



37<sup>TH</sup> INTERNATIONAL  
**NO - DIG**  
FLORENCE 2019

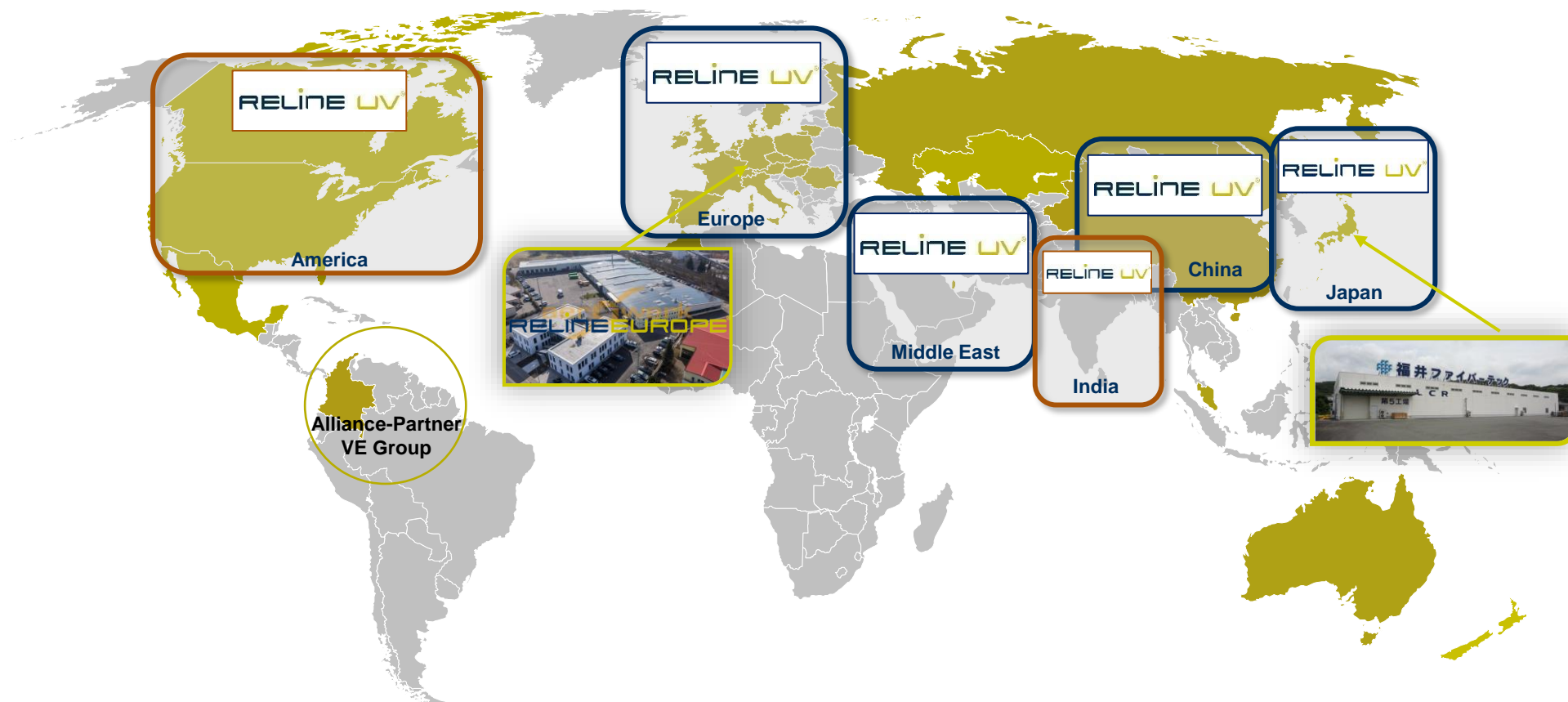
Fortezza da Basso • FLORENCE (Italy)

