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REHABILITATION OF PIPELINES

WITH **AGRULINE** AND **AGRUSAFE**



agru

Worldwide Competence
in Plastics





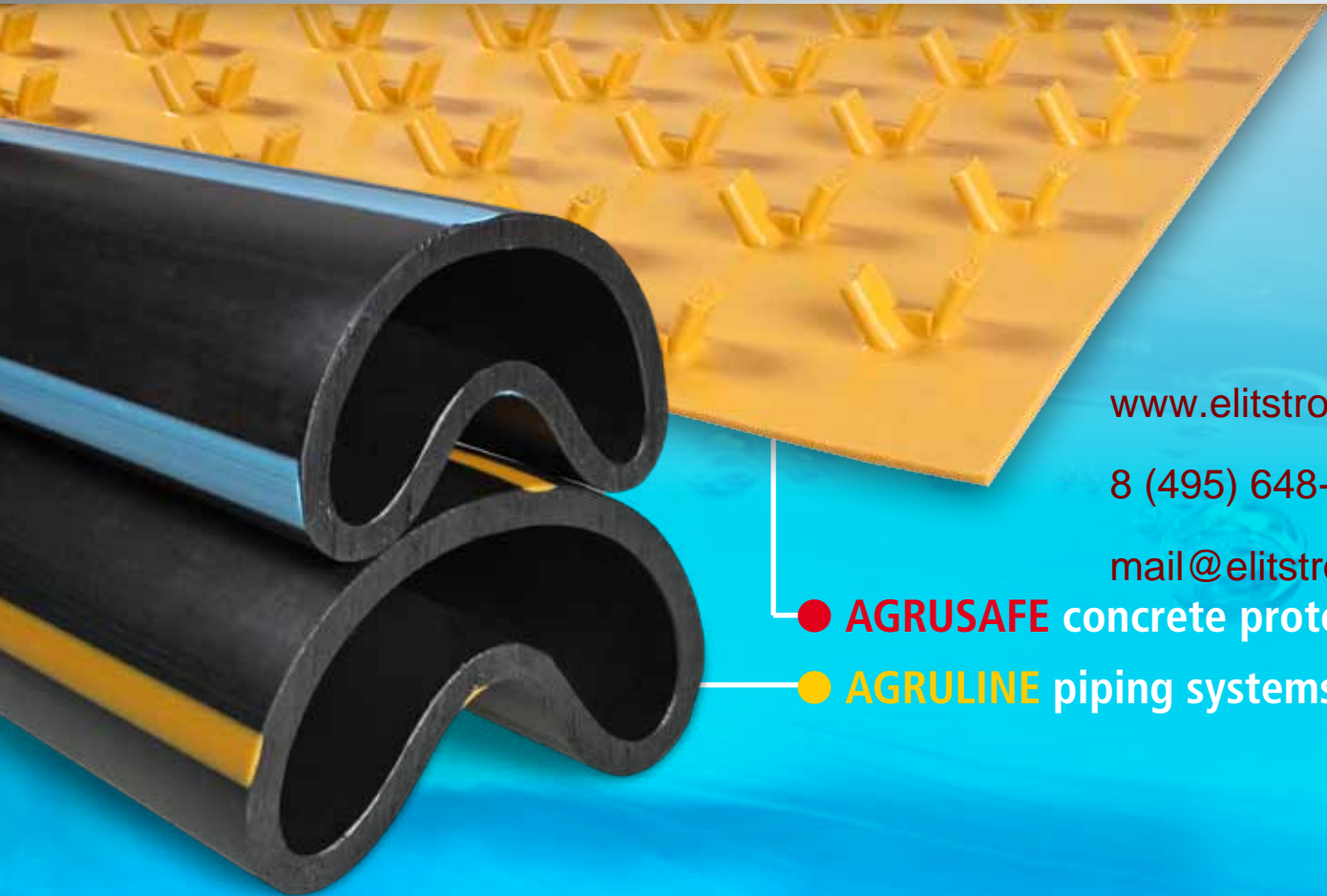
Worldwide competence in plastics

Numerous pipelines are older than 50 years and have to be renovated. In practice, trenchless installation and rehabilitation methods are well established as they are faster, easier and cheaper than conventional methods.

AGRU has successfully been producing polymer pipes for decades. As an innovative company AGRU is always interested in establishing new products in the market that focus 100 % on the customers' benefit.

With our product groups AGRULINE piping systems and AGRU-SAFE concrete protective liners we offer optimum overall solutions for relining as well as for lining of large pipelines. By offering technical consulting and project assistance we are able to support your rehabilitation project effectively.

THE FUTURE IS TRENCHLESS



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● **AGRUSAFE** concrete protection

● **AGRULINE** piping systems

Options for trenchless rehabilitation of old pipes

- Renovation of pipelines with **AGRULINE** pipes:
 - Burst-lining
 - Slip-lining
 - Close-fit-lining
- Lining of pipe lines with **AGRUSAFE** concrete protective liners:
 - Hose relining
 - Segment relining



SYSTEMS FOR GENERATIONS



Polyethylene (PE) in trenchless applications

- Light & flexible (e.g.: earthquake-proof)
- Easy installation
- Good abrasion properties
- Durability of more than 100 years
- Excellent overall economic efficiency
- Weldable (no ingrowths, leak-proof)
- High resistance to crack growth
- No deposits & low flow resistance
- Excellent chemical resistance
- Rodent-proof

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Density comparison

- PE 100 0.96 g/cm³
- Water 1.00 g/cm³
- Steel 7.85 g/cm³

AGRULINE piping systems

Burst-lining

With burst-lining the existing old pipe is cut and demolished by a cutting-widening-tool, creating space for the new pipe. The new pipe is fed right behind the tool's head.

