

# APPLIED TRENCHLESS TECHNOLOGIES

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Kuala Lumpur

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# Manhole Rehabilitation

Ralf Odenwald

JBP Workshop & Seminars at Trenchless Asia 2018

BKP Berolina Polyester GmbH & Co. KG, Germany

## Information about the BKP Berolina Polyester GmbH & Co. KG

Historic factory location till 2010: Airport area since 1905 Zeppelin airport and location of Lufthansa, German airline since the twenties of the last century

After World War II separation from Berlin and assignment to the GDR.

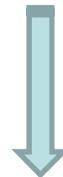
The company was founded in 1961 under the name "Plastverarbeitungswerk Staaken" in the GDR.

In GDR times about 1,200 employees were employed  
Production of FRP parts in moulding, filament winding, fiber resin spray method, pultrusion, RTM and hand laminate process. Also injection moulding came into use.

After the reunification of East- and West Germany the sale of the "state-owned enterprise" took place in August 1991 to the Berolina Group.

August 1995: Start of development work on the Berolina liner. The first Liners were delivered to customers in the spring of 1997.

February 1996: Start of Steel pipe protection by using filament winding



## Information about the BKP Berolina Polyester GmbH & Co. KG

2010:

BKP started to build new factory and headquarter in Velten near Berlin.  
Official opening at 1st of May 2011.

### Shareholder structure (01.01.1999 – 11.06.2017):

25% Mr. Ralf Odenwald (CEO of BKP)	75% Greiffenberger AG
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### Shareholder structure (since dem 11.09.2017):

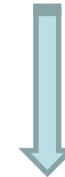
25% Herr Ralf Odenwald (CEO of BKP)	75% T3 BKP GmbH
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### BKP figures:

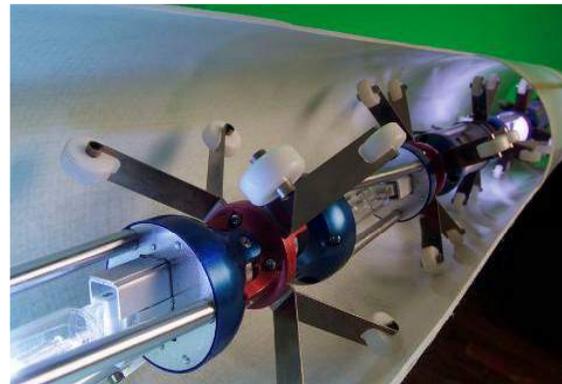
Employees 2017 (2016):	68 (65)
Turn over 2017 (2016):	about 19,000,000 € (15,000,000 €)



## Information about the BKP Berolina Polyester GmbH & Co. KG Production Program



Steelpipe protection  
(horizontal drilling, pipe ramming)

