Withstanding the pressure: liners for pressure sewers put to the test

Aging pressure sewer pipes, just like gravity sewers, require renovation. But which methods are best suited for the job? What are the pros and cons of each? The latest IKT comparative product test on pressure sewer liners offers valuable insights.

Experimental setup of pressure sewer pipes in the IKT large 1:1 scale test facility

Pressure sewers are critical and sensitive elements

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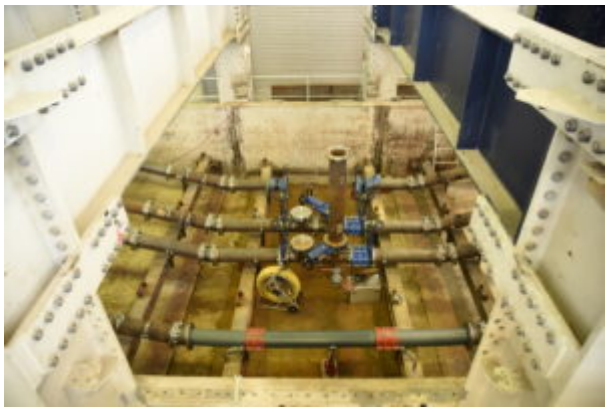
Consequently, the neutral, independent and not for profit IKT Institute for Underground Infrastructure, in Germany, has been examining rehabilitation solutions in an extensive comparative product test. Over a three-year period an evaluation project was undertaken on behalf of six municipal network operators from Bottrop, Bremen, Burscheid, Iserlohn, Cologne and Voerde and two regional water associations, the Emschergenossenschaft and the Wupperverband.

The project was supported by the district government of Münster and the State Office for Nature, Environment and Consumer Protection of North Rhine-Westphalia (LANUV). It was financed jointly by the NRW Ministry of the Environment and the eight network operators.

These organisations formed a steering group that determined the pressure sewer damage scenarios to be remedied, the testing programme and the evaluation of the results. IKT

developed the test concept, set up the test rigs in its large 1:1 scale test pit and carried out the testing.

Six liners in the comparative product test



View of the built-in sewer pressure pipelines in the IKT large 1:1 scale test facility

The steering committee selected the following lining technologi

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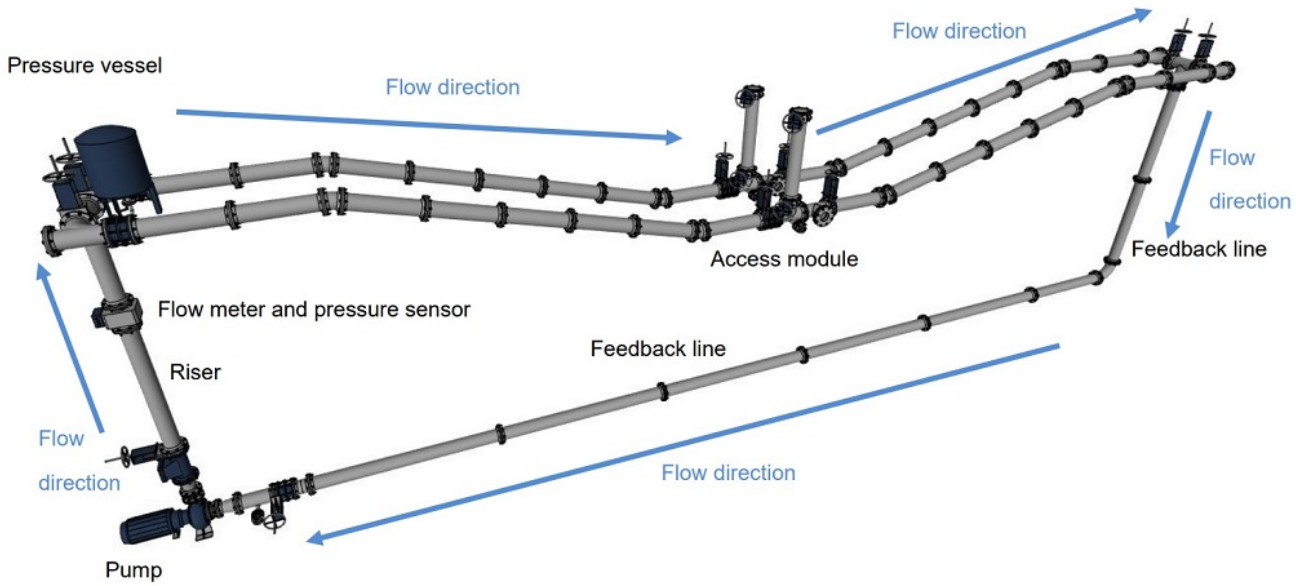
Close-fit linier method:

