



Solutions for a Better Tomorrow

The LyondellBasell Pipe Portfolio

Customer Event

Bonn, October 11th 2023



Solutions for a Better Tomorrow

Polyolefins

Infrastructure

PP and PE pipe grades that are principally used for infrastructure applications

Lyondellbasell offers the industries widest portfolio of HDPE pipe grades for infrastructure applications which currently comprises 10 pipe and 9 stripe grades.

Grade	Description
CRP 100 Black CRP 100 W Blue CRP 100 Orange	PE100 general purpose grades for water, gas, wastewater and industrial applications
CRP 100 Black XL	Large dia. high wall thickness pipes
CRP 100 Resist CR Black CRP 100 Resist CR W Blue CRP 100 Resist Orange	PE100-RC with high Stress Crack Resistance for trenchless installation and as-dug pipe bed and surround
CRP 100 RT Black CRP 100 RCD Black GM 9310 C Black	High temperature applications High disinfectant and temp. resistance Semi-conductive conduits and pipes



PP and PE pipe grades that are principally used for infrastructure applications

All three of Lyondellbasell's PP infrastructure grades are natural block co-polymer (PP-B) grades that comply with the requirements of EN 13476 and can be used in the manufacture of sold and structured wall gravity pipes and chambers.



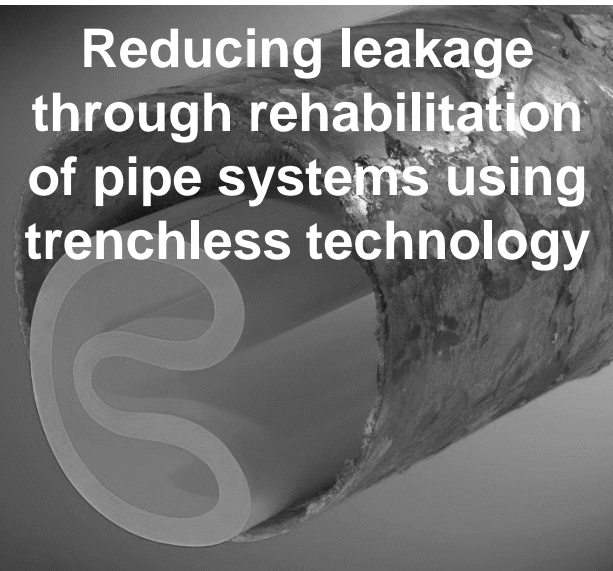
Grade	Tensile Modulus	Description
H 2464	1350 MPa	Excellent balance of stiffness and impact resistance
H 2483	1800 MPa	High stiffness with good impact resistance
H 2493	2000 MPa	Very high stiffness with sufficient impact resistance



