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FLORENCE 2019

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**PIPE REHABILITATION SYSTEMS: HOW DO YOU ENSURE THE SYSTEM
WILL WITHSTAND THE RIGOURS OF DAY TO DAY OPERATION AND
MAINTENANCE**

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INTRODUCTION



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- Introduction & Background
- Picote Brush CoatingTM System
- WRc Approval
 - High Pressure Water Jetting
 - Abrasion Resistance
- Test Results
- Conclusions
- Summary



BACKGROUND



1999

Innotia
Construction and
Rehabilitation
Business launched
in Porvoo, Finland



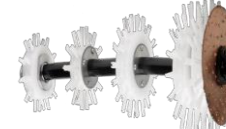
2008

Began Cured-In-Place
(CIPP) Linings. First
Picote Miller & Smart
Cutter™ developed



2012

Picote Solutions
launched. Picote
Smart Cutter™ wins
ISTT Product of the
Year



2014

Picote Twister
shortlisted for UKSTT
Innovative Product
Award

2016

Picote takes over
manufacture of all
Picote Cleaning
Chains

2018

P-Trap Cutter to
launch at WWETT
Picote Brush Coating
WRC Approved

2004

Appointed Dakki
Coating Franchisee
in Finland

2009

First patent application
submitted. Picote CIPP
Lining inside buildings
DN50 – 225 developed
further

2013

Picote Solutions,
Inc launched in
the USA

2015

Picote Maxi
Miller launched



2017

Picote Maxi
Miller Power+



PICOTE SOLUTIONS HAVE 100+ PATENTS TO DATE

MANUFACTURERS OF HIGH-SPEED CLEANING MACHINES



*Can operate in pipe diameters
DN32 to DN300*

Can be used for general unblocking, root cutting, descaling, concrete removal, lateral reinstatement, removing failed linings using specially developed tools such as Chains, Special Drill Heads, Smart Cutter™, Smart Spider, Smart Sweeper and Twisters

Picote machines operate between 500 and 2900 RPM



WRc APPROVED SCHEME



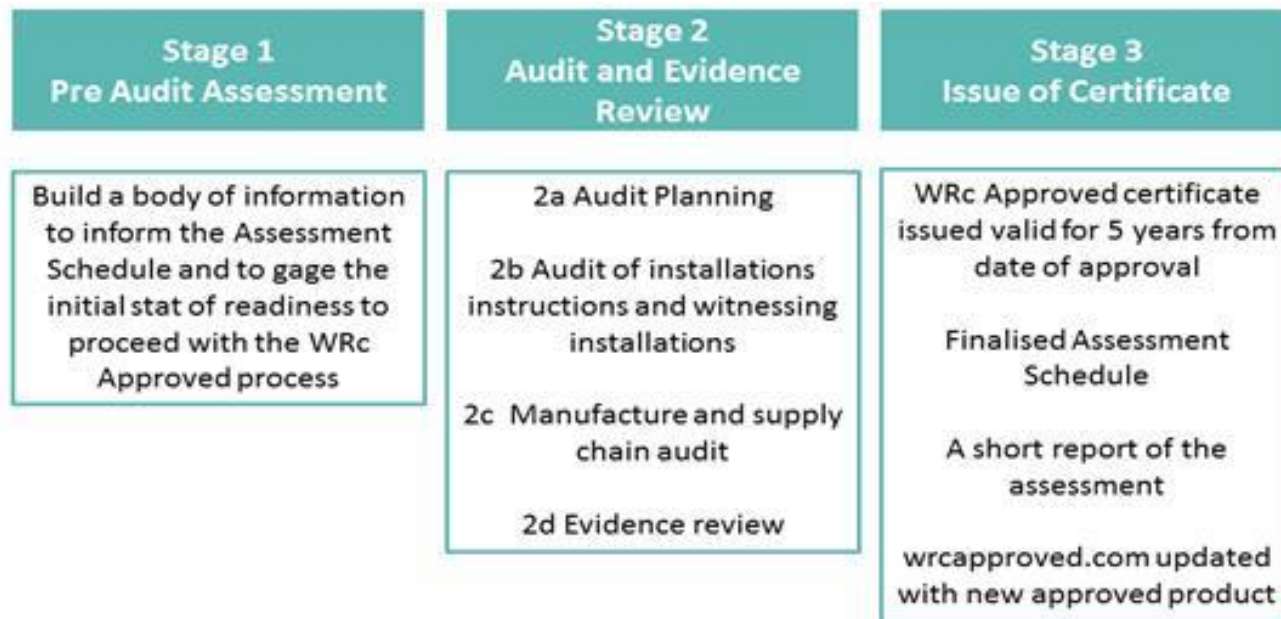
- WRc Approved is an **independent technical** view on whether a product is **fit to do the job** for which it is claimed **or** a contractor is fit to provide a specified service
- Over the past **20 years** WRc has issued in excess of **400 approvals**.
- Approval range for pipe rehabilitation, pipeline fitting, software, modular build structures, flow control and installer workmanship.
- Have been approved for UK, Europe, North America, Asia and Australasia. <http://www.wrcapproved.com/home>