30<sup>th</sup> September • 2<sup>nd</sup> October 2019

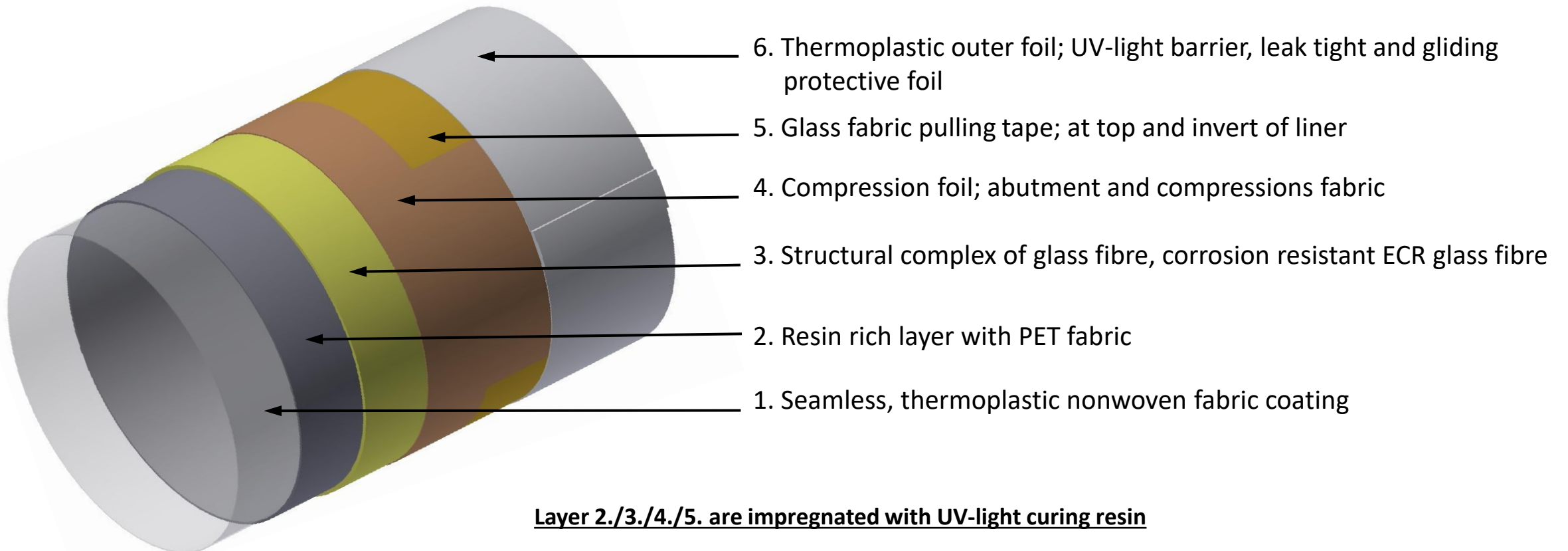
# No-dig renovation of pressure pipelines, re-connection techniques and case studies

Firmino Pires Barbosa, Civil Eng.  
Sales Director International  
RELINEEUROPE AG / RELINE APTEC GmbH

# RELINE APTEC Introduction.

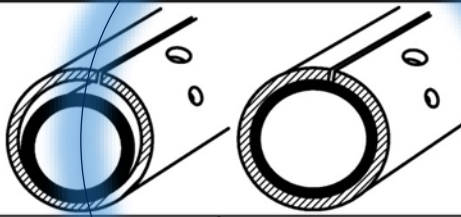
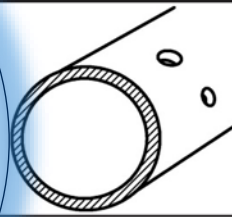
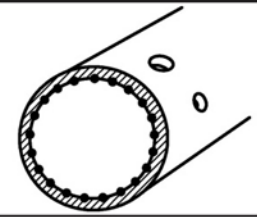
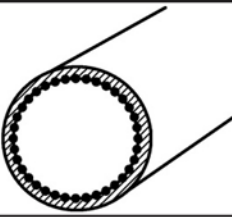


# Pressure Liner Built-up.



# Pressure liner Standards.

## DIN EN ISO 11295, 08-2010

Klasse A		Klasse B	Klasse C	Klasse D
				
locker sitzend	eng anliegend	eigene Ringsteifigkeit	beruht auf einer Klebeverbindung	beruht auf einer Klebeverbindung
unabhängig		interaktiv		
voll statisch belastbar		semi-statisch belastbar		nicht statisch belastbar
Rohrstrang-Lining				Diese Internationale Norm ist nicht anwendbar
	Close-Fit-Lining			
	Vor Ort härtendes Schlauch-Lining			
		Schlauch-Lining mit Klebebeschichtung		

Remark: The items in pictures of classes C and D report to gluing connection

# Product management Sewerage water.



## AlphalinerPN

- Diameter from DN150 (6“) up to DN1200 (48“)
- Pressure range PN 2,5 (36 psi) up to PN 16 (232 psi)
- Abrasion resistance of the seamless coating inner foil
- Dynamic internal stress test passed (certificate pressure cycles 10,000,000 x -0.8 bar to 9 bar)