How PE and PP pipe grades can improve network resilience and performance



How PE and PP pipe grades can improve network resilience and performance



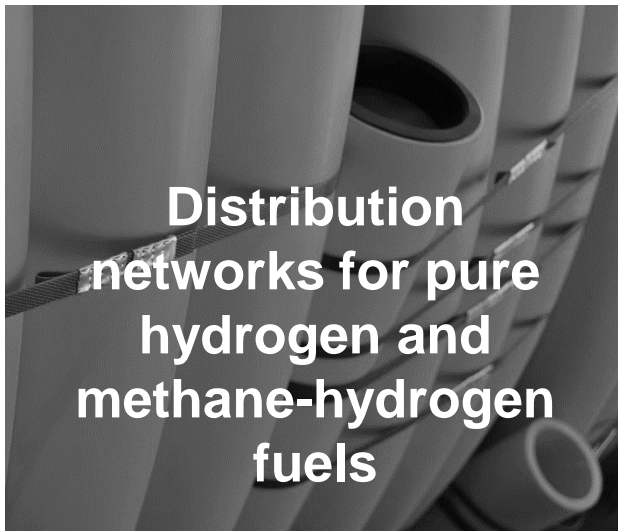
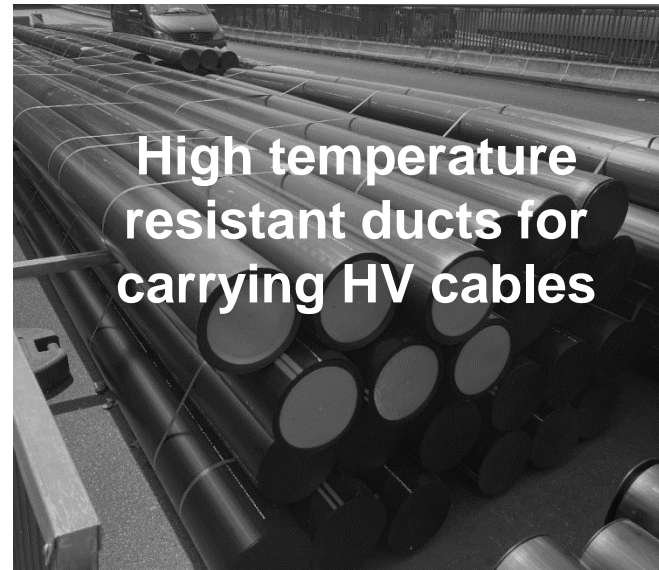
How PE and PP pipe grades can improve network resilience and performance



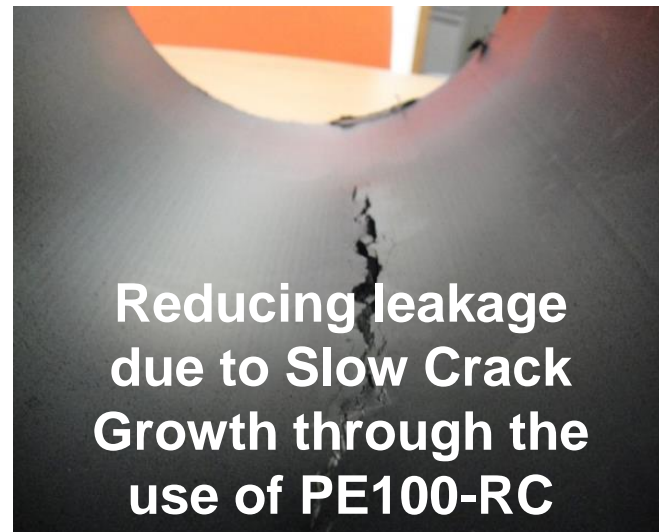
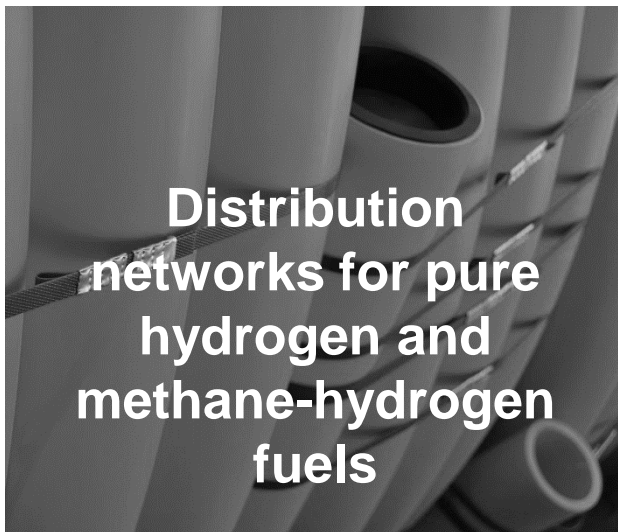
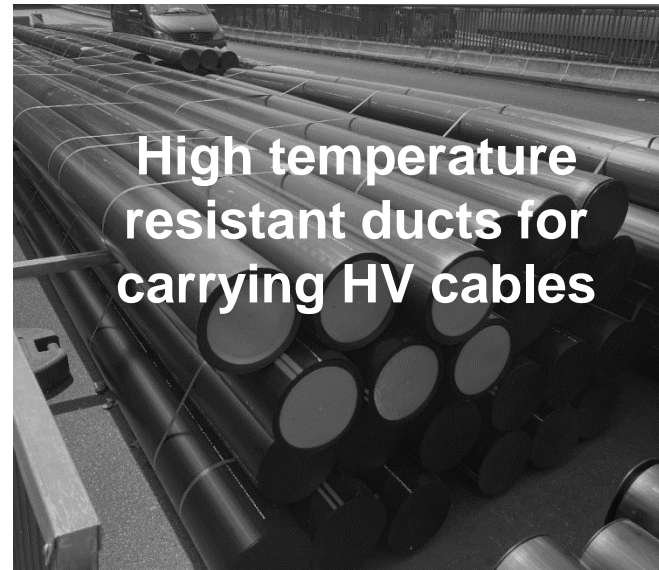
How PE and PP pipe grades can improve network resilience and performance