- Compact Pipe (Wavin GmbH)
- egeLiner (egeplast international GmbH)

Cured in Place Pipe (CIPP) liner process:

- Esders HPS Liner (Esders Pipeline Service GmbH)
- Nordiflow WPE (NordiTube Technologies SE)
- SaniPipe (AMEX Sanivar AG)
- Starliner Structure-S (Karl Weiss Technologies GmbH)

Remediation task



Schematic representation of the test setup in the IKT large 1:1 scale test facility

For each liner system, the test setup consisted of a DN200 steel pipe with damage patterns such as holes, leaky connections, point loads, transverse and longitudinal cracks, ovalisation and incrustations. This realistically depicted the damage that network operators find in their pipes.

Class A liner systems

The central issue was whether the liners are suitable as Class A products. A Class A liner must be able to withstand internal and external stresses on its own, regardless of the condition of the host pipe. The stress testing programme conducted as part of the IKT comparative product test went well beyond the regular warranty period of five years in order to consider the entire useful life.

Test program and evaluation scheme

The test programme consists of three phases: The first phase depicted the regu

Simulation of external water pressure: After flooding, part of the test setup is reflected in the water

lar, normal operation of a rehabilitated pressure pipe. Internal water pressure

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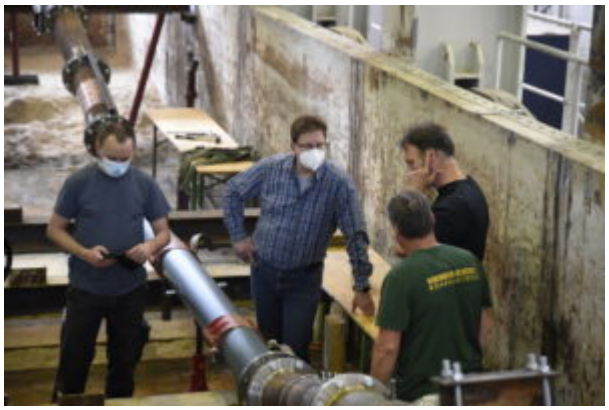
In the second phase, the degeneration of the host pipe was simulated over a prolonged period of time. For this purpose, some of the damage scenarios in the host old pipe were worsened in order to simulate progressive damage development and the resulting changes in external influences on the liner. Test pressures and flow rates remained the same as in

the first phase.

Finally, the third phase served to simulate additional, non-every day and extraordinary loads on the liner that may occur over the course of its useful life. These included high-pressure cleaning at 80 bar, abrasive substances, the rapid switching on and off of the pump or elevated groundwater levels, such as those that occur when pipes pass under rivers.

Evaluation criteria



Examination of the renovation results in the IKT large 1:1 scale test facility

The overall grades for the liner system

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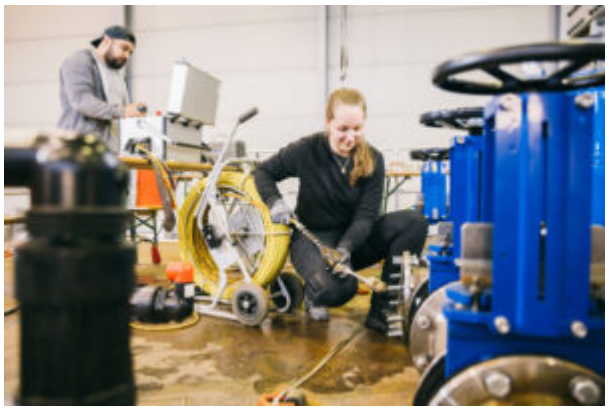
Watertightness criterion (weighting 45%)

The main weak points found in the four CIPP liner processes were the end connections to the host pipe, there were leaks. In contrast, the PE flange and electrofusion sleeve connections of the close-fit liners were reliably watertight.

The close-fit systems Compact Pipe and egeLiner proved to be watertight after renovation. In contrast, the picture for the CIPP liner end connections was very different: Nordiflow and

SaniPipe each had to be reworked once to make them all watertight, whilst the Starline end connections had to be reworked twice in order to get them tight. The Esders HPS liner remained leaky even after the connections had been repaired twice and thus it failed on this criterion.

Stability criterion (weighting 25%)



The stability Optical inspection of rehabilitated sewage pressure lines in (lthe IKT large 1:1 scale test facility oad-bearing capacity of the structure) way

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with GOOD or SATISFACTORY grades. They show no or only minor abnormalities such as lo

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The SaniPipe liner failed this criterion as it collapsed under external pressure. The reason for this was insufficient fabrication of the liner, which took place without static proof. It was therefore not a Class A liner and consequently received the overall rating INADEQUATE, regardless of performance against all other criteria.

