

More benefits with crack-resistant PE100-RC pipes

For technical details, be advised to "New requirements and testing for the certification process of PE100-RC pipes" paper which is available [here](#).

Polyethylene pipes made of PE100-RC – a clear trend

Improving the slow crack growth (SCG) performance of PE100 pressure pipe materials has been a key focus area of development, leading to improved robustness of PE pipes supporting No-Dig (trenchless installation) technology [1] [2], to further grow the value versus traditional materials like ductile iron and steel pipes, especially related to its longevity. Under the name PE100-RC (**R**aised **C**rack resistance) in Europe and PE100-HSCR (high stress crack resistance) in other parts of the world, these materials have already been in use for more than 15 years but mainly based on local standards, individual end user specifications or certification schemes like the PAS 1075 [4], Publicly Available Specification published by DIN (Deutsches Institut für Normung e.V.) in 2009. The PAS 1075 was withdrawn in Feb 2020 and is no longer a valid specification base for product certification.



@PE100+ Association
Picture: Close fit relining of old metal pipe with PE100-RC liner

The implementation of PE100-RC in the EN and ISO pressure system standards for pipes, fittings and valves (Part 1 to Part 5) is an important step to enable the gas and water industry and further industrial applications globally to make full use of the PE100-RC material and pipe performance and to have a publicly available, transparent requirement, testing and certification base. The EN 1555 (PE gas) system standard series [5] with PE100-RC included, was published July 2021, the EN 12201 (PE water) [6] in Jan. 2024. The new versions of ISO 4437-series (PE gas) [7] are ready since Feb. 2024 and ISO 4427-series (PE water) [8] will follow with comparable content by end of 2024, expected publication in Q1 2025.

Globally, this will enable the whole value chain from installers to utilities and end users to make even more use of installations without sand-bedding around the pipe and the interesting alternative installation techniques with PE100-RC.[2],[3],[4]



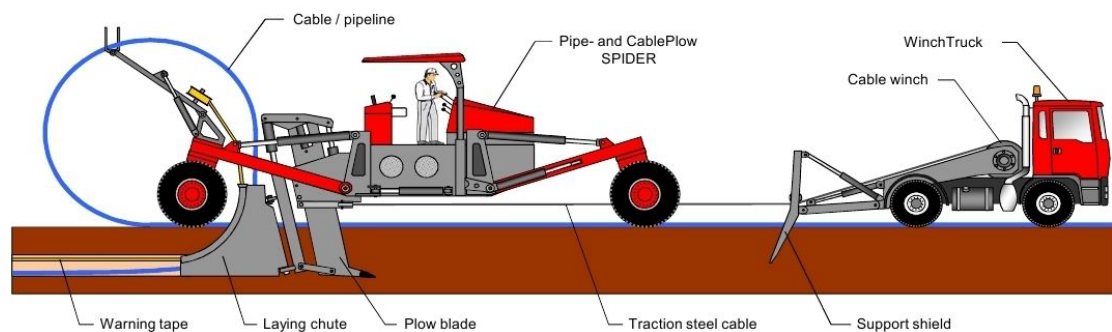
@PE100+ Association
Picture: Slip lining of old media pipe with new PE100-RC pipe

Polyethylene pressure pipe systems are today's choice for many of the gas and water utilities with a growing market share due to non-corrosion and reliable operation. They offer value, quality, safety and at low maintenance intervals.

PE100-RC is providing further added value:

- Polyethylene pressure pipe systems have a design life of 50 years at 20 °C but it is well known and published that the expected lifetime is above 100 years for water and gas systems ([9]TEPPFA/PE100+ publication). PE100-RC has improved SCG resistance versus PE100 which means that scratches and external damage do not lead to crack propagation at normal service conditions, offering additional safety and robustness to the system and furthermore securing the >100 years in even harsher conditions of installation.[10]
- Due to this robust performance PE has enabled No-Dig installation techniques where the flexibility of the PE is utilized in combination with the PE100-RC crack resistance: see Link to PE100+ webpage: <https://www.pe100plus.com/PE-Pipes/Technical-guidance/Trenchless/Methods>
 - Pipe ploughing allows trenchless long length pipe installation directly into the ground at a depth of, for example 1,5 m to 2 m without sand bedding. A very fast, cost-

effective installation method outside of urban areas and also suitable in wet land areas (beach, swamp) thanks to the longitudinal pipe flexibility.