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Interior Pipes

Interior Pipe Portfolio

PE Pressure Pipe Grades for Raised Temperature Applications

<i>Lupolen 5261Z Q456</i>	PE-Xa Powder	Engel / RAM Technology – slow but very robust
<i>Lupolen 5261Z Q456B</i>	PE-Xa Powder	A higher melt flow version of Q456
<i>Lupolen 5461B Q471</i>	PE-Xa Powder	For use with twin screw extruders
<i>Lupolen 5461B Q471B</i>	PE-Xa Powder	A higher melt flow version of Q456 - Fast PE-X
<i>Lupolen 4261A Q416</i>	PE-Xc Pallet	For use with E-beam crosslinking
<i>Hostalen 4731B</i>	PE-RT Type II	Alu Composite, Drinking Water, ASTM F2023 Class 5 (Chlorine)
<i>Hostalen 4131B</i>	PE-RT Type II	Flexible Underfloor Heating, Glossy Outer Layer (in 5 layer)

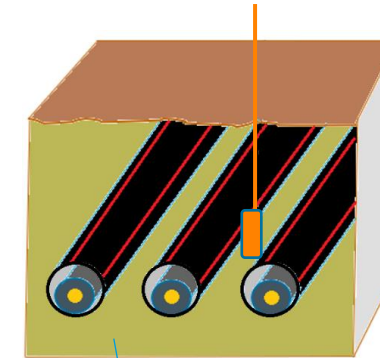
PP Pressure Pipe Grades for Raised Temperature Applications

<i>Hostalen H5416</i>	PP-R	EN ISO15874, hot/cold water pipes, classified by ISO9080
XN112-I	PP-RCT	EN ISO15874, hot/cold water pipes, classified by ISO9080
XN125-P	PP-RCT	EN ISO15874, hot/cold water pipes, classified by ISO9080

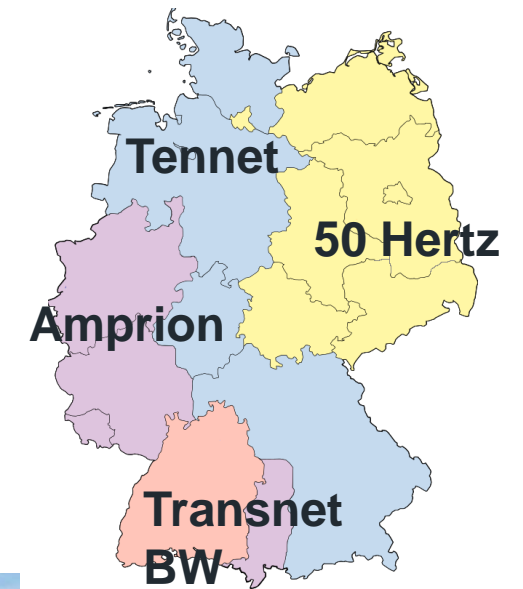
Creating Solutions for every day sustainable living - High Voltage Cable Ducts