Operational performance criterion (weighting 15%)

This examined to what extent the liners can withstand normal operating conditions such as pressure fluctuations, abrasion, static pressures and high-pressure cleaning.

Here, Compact Pipe and Clearly recognisable longitudinal fold in an installed liner
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scored a GOOD grade. Also, they did not form folds and obstacles along their le

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With high-pressure cleaning, the Compact Pipe and egeLiner close-fit products achieved a VERY GOOD rating. Nordiflow and Starline withstood this operational stress SATISFACTORILY. On the other hand, Esders and SaniPipe failed this criterion because holes and delaminations occurred. Chemical loads did not have a negative effect on any liner system.

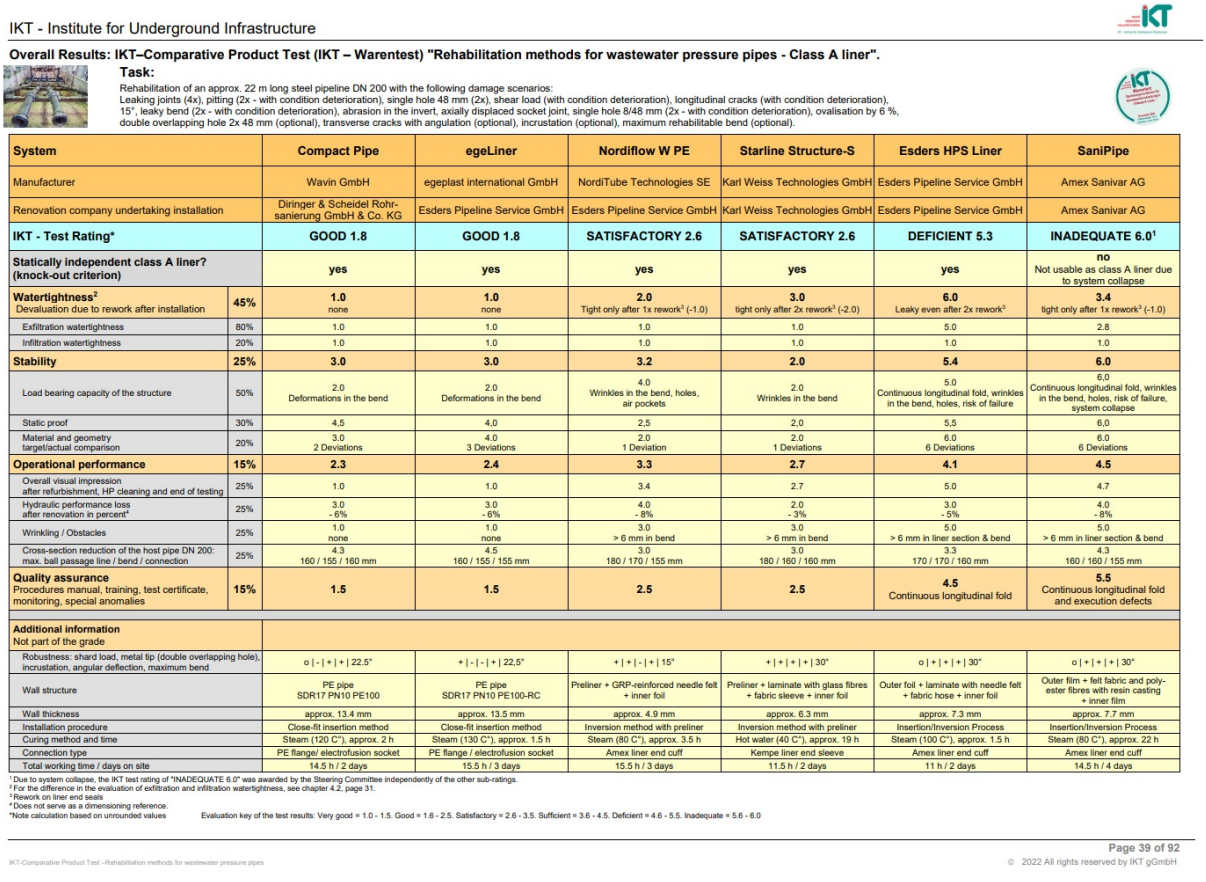
Quality assurance criterion (weighting 15%)

Although all the manufacturers provided an installation procedure manual, some of them have significant deficits in training, test certificates and external and internal

monitoring. In addition, the installed Esders and SaniPipe liners each had a continuous longitudinal fold along the length and SaniPipe had design defects, which led to a devaluation of the grade.