# Product management

## Gas – low pressure.



### GasLiner®

- Diameter from DN 150 (6") up to DN 1200 (48")
- Low and medium pressure range
- Diffusion-tightness of seamless interior coating
- WRC Approval for 2 bar
- Pilot project in GB / Wales: Renovation of a gas pipeline DN290
- Since September 2014 for a long-term survey

# Product management

## Potable water.

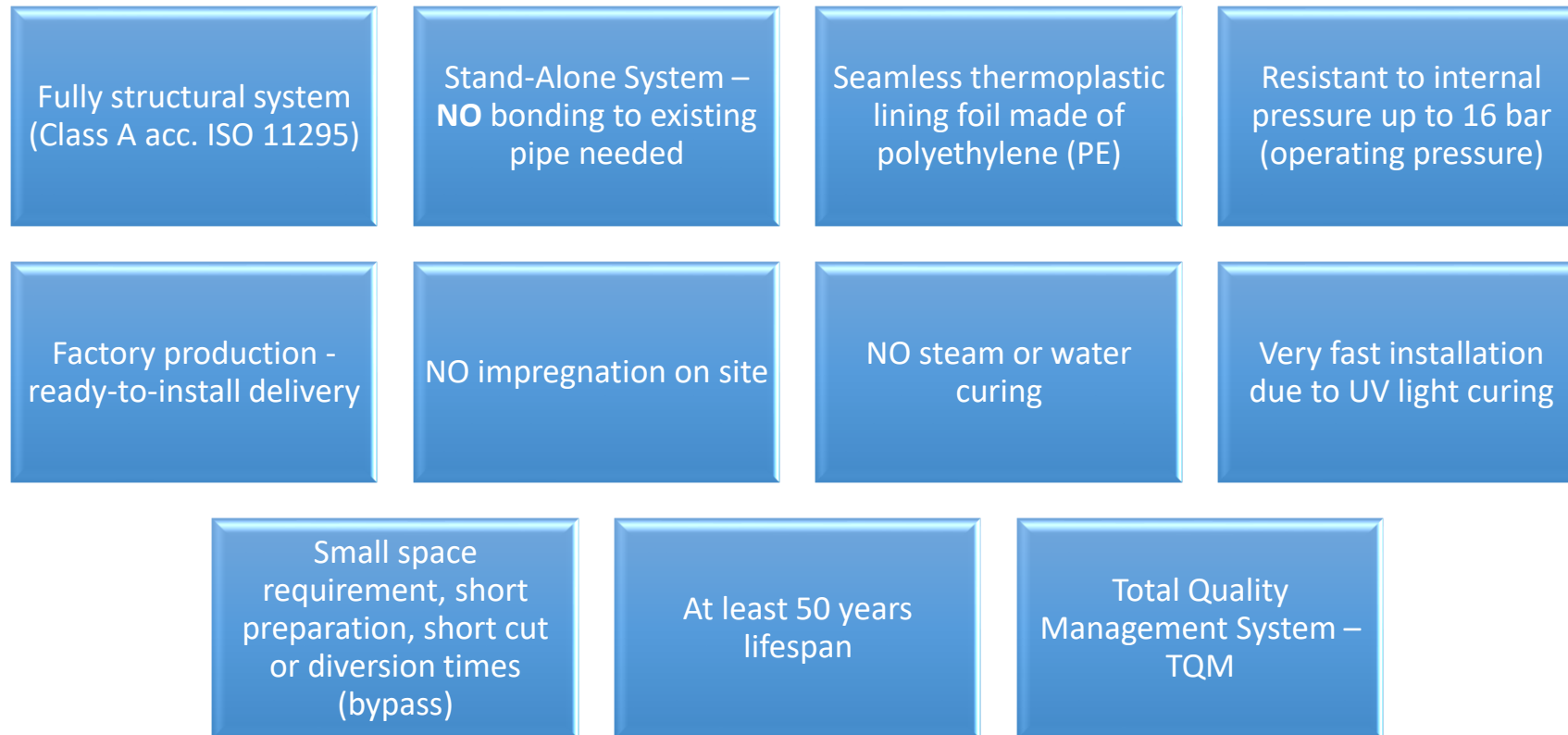


### AQUA.UV® CIPP

- Diameter from DN 150 (6") up to DN 800 (48")
- Pressure range up to PN 16 (232 psi)
- Hygienic safety and food safety
- Approvals
  - HyG – UBA-KTW Guidelines
  - DVGW W 270
  - NSF International ANSI 61
  - ACS (running)