- The sustainable energy transformation is driving demand for cable ducts and European network operators plan investment to significantly extend the High Voltage (HV) network
- Requirement of higher temperature resistance currently covered by different specifications / test methods
- 90°C operating temperatures in the copper conductor caused by ohmic losses will lead to temperatures above 40 °C in the cable duct
- *Hostalen* HS 4731B together with HS CRP100 RT Black and HS CRP100 Resist RCD Black offer best in class flexibility, UV protection, temperature resistance and welding properties
- Major upcoming projects in Germany will be undertaken by the 4 members of the Association of European Network of Transmission System Operators (ENTSO-E)

Temperature sensor



Concrete or sand



LyondellBasell provides solutions for today and for the new requirements of tomorrow



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PB-1

Polybutene-1 (PB-1) – The most technically advanced pressure pipe material

Interior piping system

- Plumbing for hot and cold drinking water
- Surface heating and cooling
- Radiator connections



Source: John Guest Ltd.

Exterior pipe

- District heating and cooling
- Geothermal pipelines



Source: Thermaflex Isolatie BV.

Ship building

- Plumbing for hot and cold drinking water



Source: Shutterstock.com

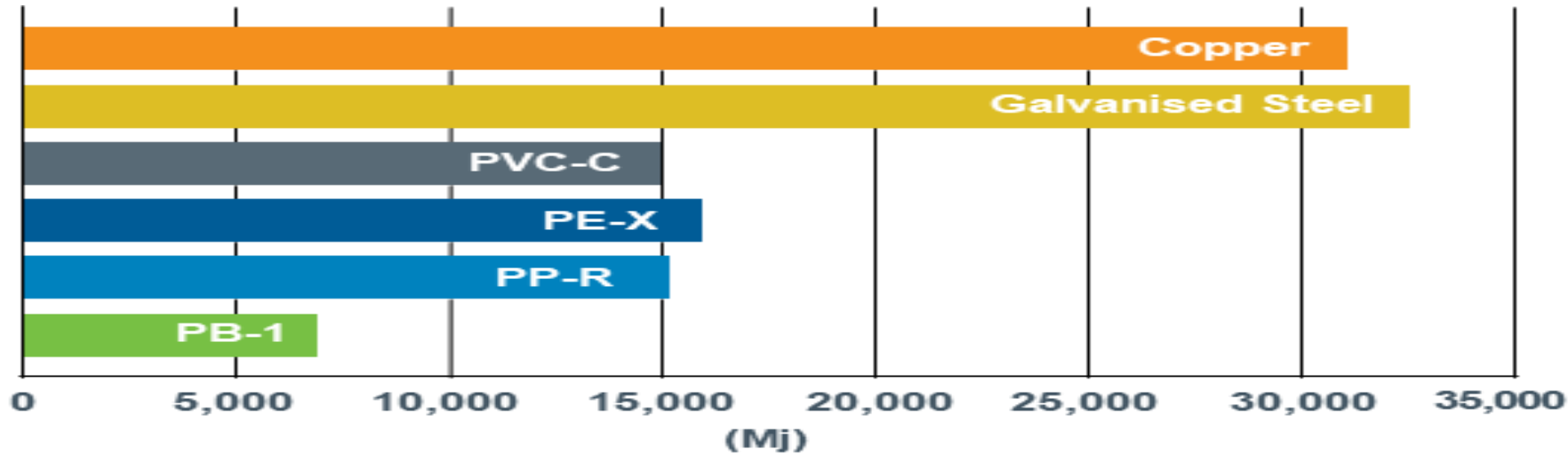


Source: Georg Fischer Piping Systems Ltd.