Overall result and conclusion

The IKT comparative product test “Renovation process for sewage pressure pipes – Class A liner” confirmed that it is possible to achieve good renovation results. However, there are major differences in the performance of the six rehabilitation technologies examined, which are reflected in the test results awarded. One of the six liners could not qualify as a Class A liner.



IKT - Institute for Underground Infrastructure

Overall Results: IKT–Comparative Product Test (IKT – Warentest) "Rehabilitation methods for wastewater pressure pipes - Class A liner".

Task:
Rehabilitation of an approx. 22 m long steel pipeline DN 200 with the following damage scenarios:
Leaking joints (4x), pitting (2x - with condition deterioration), single hole 48 mm (2x), shear load (with condition deterioration), longitudinal cracks (with condition deterioration), 15°, leaky bend (2x - with condition deterioration), abrasion in the invert, axially displaced socket joint, single hole 8/48 mm (2x - with condition deterioration), ovalisation by 6 %, double overlapping hole 2x 48 mm (optional), transverse cracks with angulation (optional), incrustation (optional), maximum rehabilitable bend (optional).

System		Compact Pipe	egeLiner	Nordiflow W PE	Starline Structure-S	Esders HPS Liner	SaniPipe
Manufacturer		Wavin GmbH	egeplast international GmbH	NordiTube Technologies SE	Karl Weiss Technologies GmbH	Esders Pipeline Service GmbH	Amex Sanivar AG
Renovation company undertaking installation		Diringer & Scheidel Rohr-sanierung GmbH & Co. KG	Esders Pipeline Service GmbH	Esders Pipeline Service GmbH	Karl Weiss Technologies GmbH	Esders Pipeline Service GmbH	Amex Sanivar AG
IKT - Test Rating*		**GOOD 1.8**	**GOOD 1.8**	**SATISFACTORY 2.6**	**SATISFACTORY 2.6**	**DEFICIENT 5.3**	**INADEQUATE 6.0[1]**
Statically independent class A liner? (knock-out criterion)		**yes**	**yes**	**yes**	**yes**	**yes**	**no** Not usable as class A liner due to system collapse
Watertightness[2] Devaluation due to rework after installation	45%	**1.0** none	**1.0** none	**2.0** Tight only after 1x rework[3] (-1.0)	**3.0** tight only after 2x rework[3] (-2.0)	**6.0** Leaky even after 2x rework[3]	**3.4** tight only after 1x rework[3] (-1.0)
Exfiltration watertightness	80%	1.0	1.0	1.0	1.0	5.0	2.8
Infiltration watertightness	20%	1.0	1.0	1.0	1.0	1.0	1.0
Stability	25%	**3.0**	**3.0**	**3.2**	**2.0**	**5.4**	**6.0**
Load bearing capacity of the structure	50%	2.0 Deformations in the bend	2.0 Deformations in the bend	4.0 Wrinkles in the bend, holes, air pockets	2.0 Wrinkles in the bend	5.0 Continuous longitudinal fold, wrinkles in the bend, holes, risk of failure	6.0 Continuous longitudinal fold, wrinkles in the bend, holes, risk of failure, system collapse
Static proof	30%	4,5	4,0	2,5	2,0	5,5	6,0
Material and geometry target/actual comparison	20%	3.0 2 Deviations	4.0 3 Deviations	2.0 1 Deviation	2.0 1 Deviations	6.0 6 Deviations	6.0 6 Deviations
Operational performance	15%	**2.3**	**2.4**	**3.3**	**2.7**	**4.1**	**4.5**
Overall visual impression after refurbishment, HP cleaning and end of testing	25%	1.0	1.0	3.4	2.7	5.0	4.7
Hydraulic performance loss after renovation in percent[4]	25%	3.0 - 6%	3.0 - 6%	4.0 - 8%	2.0 - 3%	3.0 - 5%	4.0 - 8%
Wrinkling / Obstacles	25%	1.0 none	1.0 none	3.0 > 6 mm in bend	3.0 > 6 mm in bend	5.0 > 6 mm in liner section & bend	5.0 > 6 mm in liner section & bend
Cross-section reduction of the host pipe DN 200: max. ball passage line / bend / connection	25%	4.3 160 / 155 / 160 mm	4.5 160 / 155 / 155 mm	3.0 180 / 170 / 155 mm	3.0 180 / 160 / 160 mm	3.3 170 / 170 / 160 mm	4.3 160 / 160 / 155 mm
Quality assurance Procedures manual, training, test certificate, monitoring, special anomalies	15%	**1.5**	**1.5**	**2.5**	**2.5**	**4.5** Continuous longitudinal fold	**5.5** Continuous longitudinal fold and execution defects
Additional information Not part of the grade							
Robustness: shard load, metal tip (double overlapping hole), incrustation, angular deflection, maximum bend		o | - | + | + | 22.5°	+ | - | - | + | 22,5°	+ | + | - | + | 15°	+ | + | + | + | 30°	o | + | + | + | 30°	o | + | + | + | 30°
Wall structure		PE pipe SDR17 PN10 PE100	PE pipe SDR17 PN10 PE100-RC	Preliner + GRP-reinforced needle felt + inner foil	Preliner + laminate with glass fibres + fabric sleeve + inner foil	Outer foil + laminate with needle felt + fabric hose + inner foil	Outer film + felt fabric and poly-ester fibres with resin casting + inner film
Wall thickness		approx. 13.4 mm	approx. 13.5 mm	approx. 4.9 mm	approx. 6.3 mm	approx. 7.3 mm	approx. 7.7 mm
Installation procedure		Close-fit insertion method	Close-fit insertion method	Inversion method with preliner	Inversion method with preliner	Insertion/Inversion Process	Insertion/Inversion Process
Curing method and time		Steam (120 C°), approx. 2 h	Steam (130 C°), approx. 1.5 h	Steam (80 C°), approx. 3.5 h	Hot water (40 C°), approx. 19 h	Steam (100 C°), approx. 1.5 h	Steam (80 C°), approx. 22 h
Connection type		PE flange/ electrofusion socket	PE flange / electrofusion socket	Amex liner end cuff	Kempe liner end sleeve	Amex liner end cuff	Amex liner end cuff
Total working time / days on site		14.5 h / 2 days	15.5 h / 3 days	15.5 h / 3 days	11.5 h / 2 days	11 h / 2 days	14.5 h / 4 days

