integrated, international oil and gas company. Borealis provides services and products to customers around the world in collaboration with Borouge, a joint venture with the Abu Dhabi National Oil Company (ADNOC).

Borealis and Borouge aim to proactively benefit society by taking on real societal challenges and offering real solutions. Both companies are committed to the principles of Responsible Care®, an initiative to improve safety performance within the chemical industry, and work to solve the world's water and sanitation challenges through product innovation and their Water for the World programme.

For more information visit: www.borealisgroup.com · www.borouge.com · www.waterfortheworld.net

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