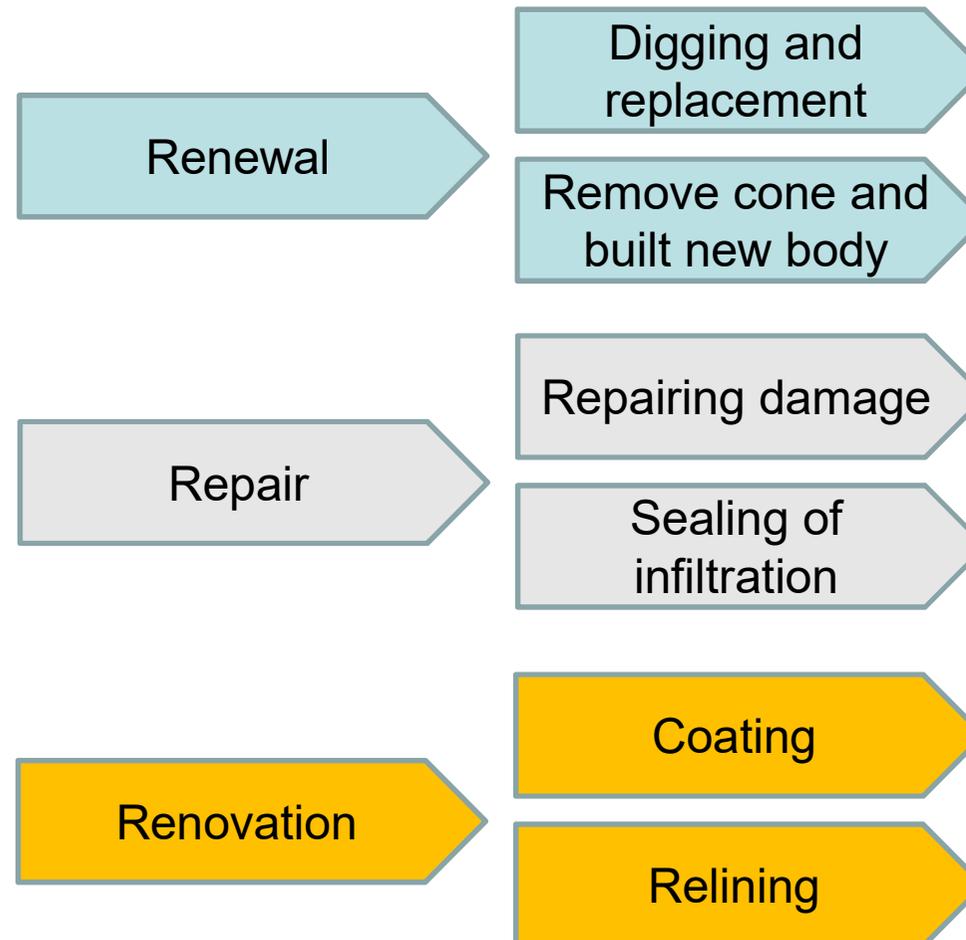


Berolina-Liner System  
DN 150 – 1.600



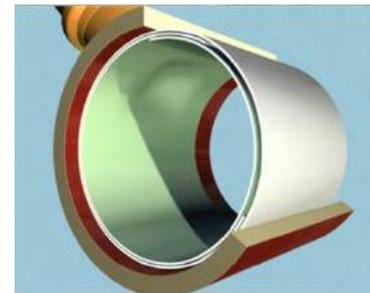
Spring 2016: Start of development on the **Berolina Manhole Lining System**

## Possibilities to bring back the manhole into function:



# Manhole Rehabilitation by Renovation

Relining

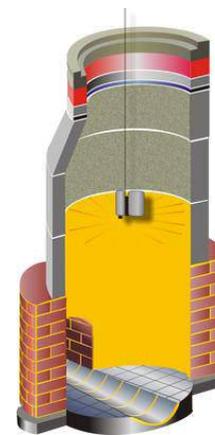


Contracting with straps a in length direction cuttet shaft.

After pasing the cone release straps And laminate the cuttet shaft.

Renovation

Coating



FRP, Polyurethan or mortar by using a spray system

©Hermes GmbH, Germany

## Manhole Rehabilitation by Relining:

### Relining

Segments of FRP plates are connectet at the joints by hand laminate.



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:

Special designed Liner is supplied like a soft sleeve for relining pipes in a crate.

After manufacture in the factory, the soft tube can be safely stored at room temperature for up to 6 months.

**No tailor made sleeve needed !**

The needed length for the cone and shaft is pulled out of the shipping box at job site and cutted of.

**No measuring of shaft and cone required in advance**



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:

A second inner tube which fits to the final diameter has to be pulled in.

The origin produced diameter is produced a bit larger than the cone entry.

**Superior expansion behaviour allows the expansion from Ø 600 mm to Ø 1000 mm**



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:

UV Light source is placed in the end can. Can then locked with steel plate



Installation of end can (packer) at top end



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:

A special end can is used to close the other end of the Manhole Liner



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:

Positioning of the Manhole Liner in the manhole  
(here at BKP test field in the factory – picture on  
the right)



Site situation:  
Liner is placed in manhole  
and fixed by a fork lift  
(picture on the left)



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:

Inflation and curing test at BKP test field.

The holes drilled into the wall of the original manhole allows to double check the expansion of the product.

Close fit situation has been reached. Expansion was successful. Lamps can be switched on.