[1] Due to system collapse, the IKT test rating of "INADEQUATE 6.0" was awarded by the Steering Committee independently of the other sub-ratings.
[2] For the difference in the evaluation of exfiltration and infiltration watertightness, see chapter 4.2, page 31.
[3] Rework on liner end seals
[4] Does not serve as a dimensioning reference.
*Note calculation based on unrounded values

Evaluation key of the test results: Very good = 1.0 - 1.5. Good = 1.6 - 2.5. Satisfactory = 2.6 - 3.5. Sufficient = 3.6 - 4.5. Deficient = 4.6 - 5.5. Inadequate = 5.6 - 6.0

Table of results IKT comparative product test “Renovation of sewage pressure pipes”

Passed:

- Compact Pipe (Wavin) GOOD (1.8)

- egeLiner (egeplast international) GOOD (1.8)
- Nordiflow W PE (NordiTube Technologies) SATISFACTORY (2.6)
- Starline Structure-S (Karl Weiss Technologies) SATISFACTORY (2.6)

Failed:

- Esders HPS Liner (Esders Pipeline Service) DEFICIENT (5.3)
- SaniPipe (Amex Sanivar) INADEQUATE (6.0)

Results at a glance and complete report (English)

The further deterioration of the condition of the host pipe over time was found to have no effect on the success of the rehabilitation. This applied in particular to signs of corrosion such as simulated pitting and point loads. Only in one case did the complete loss of the supporting host pipe lead to liner failure under external water pressure.

30° bend in a pressure sewer pipeline

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The systems were able to withstand normal operating conditions such as pressure fluctuations, abrasion and static pressure without any problems. However, there are clear limits to high-pressure cleaning and holes and delamination can occur here. Chemical stresses did not affect the tightness of the liner.

All liner systems lead to hydraulic performance losses in the pressure sewer the highest up to 8% at the top. The internal

diameter was reduced by more than 20% in some places in some liners. Wrinkles >6 mm could be seen on all the CIPP liners. In contrast, the close-fit liners showed no creasing whatsoever, but there was clear ovalisation in the bends.

Become an IKT Certified Sewer and Pipe Expert (CSPE)!

Certified Sewer and Pipe Expert (CSPE): Online course produced by Prof. Dr.-Ing. Bert Bosseler

Are you looking for professional success as a sewer infrastructure engineer? There is a new opportunity now: through the **Certified Sewer and Pipe Expert (CSPE)** course. This is an online course produced by Prof. Dr.-Ing. Bert Bosseler, one of Germany's leading wastewater infrastructure experts.

For more intensive training programme Certified Consultant "Construction and Rehabilitation of Sewer Systems".

For more than 20 years, he has been the Scientific Director of

the internationally renowned and respected engineering research institute IKT – Institute for Underground Infrastructure.

IKT's Scientific Director Prof. Bert Bosseler shares the **current state of science and technology** on the topic of sewer and pipeline construction in this certificate course, providing comprehensive training at university level.

Ideal for Newcomers
This innovative course is designed for both newcomers to the industry and seasoned professionals looking to make a strategic career shift.