The renewal by means of burst-lining is very demanding for the outside surface of the pipe. Scratches and point loads cannot be avoided. Therefore PE pipes with an extremely high resistance to crack growth are recommended. Such pipes are Sureline® pipes made of PE 100-RC and SurePEX pipes.

Usually burst-lining is used for dimensions ranging from 90 mm up to 400 mm. In comparison to other rehabilitation methods the diameter of the new pipe can be enlarged by up to 40 %.

AGRULINE
SurePEX



AGRULINE
Sureline®

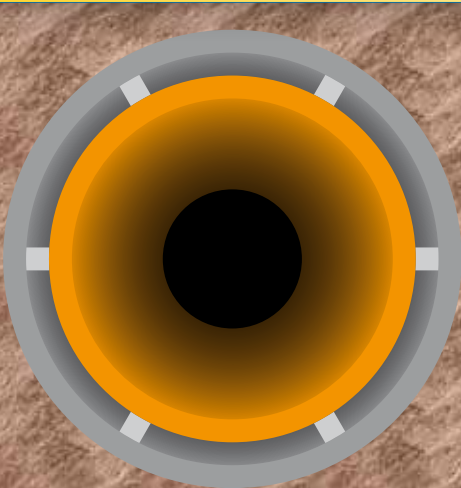


REHABILITATION WITH AGRULINE PIPES

Slip-lining

Standard PE pipes used for rehabilitation need to be smaller in diameter than the old pipe. On the one hand pipes with a length of several hundred metres can be used, e.g. coiled pipes. On the other hand singular pipes can be welded incrementally in the construction pit and afterwards be inserted into the old pipe.

Slip-lining leads to a reduction of the cross-section due to the annular space between new and old pipe. The reduced flow capacity can partially be compensated due to the good surface properties of PE. Nevertheless a capacity reduction has to be taken into account. The entire available dimension range of PE pipes (20 mm up to 2000 mm) can be used for slip-lining.



AGRULINE PE 100



AGRULINE Sureline®

Close-fit-lining

This rehabilitation method takes advantage of a very special characteristic of PE - the memory effect.

During close-fit-lining - relining without annular space - a PE pipeline with reduced cross-section is inserted into the old pipe.

There are two options:

- SureFIT® / r.tec® close-fit-liner

Pipes with smaller diameters are factory-preformed in order to reduce the pipe's cross-section.

- PE 100 pipes

Large diameter PE pipes (OD over 400 mm) are not factory-preformed. They are deformed on site just before they are fed into the old pipe.



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RELINING WITH
MEMORY EFFECT



Once the pipe has been inserted into the existing old pipe, both ends are sealed. Then the pipe is heated up using steam (water) and / or pressure.

This activates the memory effect. The treatment is continued until the pipe regains its original round shape and fits closely to the old pipe.

In the range of factory-preformed pipes AGRU offers the SureFIT® / r.tec® close-fit-liner - a tailor-made solution for diameters ranging between 78 mm and 400 mm. If bigger diameters are required, PE 100 pipes are used of which the cross-section will be reduced on site.



AGRULINE PE 100



SureFIT® / r.tec® close-fit-liner



AGRUSAFE concrete prote

Lining systems

Concrete protective liners are generally used for rehabilitations as well as new installations of diameters larger than one metre. AGRUSAFE concrete protective liners are used for lining concrete pipes and steel pipes, which take up the mechanical loads.

The lining of such pipes combines the good mechanical properties of concrete and steel with those of polyethylene (PE), e.g. excellent abrasion resistance, non-corroding and good chemical resistance. In the end a permanent leak-proof composite pipe with a long life-time is created.

With AGRUSAFE concrete protective liners various pipe cross-section shapes can be lined without difficulty.

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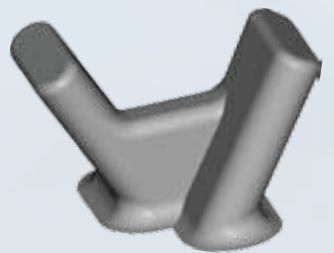
RELINING WITH AGRUSAFE

The Sure Grip® principle

The unique and patented form of the V-shaped anchor studs, which are directly formed onto the liner during the extrusion process, allows safe mechanical anchoring of the concrete protective liner to the concrete.

This design guarantees optimal anchoring to the concrete or injector even though plastic and concrete do have different thermal expansion coefficients.

Depending on the project requirements different stud forms and liner thicknesses can be used.



ction



AGRUSAFE Sure Grip®



AGRUSAFE Ultra Grip®



SCS SelfCleaningSystem
with bionic surface



AGRUSAFE with
signal layer



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CONCRETE PROTECTIVE LINERS



Hose relining

The liners, customised for each and every dimension, are drawn from manhole to manhole. The liner is sealed with balloons and water pressure is added depending on the grouting length. Afterwards special mortar is injected.

Segment relining

Short pre-fabricated liner sections are inserted into the channel and then welded together by means of extrusion welding. Afterwards they are fixed to a formwork system. Similar to hose relining, the gap between the liner and the old pipe is finally filled with highly flowable injection mortar.



Trenchless rehabilitation with the

SureFIT® / r.tec® close-fit-liner

suitable for natural gas, potable water, sewage and industrial pipelines

- Fast & easy
- Sustainable & environmentally friendly
- Long-lasting (+100 years)
- Dim 78 mm up to 400 mm



AGRULINE

PIPING SYSTEMS FOR NATURAL GAS, POTABLE WATER
& SEWAGE



AGRUSAFE

CONCRETE PROTECTION

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