# RELINEAPTEC pressure liner

## The advantages at a glance.



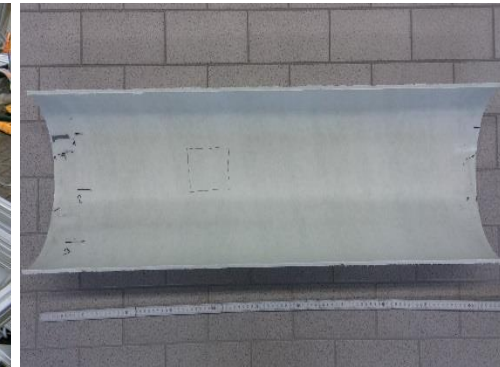
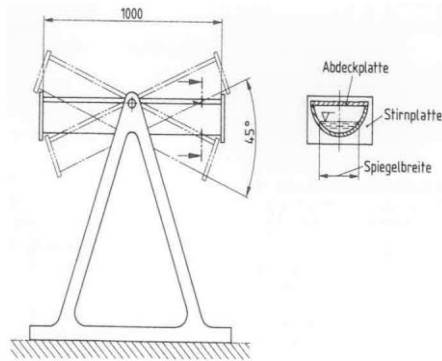


# AlphalinerPN

## Coated, seamless inner foil.

### ■ Testing of the abrasion behavior with subsequent HP flushing test

Surface abrasion on average after 100,000 load cycles; Tipping frequency 20 load cycles / min	DIN EN 295-3	mm	0,06
High pressure rinse strength; 3 x 3 purge lines;	DIN 19523-1	W/mm <sup>2</sup>	450 ± 15 passed



# Testing the adhesion of the seamless inner coating.

- Vacuum test  
after previous weight drop test at 0 degrees C and 24 h internal pressure 3 bar

Vacuum test	DIN EN 1119:2009	100 h (-0,7 ± 0,1) bar	NO De-Lamination
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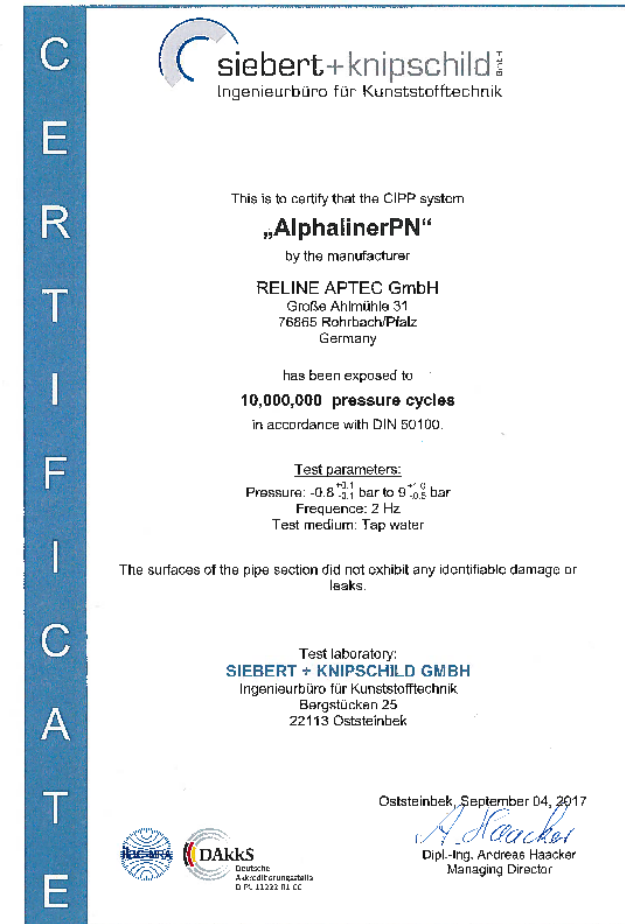
# AlphalinerPN

## Dynamic stress test.

- 10,000,000 pressure change cycles (based on DIN 50100)
- Testing parameter

Pressure	-0,8 ± 0,1 bar	up to	9 <sup>+1</sup> <sub>-0,5</sub> bar
Frequency	2 Hz		
Test medium	Tap water		

- Passed without material damage and without leaks!