Prof. Bert Bosseler is IKT's Scientific Director

60 hours of self-study
The course comprises online lectures, plus study materials, resulting in a total study effort of about 60 hours. It is divided into 18 modules comprising textbook learning supported by recorded online lectures. Throughout the course, you can schedule individual online meetings with Prof. Bosseler to discuss your questions with him and receive **support, and reassurance**.

Certificate from IKT
At the end of the course, Prof. Bosseler will personally conduct an oral exam online with you. If successful, you will

receive the course Certificate from IKT documenting what you have accomplished and the knowledge you now have. Then you can use it to support your next career step!

Boost your career – Start the course now!
Book this course today – it is a key decision for your career and for your professional future! You can start the course whenever you are ready – arrange your own personal start date! more information

Prof. Bert Bosseler is IKT's Scientific Director

What to expect

The **course content** includes the following modules:

- Introduction
- Open Cut – Construction Practice
- Open Cut – Structural Safety
- Open Cut Method Soil and Components – Flowable Backfill
- Open Cut Method Soil and Components -Reinforced Concrete Pipes
- Open Cut Method Soil and Components – Flexible Pipes
- New Construction Trenchless Overview
- New Construction Trenchless Pipe Jacking
- Rehabilitation – Objectives

- Rehabilitation – Replacements
- Rehabilitation – Repair
- Rehabilitation – Renovation
- Rehabilitation Liner – Statics
- Rehabilitation – Surface Preparation
- On the topic of the servicelife of the sewers and pipelines
- On the topic of tightness testing of sewers and pipelines
- On the topic of root resistance of sewers and pipelines
- On the topic of urban flooding and drainage

Course Director

Prof. Dr.-Ing. habil. Bert Bosseler has been Scientific Director of IKT – Institute for Underground Infrastructure for over 20 years. He is a visiting lecturer at Leibniz University, Hanover (on underground sewer and pipeline construction) and at the Ruhr University, Bochum (on pipeline maintenance and network management).

His National and international committee work covers:

- ISO TC 224 – Service activities relating to drinking water supply systems and wastewater systems
- ISO TC 224 /WG11 – Stormwater management
- ISO TC 224 /WG15 – Smart water
- ISO TC 224 /WG16 – Climate change
- ISO 268/SC1 – Smart community infrastructures
- ISO 268/SC1/WG6 – Disaster risk reduction
- CEN TC 165 – Wastewater engineering

Study materials

Professor Bosseler‘s **video lectures** for all modules are complemented by the following **downloadable documents**:

- The course textbook
- The slides of all video lectures
- A verbatim transcript of all video lectures

In addition, during all phases of the course you can contact Professor Bosseler directly and arrange **individual meetings** as a video conference to clarify open questions.

Certified Sewer and Pipeline Expert (CSPE)
Start date? Your choice!
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Contact

- **Iain Naismith**
  T: +44 (0)7983 605219
  E: naismith@ikt.institute
- **Ashwini Ausekar**
  T: +49 (0)209 17806-47
  E: ausekar@ikt.institute

How testing CIPP liners helps sewer network owners protect

their scarce money

IKT’s Test Lab: Three-point-bending test of CIPP sample

How can you as a sewer network operator be sure that your newly installed CIPP liner is of good quality? How sure can you be that it will actually last the promised **50+ years**? How can you know whether you have received the promised quality for your good money? There is a reliable yet inexpensive way to find out.
CIPP liners are made on site under conditions that are **difficult to control**. Every job site is different and liner quality depends on many factors. For example, the human factor and the environmental conditions play a major role.

CIPP liners are always created in situ on the day of installation. The **risk is high** that work may be done too quickly and too carelessly on the job site. Therefore, you cannot always be sure you have really received a good quality CIPP installation.

Initial assessment of a CIPP sample: searching for weak spots

CIPP Quality Risks

You have to ask yourself: Were the curing **specifications** complied with? Is the wall thickness strong enough to withstand ground water pressure? Was a cheap or an expensive resin used? Is the liner really water tight?

Liners with poor material characteristics may not be stable and sufficiently **load-bearing**, and leak. Above all, they do not achieve the promised service life. Then you might have spent a lot of money for nothing and have to replace the liner with a new one at an early stage.

In the worst case, the sewer pipe has to be completely replaced with a new one. A very **expensive affair**.

Water tightness test

Certainty through laboratory testing

You can avoid all this by having tested your CIPP by IKT’s lab directly **after installation**. For you, this is quite simple: You just have to extract a sample from the installed liner and send it to us.

We will determine the most important **material parameters** and compare them with the expected target specifications. We will also test your sample for water tightness.

Then you will receive an expert **test report** that can give you peace of mind.