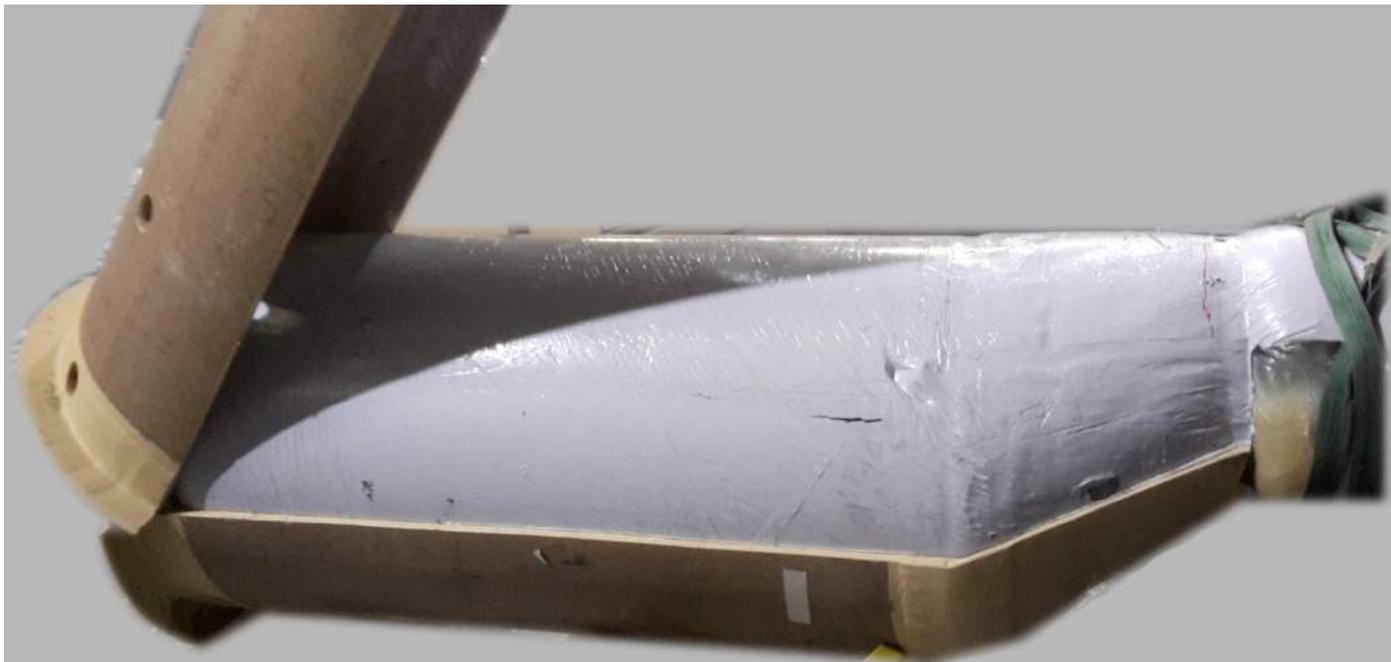


After a short period of time the UV curing process is coming to an end



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:

After the installation process has been finished the test manhole is opened and the result inspected. The test manhole can be used for another test.



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:

Close fit situation at the edge of the cone



Close fit situation along the shaft



## Manhole Rehabilitation by Relining with UV curable glass fiber reinforced Berolina Manhole Liner:



Inside view from the bottom to the cone:

Very smooth inner surface beside some material wrinkles at the far end of the cone which do not have any effect for the future use of the relined manhole.

Inner view upside down

# Berolina Manhole Liner - Advantages at a glance:

## No excavation

Static loads can be completely absorbed by the new shaft

High corrosion resistance and permanent tightness

## Cone does not have to be removed

Low maintenance and long life time

No hand laminate at the joint between the cone and the shaft

## No measuring of shaft and cone required in advance

Short installation and curing times

Easy to use

## Possibly existing UV equipment can be used

low transport volume and costs

Stock available on the smallest space requirement

## independent from host pipe material

# Manhole Rehabilitation – helpful accessories



© Hailo, Germany

Easy manhole entry



Flexible flume



© Predl, Germany

**Thank You For Your Attention!**

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