# GasLiner® Long-term diffusion test.

## ■ Pressure test under special conditions

Long-term pressure test	DIN EN ISO 1167-1	3bar 70°C 1.000h	passed
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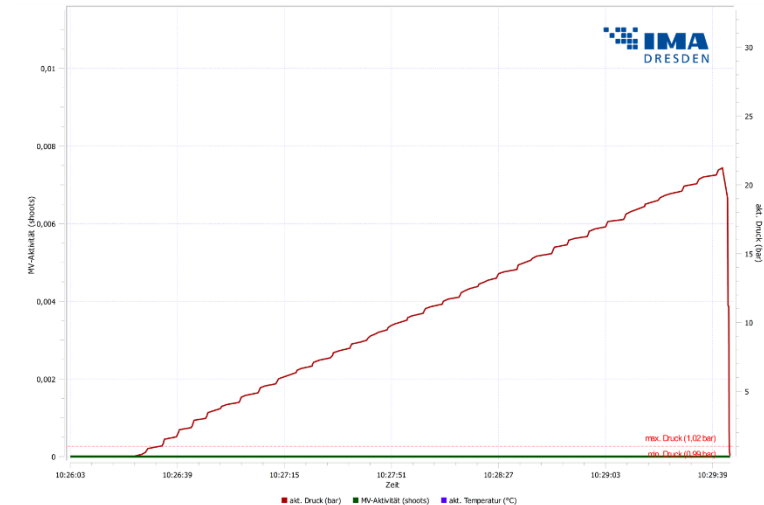




# GasLiner® Burst pressure.

- Pressure test  
after previous weight drop test at 0 degrees C and 24 h internal pressure 3 bar

Burst pressure test	DIN EN 744:1995	3 bar 0 °C	31 bar
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# AQUA.UV® CIPP Approvals/Certificates.



## Hygiene-Institut des Ruhrgebiets

Institut für Umwelt Hygiene und Toxikologie  
Direktor: Prof. Dr. rer. nat. L. Dennerich

Träger: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V.

Hygiene-Institut des Ruhrgebiets

RELINAPTEC GmbH  
Große Ahlmühle 31  
76865 Rohrbach



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Dennerich Str. 21, 45679 Gelsenkirchen,  
Germany

Switchboard: 00492089 82422  
Phone: 00492089 8242258  
Fax: 00492089 8242222  
E-Mail: c.schell@igb.de  
Internet: www.igb.de

Reference: W-299318e-18-SI/Krü  
Contact person: Mrs. Dr. Ch. Schell  
Gelsenkirchen, den 08.06.2018

## TEST CERTIFICATE

Enhancement of Microbial Growth on Materials to Come into Contact with Drinking water  
Test pursuant to DVGW Technical Standard W 270, November 2007

**Client:** RELINAPTEC GmbH  
Große Ahlmühle 31  
76865 Rohrbach

**Test material:** AQUA.UV-CIPP

**Test method:** Material test

According to test report **W-299318e-18-SI/Krü** of **08.06.2018**, the material **AQUA.UV-CIPP** is conform to the requirements for the use in the area of drinking water systems pursuant to DVGW Technical Standard W 270. Details regarding testing procedure and test results are itemized in the test report.

This test certificate is valid from the date of issue and, given that the conditions and requirements remain unaltered, expires on **08.06.2023**. Upon request of the client, the validity may be extended up to another 5 year term provided that the specifications of Technical Standard W 270 are met.

The Director of the Institute  
p.p.  
Dr. Ch. Schell  
Head of Laboratory  
Department of Environmental Hygiene and Environmental Microbiology

The test results and assessments only apply to the tested test specimens and all applicable statutory regulations. The validity of the document expires in case of modification or replacement of the material or the prevailing conditions. The test document may only be published and reproduced as a standstill and without the document being modified.

Träger: Verein zur Bekämpfung der Volkskrankheiten im Ruhrkohlengebiet e.V., Vereinigte Ruhr 619 Kohlenwerke Gelsenkirchen, 45679-00150018356  
Vorstand: Prof. Dr. rer. nat. L. Dennerich, Dr. rer. nat. Ch. Schell, Dr. rer. nat. Ch. Schell, Dr. rer. nat. Ch. Schell, Dr. rer. nat. Ch. Schell, Dr. rer. nat. Ch. Schell

## NSF International

789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES

Reline Aptec GmbH  
Germany

AS COMPLYING WITH NSF/ANSI 61 AND ALL APPLICABLE REQUIREMENTS.  
PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE  
AUTHORIZED TO BEAR THE NSF MARK.



ISO/IEC 17065  
Product Certification Body  
#0279  
Certification Program  
Accredited by the  
American National  
Standards Institute



Certification Program  
Accredited by the  
Standards Council  
of Canada

This certificate is the property of NSF International and must be returned upon request. This certificate remains valid as long as this client has products in NSF's Official Listings for the referenced standards. For the most current and complete Listing information, please access NSF's website ([www.nsf.org](http://www.nsf.org)).