Water tightness test with red dyed water

Neutral and independent testing

Our CIPP test center carries out **around 4,000** such quality tests every year. And we do so completely neutrally and independently, free from the economic interests of liner manufacturers and rehabilitation companies.

This is because we are a **neutral and non-profit** research and testing institute supported by more than 150 German municipalities, including Berlin, Munich and Hamburg.

We have been conducting quality tests on CIPP liners for **more than 25 years** and for which we have a strong reputation.

Rig for long-term tests

Contact us for testing

So if you also want to have certainty about the quality of the CIPP installed at your site, contact us and we will make you a quote **immediately**. We will explain to you how to take the samples and how to send them to us. It is much easier than you think!

Your contact person

Dieter Homann is the longstanding **director** of the IKT laboratory. He is a widely recognized expert who participates in numerous expert panels in Germany and abroad. He will help you understand the complexities of CIPP quality and interpret test results. Contact him, he will be happy to answer all your questions!

Dieter Homann, Director of IKT’s Test Centre for CIPP liners

Simply address your questions to:
Dieter Homann
Director of IKT’s Test Centre for CIPP
phone: +49 209 17806-0
email: homann@ikt.institute

More information on our CIPP testing procedures and how to send us your samples:
IKT Test Center for CIPP

See also an **overview** of our CIPP test results in our annual IKT LinerReport from 2003 until today:
IKT-LinerReport

Innovating Urban Drainage

Systems together: Teaming up at Co-UDlabs Ideas Marketplace

Interested in finding, exchanging, and **improving ideas** on innovative methods and technologies for **sustainable urban drainage**? Seeking alliances, synergies, and new **partnerships**? Then visit the **Co-UDlabs Ideas Marketplace** online and participate in Co-UDlabs' Transnational Access call!

Co-UDlabs (Collaborative Urban Drainage Research Labs – one of which is IKT) offers free-of-charge **Transnational Access** (TA) to its 17-facility research infrastructure. A global call for TA is now open until January 31, 2022. All information about the TA call, including all documentation required to submit a proposal, can be found in the TA call hub.

What is the Marketplace?

The **Marketplace webpage** is set out to work as a living, changing 'message board' in which the people of the community can **exchange propositions, ideas, contacts, methods, and plans**. Following a recent Hackathon, Co-UDlabs has already collected some early conversations and presentations in the Co-UDlabs Ideas Marketplace. You are free to share your idea and team up with other users!

You can **browse the ideas** that are currently available on the Marketplace and the information about their authors and their affiliation. Interested users can also submit their pitch and a few details. This way Co-UDlabs can update the 'board' and facilitate some **match-making**. You can also share any idea or proposal which you would like to show on the Marketplace. If you want you can **discuss your idea with the Research Facilities providers** and look for support to improve a TA proposal.

What does Co-UDlabs do?

Across borders: research institutions from Europe network their laboratories.

The overall aim of Co-UDlabs project is integrate research and innovation activities in the field of Urban Drainage Systems (UDS) to address pressing public health, flood risks and environmental **challenges**. Co-UDlabs aims to integrate 17 key **large scale research facilities** at a European scale into an ambitious project aiming to offer the R&D community, water infrastructure operators and their supply chain high quality **laboratory and field facilities**, human resources, high level training opportunities and improved data sharing platforms in order to meet major UDS related societal, environmental, and economic sustainability challenges of the 21st Century. The main objective of Co-UDlabs is to provide a **transnational**

multidisciplinary collaborative research infrastructure that will allow stakeholders, academic researchers and innovators in the urban drainage water sector to come together, share ideas, co-produce project concepts and then benefit from access to top-class research infrastructures to develop, improve and demonstrate those concepts.

Building a collaborative European Urban Drainage innovation community!

The Co-Udlabs project has received funding from the European Union’s Horizon 2020 research and innovation programme.

about Co-UDlabs

visit Co-UDlabs Ideas Marketplace

about the TA call

Contact

Iain Naismith
T: +44 (0) 7983 605219
E: naismith@ikt.institute

Co-UDlabs Hackathon: Developing and exploring ideas for the urban drainage of tomorrow

After Co-UDlabs formed in the first half of the year and sorted itself out in the past months, things are now getting concrete: in a **two-day hackathon**, valuable project ideas relating to **urban drainage** will be collected, shared and thought through together with interested institutions. And perhaps even get one or two things off the ground.

