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Melt In Place Pipe "MIPP"

"The ONLY DWI (REG31) approved liner for drinking water in the UK"

Commercial Presentation

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Introduction - Commercial

- **Patented technology** for drinking water pipe renewal
- Cheaper than replacement (***up to 50%)***
- Quicker (***up to 10 times)***
- Unique **Regulatory Approval** for drinking water in UK
- Trial installations for ***Yorkshire, Anglian and Wessex***

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Process for Pipe Renewal/Replacement

- Fully structural stand alone pipe capable of taking both internal pressure/vacuum or external load
- Similar cost and thickness of many semi-structural methods
- Not a coating/repair/rehabilitation process where the original host pipe condition is critical to its performance

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Patented technology developed in the UK in conjunction with

Severn Trent Water (STW)
Yorkshire Water (YW)
Anglian Water (AW)
Wessex Water (WW)

Patented method to line corroded water mains and sewers with a structural thermoplastic composite material

Intellectual Property - Patents

Patent protection to 2038 and expanding

Patent (GB2554431)

- Granted UK-July 18 covers the unique design of the heated Pig that melts material in the pipe
- In 2021 grant has been confirmed in ***8 European Countries & Japan***
- Patent application is pending in the ***US and Australia***

Patent (GB2571127)

- Granted UK-March 21 covers the design necessary to achieve even air flow and temperature as it exits the heated pig.
- Patent applications are pending in ***Europe, North America and Asia***

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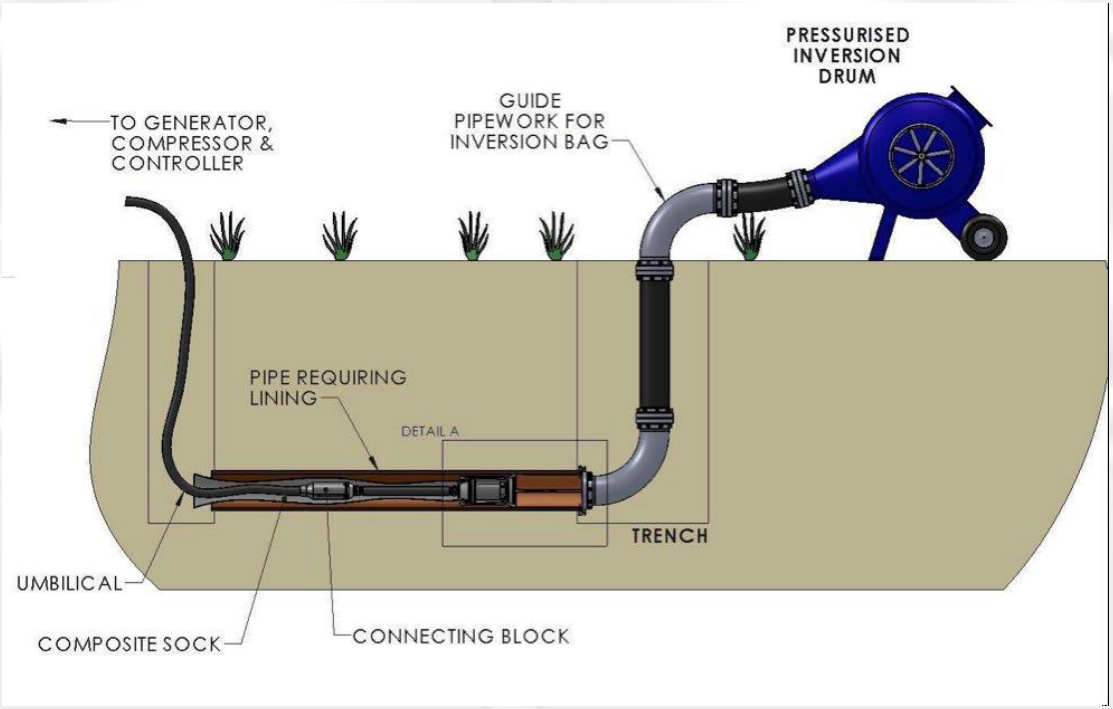
"MIPP" PROCESS–How does it work?

A glass fibre-reinforced polypropylene sock is inserted into a deteriorated pipe. After sock insertion, a silicone rubber inflation tube pushes a heated "pig" through the composite, melting the sock against the pipe, which then cools to form a solid glass-reinforced thermoplastic pipe



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Key Regulatory Approvals Granted

- UK Drinking Water Contact Approval (*DWI Reg 31*) - *currently the only approved structured liner (renewed until Nov 2021)*
- Received WRc Approved Products and Services for Sewers (Cert no:PT/396/1114 – AS)
- NSF 61 - Drinking Water Installation Certification for North America