@ Walter Foeckersperger GMBH
Picture: Flexible PE100-RC pipe installed directly into the ground without open trench

- Horizontal Directional Drilling [2] allows pipe installation without opening a trench and the technique makes it possible to undergo any obstacles like a crossing road, river, railway trails, buildings etc. There is hardly any other material in use than PE as it can be produced in long lengths (and by butt welding) without the need for fittings. The undefinable bedding conditions are tolerated by the robust PE100-RC.
- Our ageing infrastructure requires urgent replacement. The old traditional materials are at their end-of-life stage and often corrosion has been a problem, with incrustations influencing the hydraulic capacity and the hygienic integrity of water systems. PE100-RC pipes are the choice for relining, pipe bursting [1] and pipe slitting techniques, as scratches on the outside surfaces can be tolerated. In very harsh cases pipes with an additional protective PP layer are offered. The flexibility and formability of PE supports the close-fit installation like by swage-lining or by folding the pipe into a “C” or “U”-shape. [3] (link to web-page: <https://www.pe100plus.com/PE-Pipes/Technical-guidance/Trenchless/Methods>)



@PE100+ Association

Picture: U-liner or C-Liner made of PE100-RC for relining of existing pipes

- Sustainability should not be missed when talking about PE or PE100-RC systems versus other traditional materials:
 - Lower energy consumption and lower CO₂ footprint during the production of the system components versus metal competitors.
 - Transport due to the low weight consumes less energy and causes less CO₂ emissions.
 - Installers can make use of No-Dig technologies with PE which translates directly into less movement of excavated soil, less pollution due to transport and excavation work.
 - Less disturbance of public traffic, so not causing traffic queues, less detours, less exhaust fumes.
 - After >100 years in use you can take the PE and PE100-RC pipes and recycle them for further use in non-pressure applications or as feedstock for the chemical recycling.
 - Instead of fossil feedstock the PE100-RC can also be offered from renewable feedstocks like from residues of food or biomass (e.g. bio-based waste or residue vegetable oils) or from forest industries.
 - PE and PE100-RC systems are connected by welding and are therefore leak tight and ensure no loss of precious drinking water during transport to the consumer.
 - Full systems of pipes, fittings and valves are existing and covered in the EN and ISO standards. The connection of pipes can be done by butt-welding, electrofusion welding and mechanical fittings. PE pipes are used for pressure sewage pipes according to EN 12201 and ISO 4427 and form a leak tight system to protect our groundwater from contamination.

PE100-RC is the logical next technology step after the development of PE80 and PE100 as it offers many convincing benefits. The market has already started to gradually move to that newest PE material generation. Complexity reduction of pipe stocks at pipe producer, distributor and gas and water company can be achieved with one material specified. After the positive experience of the last >15 years in some major markets [11], public system standards for PE100-RC are now published. The next article will provide the details around the technical requirements for PE100-RC which are implemented in EN and ISO PE system standards of pipes, fittings and valves for gas, water and industrial applications.

REFERENCES

- [1] EN ISO 21225-1: *Plastics piping systems for the trenchless replacement of underground pipeline networks - Part 1: Replacement on the line by pipe bursting and pipe extraction*
- [2] EN ISO 21225-2: *Plastics piping systems for the trenchless replacement of underground pipeline networks - Part 2: Replacement off the line by horizontal directional drilling and impact moling*
- [3] EN ISO 11295 *Plastics piping systems used for the rehabilitation of pipelines - Classification and overview of strategic and operational activities*
- [4] PAS1075:2009-04, *Public Available Specification published by DIN Germany, Pipes made from Polyethylene for alternative installation techniques – Dimensions, technical requirements and testing*
- [5] EN 1555 *Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) - Part 1-5*
- [6] EN 12201 *Plastics piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE) - Part 1-5*
- [7] ISO 4437 *Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) - Part 1-5*
- [8] ISO 4427 *Plastics piping systems for water supply and for drainage and sewerage under pressure - Polyethylene (PE) - Part 1-5*
- [9] *Position Paper, TEPPFA and PE100+ Association dated 25th June 2019 - 100 years lifetime of Polyethylene pressure pipe systems buried in the ground for water and natural gas supply*
www.teppfa.eu www.pe100plus.com
- [10] *100 years lifetime of plastic pipes – study by Montanuniversität Leoben Austria - Commissioned by the European Plastic Pipes and Fittings Association (TEPPFA) dated 13 February 2024*
- [11] *Dr. Joachim Hessel – PE100-RC-A PE100 with extended application potential, publication 3R International, Vulkan Verlag, 47. Edition, 2008*

About TEPPFA

TEPPFA is the European Plastic Pipes and Fittings Association founded in 1991 with headquarters in Brussels. TEPPFA's 14 multinational company members and 15 national associations across Europe represent 350 companies that manufacture plastic pipes and fittings. TEPPFA members' final products have an annual production volume of 4 million tonnes directly employing 40,000 people with €12 billion combined annual sales. TEPPFA positions itself as polymer neutral. TEPPFA members' final products are subdivided into two application groups: above ground systems for hot and cold water, surface heating and cooling, waste water discharge and rainwater drainage, and below ground systems for sewers, stormwater and drainage, drinking water and gas supply and, cable ducts.

The European Plastic Pipes & Fittings Association © TEPPFA, 2024 RP-202410-20