PB-1 has been used for pressurized hot & cold-water pipe systems for >50 years

Sustainability aspects: Energy efficiency

Energy equivalent value of the complete piping system for a 16 family housing complex



The Technical University of Berlin has conducted an energy efficiency and environmental impact analysis on hot and cold water pressurized piping systems. The study made a comparison of the total energy consumption for the production and installation of a piping system for a multiple dwelling with 16 apartments using a number of competitive metal and plastic systems.

Due principally to their lighter weight, plastics materials had a distinct advantage over metal pipes, but the Polybutene piping system proved to be substantially lower in total energy consumption than the other plastics systems included in the study. This was due to its superior internal pressure performance, permitting the utilization of pipes with smaller wall thickness

Source: [Site Installations | Polybutene Piping Systems \(pbpsa.com\)](https://www.pbpsa.com)

On energy efficiency PB-1 outperforms all other typical pressure pipe materials

New application with PB-1 : Hot water boiler tanks

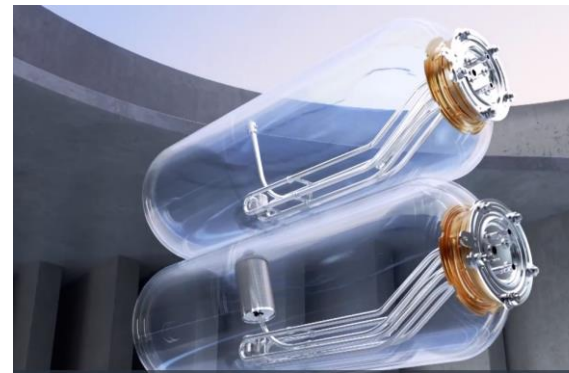


Typical issues metal tanks:

- Heavy
- Prone to corrosion / leakages
- High maintenance costs
- Limited service lifetime
- Less energy efficient

HAIER launched high-end electrical water boiler *CASARTE* with PB-1 tanks inside

Haier
Inspired Living



PB-1 brings longevity and maintenance free operation in continuous hot water environments

New application with PB-1 : Flexible tubing

PB-1 Koattro can easily be blended with PP in any ratio → *Akoaflex*

- Ready-to-use compounds bringing softness, flexibility, improved optical properties and are phthalate and plasticizer free
- Aimed to replace incumbent flexible tubing materials such as soft-PVC, EPDM, Silicone compounds or other TPE's



Applications

- Shower hoses
- Armed tubes for pressurized water
- Industrial flexible tubes (pneumatics)



PB-1 *Akoaflex* addresses regulatory concerns for flexible potable water applications

Conclusions

The unique material characteristics of PB-1 unlock new applications, while addressing sustainability concerns

- The proven track record of using PB-1 in continuous hot water environments make water tanks more durable
- Replacement of incumbent materials for flexible applications without the use of plasticizers or phthalates
- PB-1 has an unmatched low carbon footprint versus alternative pipe materials



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Advanced Polymer Solutions

Masterbatches and Colour Concentrates

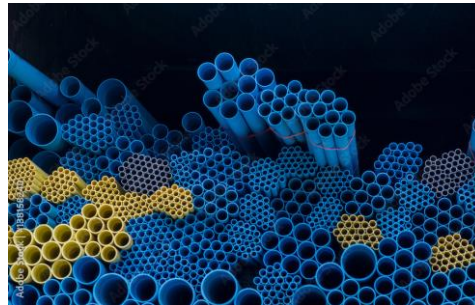
LyondellBasell's offering beyond Polymers: Masterbatches for Pipes & Tubes

- Relevant for all types of pipes (e.g., water& gas, sewer, fuel, sprinkle, corrugated...) and tubes (e.g., electricity, battery cooling...)
- Capability to work with a broad variety of polymers, including PE, PP, PB, PVC, ABS and reinforced thermoplastics
- Possibility to combine different additives and colors in one single masterbatch (combi masterbatches)
- Broad portfolio of masterbatches to support the needs of the industry through the lifetime of the pipe.