WRc APPROVED SCHEME



Straightforward yet robust, based on rigorous audits



- WRc approvals are valid for 5 years.
- After which a re-approval is required, ensuring that your product is still 'fit for purpose'.
- Further testing may be required in order to comply with any changes to the appropriate standards.

PICOTE BRUSH COATING™ SYSTEM



DC1000E 100% SOLIDS EPOXY RESIN



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- Dual Colour Epoxy Resin System
- White or Grey in Colour
- Semi Structural System
- Choice of resin depends on the colour of host pipe. (i.e cast iron – 1st coat is white)
- Change colours between coats so operator can see the coating is applied uniformly
- Vary the flow of resin to fill any holes or cracks
- Client can visually see how many coats applied
- Client can be supplied with CCTV showing application of each coat



HIGH PRESSURE WATER JETTING (HPWJ)

- Water Industry Specification (WIS) 4-35-01
- Specification for Thermoplastics Structured Wall Pipes, Joints and Couplers with a Smooth Bore for Gravity Sewers for the Size Range 150-900
- To determine:
 - The Picote Brush CoatingTM System resistance to through-wall puncture
 - Whether or not the Picote Brush CoatingTM System would de-bond and lift from the host pipe
 - The pass criteria to determine the jetting resistance of the applied coating was selected to be the same as thermoplastic pipes (2600 psi /180 bar)
- The test samples, witnessed by WRc, were made by brush coating a DN150 steel pipe with 5 coats of the DC1000E



TEST METHOD

- Increase the pressure uniformly to 180 bar (2600 PSI) over a time period of not less than 10 seconds but not more than 15 seconds.
- The test pressure was applied to the pipe surface for 120 seconds
- Stop the pump, remove the test piece from the rig, inspect for signs of damage, and record pass or fail.
- The test was repeated 5 times at the test pressure.



TEST RESULTS

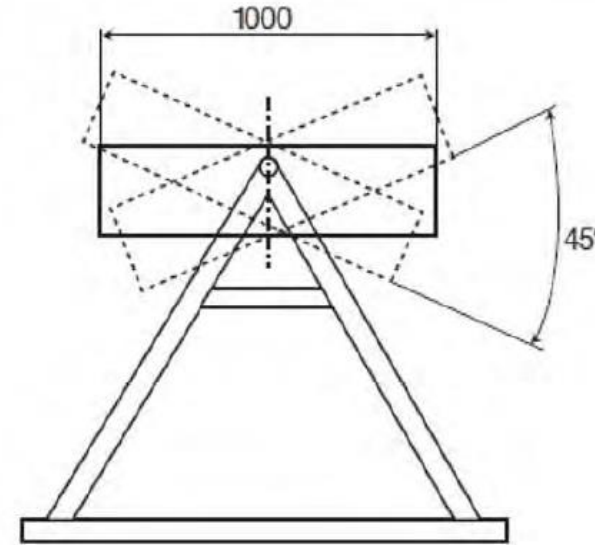


- De-bonding: Testing indicated that the coating could be punctured though there was no lifting or de-bonding beyond the immediate puncture area
- Through-wall puncture: The testing was targeted at the trough within the applied coating. On visual completion of 5 runs at 2600 psi /180 bar the coated pipe was then cut in the hoop direction and within 15 mm of the jetting impact point

| REFERENCE | PRESSURE | LAYERS EXPOSED | PASS / FAIL |
|-----------|--------------------|----------------|-------------|
| 1 | 180 BAR / 2600 PSI | 4 | PASS |
| 2 | 180 BAR / 2600 PSI | 3 | PASS |
| 3 | 180 BAR / 2600 PSI | 3 | PASS |
| 4 | 180 BAR / 2600 PSI | 4 | PASS |
| 5 | 180 BAR / 2600 PSI | 3 | PASS |

DARMSTADT ABRASION TEST

- Carried out in accordance with BS EN 295-3, Vitrified Clay Pipe Systems for Drains and Sewers, Test Methods
- The abrasion test is the standard test method used to assess the resistance of vitrified clay, concrete and PVC drain and sewer pipes to abrasion by sediments
- Also used a general abrasion test for CIPP liner, pipe coatings etc