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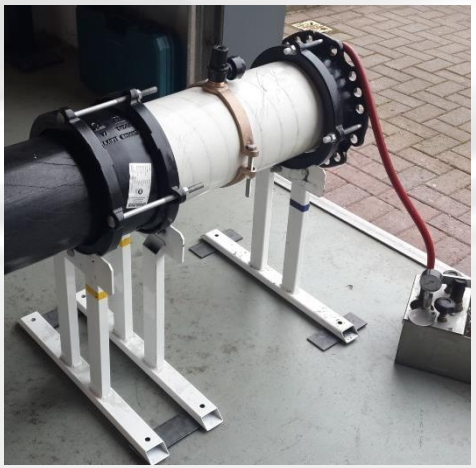
Standard End Seals, Couplings and Ferrules

Flange adaptor/End seal

Liner coupler

Ferrule/House Connection



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Drinking Water Pipe Replacement Methods

- **Open Cut** - *Dig up and replace*
- **HDD** - *Horizontally Directional Drilling a new hole and pull in a new pipe*
- **Close fit lining** - *Insert a new pipe under tension though the existing pipe and release it to expand to the diameter of the existing pipe*
- **Slip Lining** – *Insert a smaller diameter new pipe and grout in place*
- **Fold and form** - *Insert a new folded pipe or pipe pulled though a die into the existing pipe and expand it to the diameter of the existing pipe*
- **Pipe Burst** - *Mechanically expand the existing pipe until it bursts while pulling through a new replacement*
- ***Spray Lining*** - *Spray-on linings are a non-structural coating and have been one of the most widely used methods for providing corrosion protection and water quality improvement*

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UK WATER MAINS REPLACEMENT

Road 3/4 *(200mm)*

Method	Change in cross section *HDPE:SDR-17*[c]	Structural Class[a]	Environment Impact/Equipment Footprint *(Lane closures!)*	Installation rate (per/week)	Design Life (Years)	Risk to nearby Infrastructure	Relative Cost per meter
Open Cut	***0%***	***4***	***Major***	***80***	***50+***	***Moderate***	***£150+***
HDD	0%	4	Medium/Major	300	50+	Yes	£100
Close Fit	-23%	3-4	Medium	150	50+	*None*	£95-£105
Slip lining	-37%	3-4	Medium	200	50+	*None*	£85-£95
Pipe Bursting	0%	4	Medium/Major	200	50+	Yes	£100+
Spray Lining	N/A	1	Minor	300	N/A	*None*	£70-80
Aqualiner	***-5%***	***4***	***Minor/Medium***	***300/600***[b]	***50+***	***None***	***£90***

a) CEN ISO/AWWA Structural Classifications
1 – Non- Structural, 2/3 – Semi Structural, 4 – Fully Structural – new pipe equivalent
b) Target installation rate
c) Standard Dimensional Ratio (SDR)

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Key Benefits

- **Regulatory Approved**
- **Trenchless**
- **Thin-walled (3mm)** – *to maintain the pipe's hydraulic capacity*
- **Structural** – *standalone integrity with 60 year life*
- **Cost-effective**
- **Uses stock items - end seals, couplings and ferrules**
- **Environmentally friendly** – *low carbon footprint*

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Development Stage

- Live installations in sewer and storm drains
- Trials in a series of drinking water pipes
- Licenses already sold to early adopters (awaiting domestic approvals): Japan, Singapore, Taiwan, South Korea, South Africa & UK
- **LATEST**: Live Installation in UK Drinking Water

anglianwater

SEVERN TRENT WATER

YorkshireWater

Essex & Suffolk Water a YTL company

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Commercial Model

- **Territorial licenses for contractors**
- **Equipment sales** - each capable of 25-30km per annum
- **Material sales** – the lining material

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Target 'Market' - Global

- 4"-12" (100-300mm) potable water pipes
- Suitable host pipes - include cast/ductile iron, bitumen coated cast iron, asbestos, reinforced concrete, clay and PVC
- Single shot target length 120+m
- Same day return to service (*a few hours disconnection*)
- Market penetration through existing mainframe and/or sub contractors globally

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50 Year Life

- WRc Long Term Testing
- 10,000 hours Creep Test
- 10,000 hour Strain Corrosion Test
- Yield 50 year E Modulus values and long term tensile and flexural strength estimate for design using ASTM F1216

Targeted Equipment Capability

- Inflation Drum Capacity 150m
- Estimated Operating Capacity 120+m
- Pig and Umbilical Power Supply 120+m

Target Installed length 120+m

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Installation Rate

- Set up and make ready equipment 1 Hour
- Target installation rate 1.0m/minute
- Cool down and demobilise 1 Hour
- Phase 2 3-4 hours 120m

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Summary

- ✓ Trenchless pipe replacement process
- ✓ Thin-walled (3mm), Fully Structural & Cost-effective pipe
- ✓ Standard end seals, couplings and ferrules
- ✓ Environmentally friendly *with* Minimal maintenance
- ✓ Regulatory approved in UK & US