*Theresa Bellish*

December 21, 2018  
Certificate# C0331030 - 01

Theresa Bellish  
General Manager, Water Systems



# RELINEAPTEC Production.

- Production in the proven winding process



November 19



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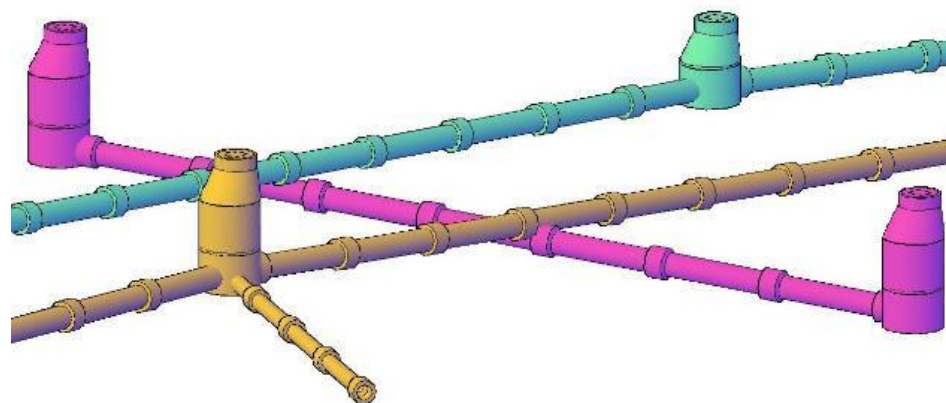


# RELINEAPTEC Production.

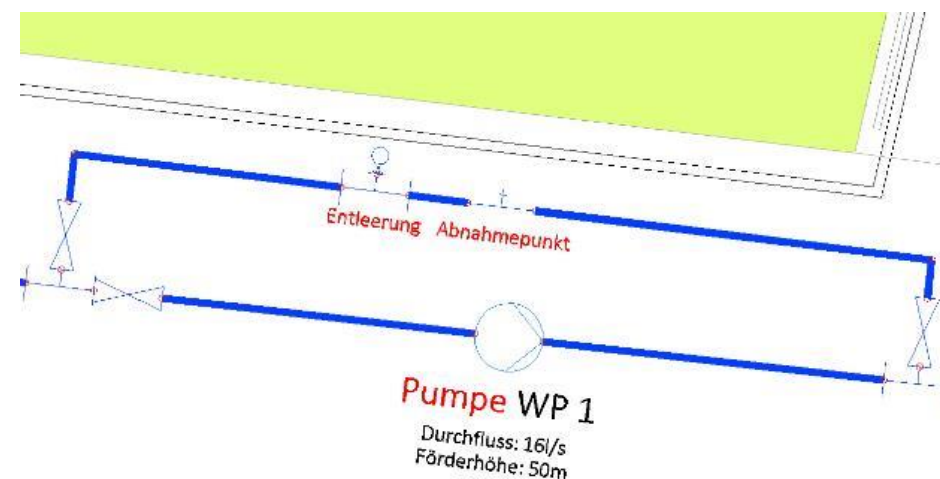
- Production in the proven winding process



## Differences between gravity drainage and pressure mains



Accessibility through manholes  
generally possible at any time

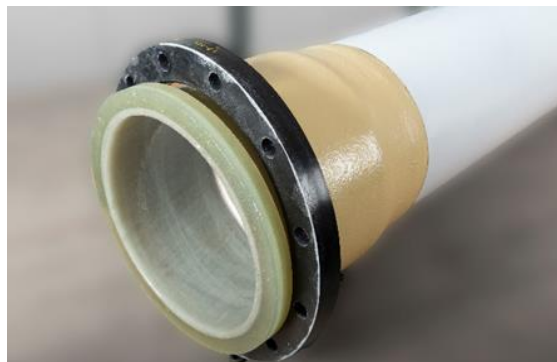


Accessibility very limited or not possible at all;  
Necessary excavation of pits respectively.