TEST METHOD

- Test solution was a mix of sand, gravel and water
- The sediment fraction was a blend of natural unbroken round grained quartz silts, sands and gravels
- Grain size up to 15mm
- Tap water was added to a depth of 38mm from pipe invert
- 70 measurements were taken before and after testing
- Test was run for 100,000 tip cycles



TEST CRITERIA

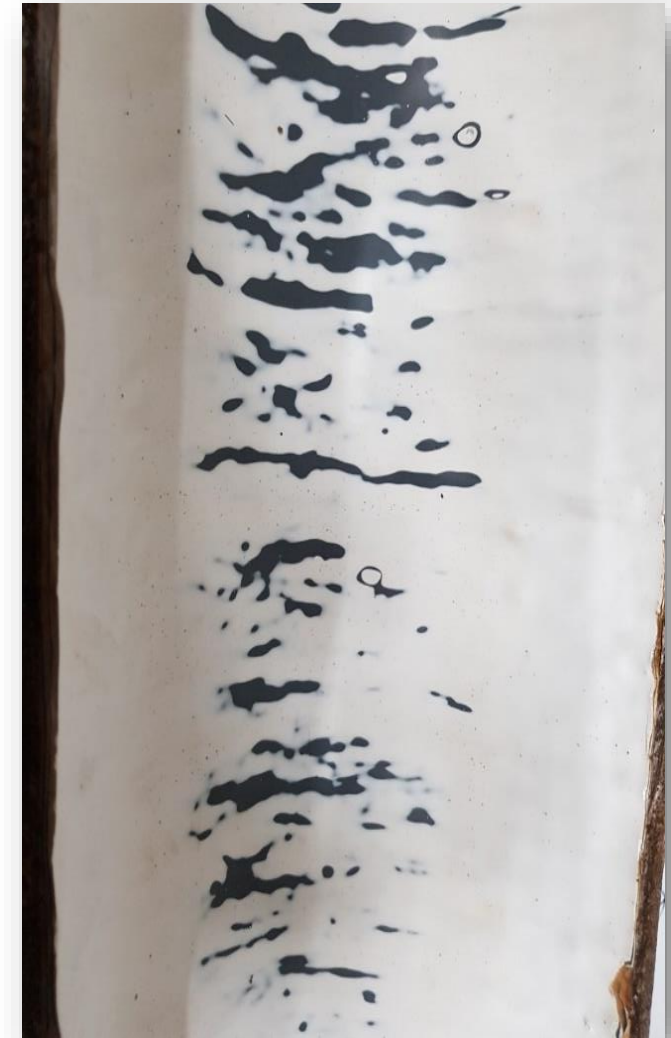


- There is no pass or fail threshold for this type of test apart from typical wear values for vitrified clay pipes of 0.2mm to 0.5mm
- It was agreed to apply the following criteria for non-vitrified clay materials:
 - Through wear of the coating to the host pipe
 - Delamination of the coating from the sample surface
 - Damage to the protective coating to an extent that it will fail to give the intended protection
- The equipment rocks the test sample in the longitudinal direction through 45 degrees causing the test medium to travel end to end along the invert of the test sample producing an abrasive action

TEST RESULTS

- The test sample completed the 100,000 test tip cycles
- The AVERAGE wear value was 0.44mm
- The MAXIMUM wear value measured was 1.23mm
- The LOWEST wear value measured was zero
- The results were in the range of 0.2mm to 0.5mm referenced for vitrified clay abrasion resistance

It was noted that the brush coating technique leaves a ridged finish. Smoothing of the raised ridges occurred with the top layer of white worn through to the previous applied grey coat





- The high pressure water jetting test showed that a minimum of 5 coats would need to be applied to the pipe to withstand a jetting pressure of 180 Bar (2600 PSI) as required by Water Industry Specification (WIS) 4-35-01 and demonstrated that:
 - There was no lifting or de-bonding beyond the immediate puncture area
 - The jetting resistance of the Picote Brush CoatingTM System was the same as thermoplastic pipe systems

The Darmstadt test demonstrated that:

- The coating wear value is within the range quoted in EN 295-3 for vitrified clay pipes
- No failure of the coating through to the host pipe was observed
- No delamination of the coating layers was observed
- The coating remained fully adhered to the host pipe and previous layers of coating

The Picote Brush CoatingTM System is considered to have passed the abrasion resistance test when compared to vitrified clay pipes and significantly lower than the abrasion characteristics of asbestos cement, concrete and fibre glass reinforced pipes

SUMMARY



Overall the testing regime undertaken by WRc as part of the WRc Approved Scheme demonstrated that the Picote Brush Coating™ System could withstand the long term rigours of day to day operation and maintenance as a semi-structural repair