Pipe extrusion process

- Anti Oxidant
- Process Stabilizers
- Nucleators / Fillers
- Polymer Processing Additives



Storage


- Light stabilizers
- HALS
- Anti-static
- Carbon black



Final usage

- Thermal and UV stability
- Carbon black: semi-conductive
- Customized colors
- Anti-static
- Laser marking
- Low friction, sound dampening, flame retardant

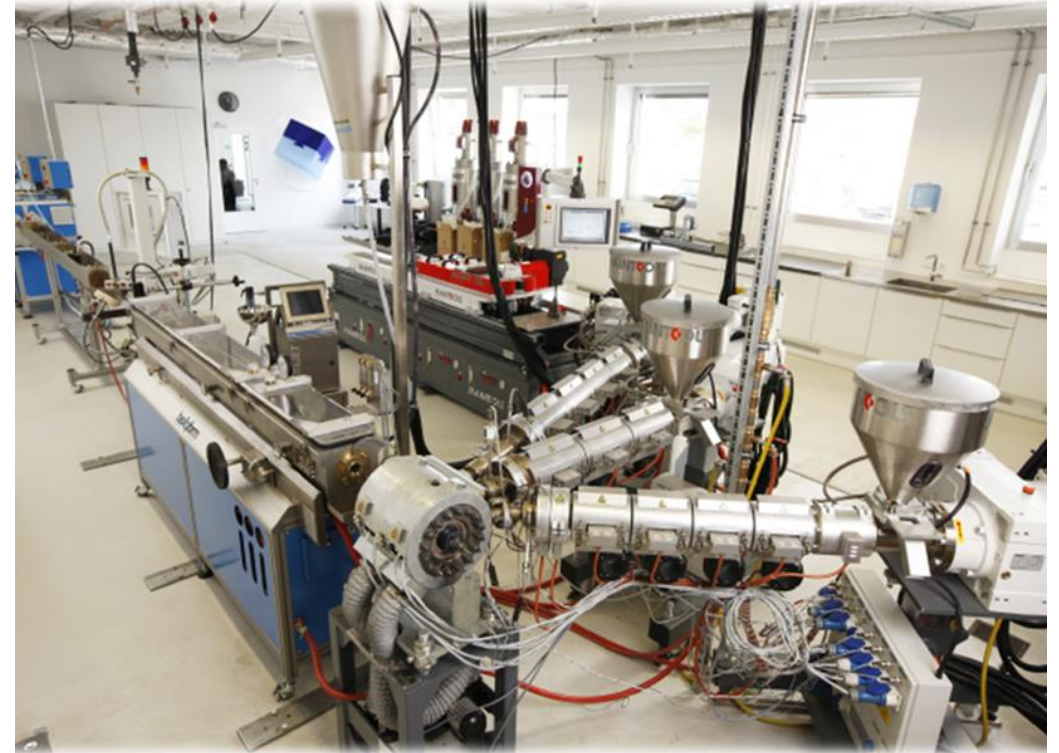
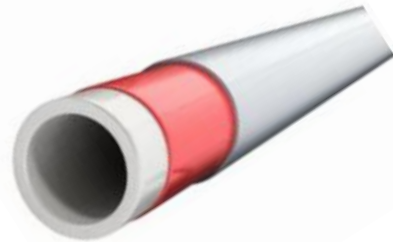
Competence center for extrusion of Pipes & Tubes for development of compounds

 Extrusion line to support the development of compounds and production of prototypes

 Located in Kerpen (Germany)

 Capabilities

- Almost all polymer types, all colors and layer combinations
- Mono and up to 3 layer tube extrusion
- Diameter 4mm-36mm
- Mechanical tests on tubes : elongation, burst pressure, cold impact
- Media storage
- Tubes in pieces or coils



More information available via your technical contact or Tobias Brack (Business Development Manager Extrusion | tobias.brack@lyondellbasell.com)

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