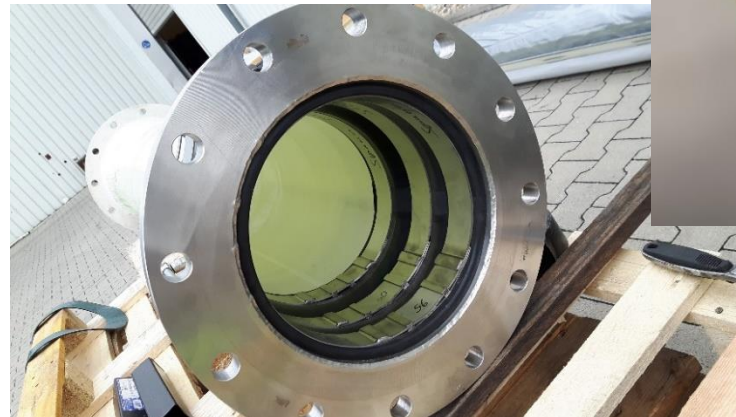


# RELINEAPTEC Engineering.

## ■ Re-connecting techniques



- Re-connecting techniques
  - Liner end sleeves
  - Locally produced liner connection
    - Re-connection with flanged couplings
    - e.g. GRP coupling with lose or fixed flange
    - manually wrapped (necessary lamination skills)
    - or monolithic produced and locally assembled





- Re-connecting techniques
- Liner end sleeves
  - EPDM gasket with stainless steel pressure rings
  - Berlin, sewer rising main DN750, 10bar service pressure, AlphalinerPN-7,2mm, December 2016





- Re-connecting techniques
  - ❖ GRP monolithic pipe coupling with lose flange
  - ✓ Assembly and connection during liner installation and curing



- Re-connecting techniques
  - ❖ GRP monolithic pipe coupling with fixed flange
    - ✓ Assembly and connection after liner installation and curing



November 19



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# RELINEAPTEC Case studies.

Berlin, Renovation of sewer rising main,  
DN750, service pressure 10bar, AlphalinerPN-7,2mm, December 2016



# RELINEAPTEC Case studies.

Berlin, DN 750, 43 m

- AlphalinerPN, WT = 7.2 mm
- Service pressure 10 bar
- Testing pressure 12 bar





# RELINEAPTEC Case studies.

## Berlin, DN 750, 43 m

- AlphalinerPN, WT = 7.2 mm
- UV-light curing 6 x 2500 W
- Curing time 24 min



# RELINEAPTEC

## Case studies.

Le Havre - Harfleur, DN 600,  
109 m; 144 m; 81 m and 66 m

- AlphalinerPN, WT = 6.5 mm
- Service pressure 6 bar
- Testing pressure 9 bar





# RELINEAPTEC Case studies.

Le Havre - Harfleur, DN 600,  
109 m; 144 m; 81 m and 66 m

- AlphalinerPN, WT = 6.5 mm
- UV-light curing 6 x 2000 W
- Curing time 2 h; 2,7 h; 1,5 h and 1,2 h



# RELINEAPTEC Case studies.

Fuhlendorf,      DN 200, 38 m  
                      DN 250, 42 m

- AlphalinerPN, WT = 3,0 and 3,7 mm
- Service pressure 2 bar
- Testing pressure 6 bar





# RELINEAPTEC Case studies.

Fuhlendorf,      DN 200, 38 m  
                         DN 250, 42 m

- AlphalinerPN, WT = 3,0 and 3,7 mm
- Uvlight curing with 10 x 400 W and 10 x 500 W
- Curing time 28 min and 29 min



# RELINEAPTEC Case studies.

Fuhlendorf,

DN 200, 38 m

DN 250, 42 m

- AlphalinerPN, WT = 3,0 and 3,7 mm
- Re-connection with GRP coupling PN6
- Fixing with lose flange to PVC pipe