Co-UDlabs Hackathon: Transnational Access to Research Infrastructures

Online workshop of the new European network of urban drainage labs.
23-25 November 2021
– Participation free of charge –
more on the website of the Co-UDlabs project

If you just want to find out more about Co-UDlabs just join the event for the first hour on Tuesday 23rd.
Please note if joining from the UK, Ireland or Portugal – the time difference is 1 hour so 09.00 in the programme is 08.00 at your place!
Operators of public wastewater facilities worldwide are facing **major challenges**: Extreme weather events are statistically occurring more frequently. Infrastructure is ageing. Urbanisation is advancing. And we are working to decarbonise our lifestyles. **Innovation and research** in urban drainage are in demand.

17 pilot plants in Europe

Across borders: research institutions from Europe network their laboratories.

This is where the laboratory network project Co-UDlabs (Collaborative Urban Drainage research labs communities), funded by the European Union, comes in. At the European level, research institutes and universities from seven countries – including IKT – are networking and making their total of 17 unique **test facilities** available to each other as well as to external organisations and companies (e.g. industrial companies, universities, urban drainage companies, water and industry associations and consortia).
Transnational access to Co-UDlabs research infrastructures is **free of charge** and includes logistical, technological and scientific support, including a briefing. Travel expenses are reimbursed.

Have we piqued your **interest**? Then join us at the Hackathon on 23-25 November and contribute your ideas!

learn more about the Hackathon
register online for the Hackathon
view the full agenda of the event (PDF)
learn more about Co-UDlabs

Co-UDlabs is funded by the Horizon 2020 programme of the

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Contact

Thomas Brüggemann
phone: 0209 17806-18
E-mail: brueggemann@ikt.institute

Heavy Rain Check research and consequences of July's Storm Bernd published in Water journal

Free paper: Lessons learnt from Storm Bernd

The Water journal has published the free access paper *"**Living with Urban Flooding:** A Continuous Learning Process for Local Municipalities and Lessons Learnt from the 2021 Events in Germany"* by Prof Bert Bosseler, Mirko Salomon and Marco Schlüter of IKT and Matteo Rubinato of Coventry University. It describes the findings of our Heavy Rain Check project and

lessons learnt from the aftermath of the catastrophic **Storm Bernd flooding** in July 2021.
The paper can be accessed here

Heavy Rain Check

In 2021, heavy precipitation events in Germany have confirmed once again that **pluvial flooding** can cause catastrophic damage in large, medium, and small cities. However, despite several hazard-oriented strategies already in place, to date there is still a **lack of integrated approaches** to actually preventing negative consequences induced by **heavy rainfall events**. To address this gap, this paper presents the outcomes of the research project “Heavy Rainfall Checklist for Sewer Operation” which we conducted with sewer network operator members of KomNetAbwasser (ComNetWasteWater), to involve all the stakeholders affected by pluvial flooding within cities, and implement **a series of documents** that can be adopted by network owners across the world to support organizations and their operational staff in **preventing problems** caused by heavy rainfall incidents.

Outline of the Heavy Rain Check continuous process for developing responses to heavy rain (click on picture to enlarge)

It analyses three different **rainfall scenarios** providing for each a list of specific **tasks and suggestions** for aiding

decision-making:

- Stormwater drainage – for performance of networks for “as designed” levels of rainfall
- Heavy rain – events exceeding the “as designed” capacity of a network leading to localised flooding
- Catastrophic rain – leading to overwhelming flooding

To develop the Heavy Rain Check three levels of steering group (panels) were used to discuss the results and to check their significance and quality:

Members of KomNetAbwasser participating in the Heavy Rain Check project (click on picture to enlarge)

- User panel: This group consists of all approximately 70 members of the KomNetAbwassser group of network owners that meets weekly online to continuously exchange information, evaluate new issues and review recent flooding episodes.
- Expert panel: This group partly consists of 13 members of the KomNetAbwasser, who supported the research project in an independent project funding. The group is supplemented by representatives of the Detmold district government and the North Rhine-Westphalian Environmental Agency, which funded the research project.
- Pioneer Panel: This group includes 5 members of the expert

panel who, as pioneers,
have already helped to develop and implement essential measures on site independently.

Storm BERND

Emergency operations/deployments in first week after storm Bernd (click on picture to enlarge)

In July 2021 a **catastrophic rainfall event** affected parts of Germany, the Netherlands and Belgium and its effects were also felt in the UK and around other European countries. Between the 19th and 26th July, IKT co-ordinated **assistance interventions** by unaffected municipalities in support of those badly affected (see figure).
The **lessons are still being learned** and initial observations on the consequences for the affected network owners are presented in the paper.
For **more information** about the consequences of Storm Bernd and the response by KomNetAbwasser members see this post on our German website.

Visit the Water journal to read the paper on urban flooding!

Contact

- Mirko Salomon
  T: +49 (0) 17806-25
  M: salomon@ikt.institute
- Prof Bert Bosseler
  T: +49 (0) 209 17806-0
  E: info@ikt.institute