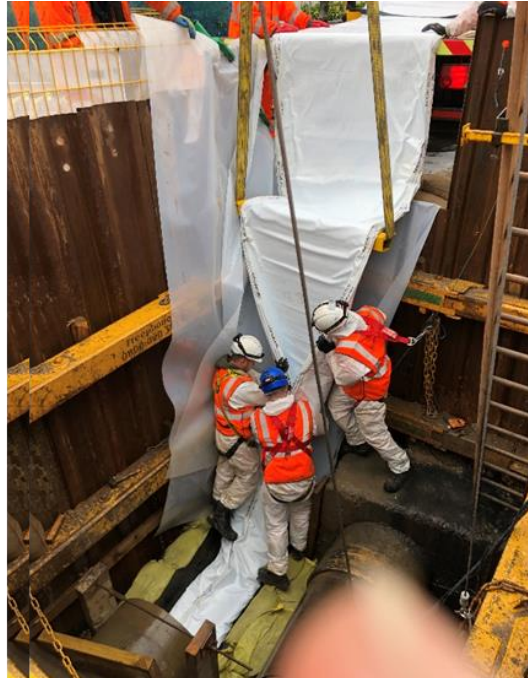
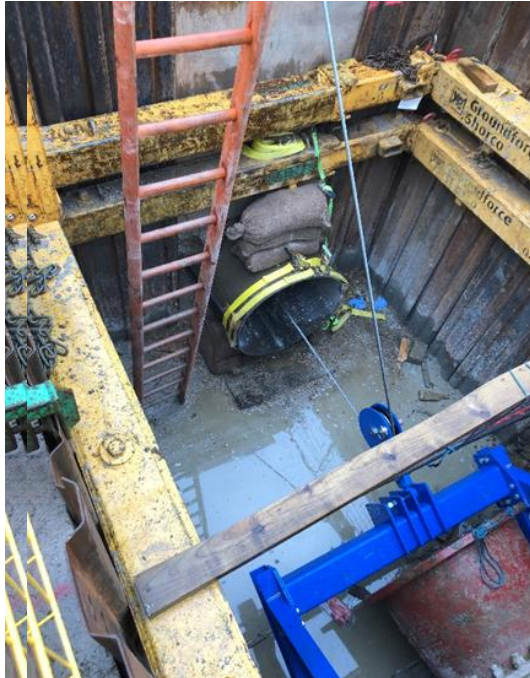




# RELINEAPTEC Case studies.

London, DN 800, 168 m  
DN 800, 90 m

- AlphalinerPN, WT = 14,9 mm
- Service pressure 9 bar
- Testing pressure 12 bar



# RELINEAPTEC Case studies.

London, DN 800, 168 m  
DN 800, 90 m

- AlphalinerPN, WT = 14,9 mm
- UV-light curing 6 x 3000 W
- Curing time 4,7 h und 2,5 h





# RELINEAPTEC Case studies.

London, DN 800, 168 m  
DN 800, 90 m

- AlphalinerPN, WT = 14,9 mm
- Re-connection with GRP flanged coupling PN10
- GRP flanged coupling with overlapping of host pipe



# RELINEAPTEC Case studies.

Montluel, usine Carrier,  
DN 150, 51 m

- AQUA.UV<sup>®</sup>, WT = 3,0 mm
- Service pressure 9 bar
- Testing pressure 12 bar





# RELINEAPTEC Case studies.

Montluel, usine Carrier,  
DN 150, 51 m

- AQUA.UV®, WT = 3,0 mm
- UV-light curing with 10 x 300 W
- Curing time 39 min



# RELINEAPTEC Case studies.

Montluel, usine Carrier,  
DN 150, 51 m

- AQUA.UV®, WT = 3,0 mm
- Sealing with inner sleeves
- Re-connection to steel pipe with appropriate multi-range pipe couplings



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## Global solutions for no-dig renovation of

- ✓ Sewer rising mains – AlphalinerPN
- ✓ Gas pipelines – GasLiner®
- ✓ Potable water mains – AQUA.UV®

### Including

- ✓ Design and calculation
- ✓ Re-connection techniques
- ✓ Know-how transfer and site support

#### AQUA.UV CIPP

##### Object questionnaire

Seamless, static self-supporting and UV-light curing glass-fibre reinforced CIPP liners (class A of DIN EN ISO 11295) based on UP-resin (according to DIN EN 13121 group 4 and DIN EN 16946-2 type 1140) for sewage pressure pipes DN150 up to DN1200 and an operation pressure 2 up to 16 bar. Factory-provided production of the CIPP liner, ready to be installed delivery to the site.

**RELINEAPTEC**  
Advanced Liner for Pressure Pipes

Project information	
Project name	
Project location	
Dimension/form	
Total length	
Transport medium	<input type="checkbox"/> Drinking water <input type="checkbox"/> Potable water <input type="checkbox"/> Fire extinguishing water <input type="checkbox"/> Others
Execution period	from _____ until _____
Reason for renovation	<input type="checkbox"/> Corrosion damage <input type="checkbox"/> Infiltration/groundwater seepage into a watercourse <input type="checkbox"/> Static/hydraulic support <input type="checkbox"/> Others

Customer	
Company name	
Contact person	
Phone/mobile	
E-Mail	

Network operator/Consulting engineers				
Company name				
Contact person				
Phone/mobile				
Address				
Reply concerning	Feasibility	Static design	Offer	Budget
Date	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

RELINEAPTEC	
Responsible person	
Phone	
Mobile phone	
E-Mail	



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Advanced Liner for  
Pressure Pipes

**Thank you very much for the attention!**

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