ISTT Master Class

"The importance of effective assessment when indentifying optimal trenchless rehabilitation solutions."

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JBP Consultancy Services Asia Sdn. Bhd.

Presentation Overview

The importance of effective assessment when indentifying optimal trenchless rehabilitation solutions:

1. JBP Group overview
2. Pipeline Assessment
3. Training and Education
4. Rehabilitation technologies
**JBP Group overview**

BKP Berolina-Liner System (M) Sdn Bhd (No: 834485-K)
- Established: 2008
- Focus:
  - Expert assessment, advice and solutions to meet local needs
  - Distribution partner in the region for the Berolina-Liner System, UV-Cured pipeline rehabilitation system, produced in Germany by BKP Berolina Polyester GmbH & Co. KG

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**Pipeline Assessment & Training**

i. Pipeline assessment
ii. PACP Training

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**Pipeline Assessment**

i. Inspection
ii. Investigation
iii. Condition Assessment
iv. Trenchless technologies Assessment
v. Selection of Rehabilitation Methods

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**Condition Assessment**

**INSPECTION**
**DIAGNOSTIC TOOLS**
**CONDITION ASSESSMENT**
**REHABILITATION DECISIONS**

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**Assessment – Why?**

The Condition Assessment Process:
- Manages risk through identifying likelihood of failure
- Bridges the gap between:
  - Raw data from desk study and field inspection and
  - Information that forms the platform for decisions and action
- Transforms data into actionable information

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www.jbp-consultancy.com
**Assessment – How?**

- Understand the existing system from records and desk study
- Determine what information and where investigation is needed to fill gaps in the data
- Decide on method of investigation/inspection necessary
- Assess the system condition and performance from the total data available after investigation/inspection
- Make rehabilitation decisions to support efficient and effective Asset Management

**Pipeline Assessment Techniques**

Major component of any proactive maintenance or rehabilitation programme. Must aggressively minimize the likelihood of emergency failures, sewage spills, infiltration, infloes, ex-filtration, etc.

- **CCTV**
- **Sonar**
- **Ground Penetrating Radar**
- **Laser** – laser scanning can provide a profile of the inner pipe surface including measurement of crown corrosion due to H2S
**Deliverables from Condition Assessment**

Clear knowledge of sewer condition and level of risk which is used to:

- Predict service life at acceptable level of risk
- Determine need and priority for rehabilitation
- Determine feasible and cost-effective options and solutions
- Develop strategies to support active and effective Asset Management

**Pipelne Assessment & Conclusions:**

Pipe assessment combined with modern pipeline rehabilitation solutions,

Key factors:
- Extensive, and detailed regional knowledge of the networks, conditions and requirements.
- Effective and accurate assessment procedures and reporting
- Appropriate selection and application of trenchless technologies which will meet specific local needs and conditions
- Professional training and support, to develop relevant local expertise and skills

**Training & Education:**

PACP Training

Professional training and support, to develop relevant local expertise and skills
Strong Enforcement from the Regional Authorities

Certify Technical Personnel - valid certification
- GIS & Sewer-Data Processing
- Pipeline Condition Assessment
- Flow Monitoring & Analysis
- Assessment tools
- Rehabilitation Technologies
- Design and Selection
- Sewer Maintenance

Rehabilitation Technologies

CIPP-General Overview

UV-Cured CIPP in General

The Berolina-Liner System

Sewer rehabilitation – History CIPP

Since its inception in 1971, Cure In Place Pipes (CIPP) has taken enormous strides in market development as well as materials and technology improvements.

To date, more than 100,000 km installed globally since its introduction

UV cured liners now account for an estimated up to 50% of liners installed in Europe, with similar trends taking place in other markets around the globe.

Sewer rehabilitation needs - Europe

Table 1 shows an estimate of sewer rehabilitation needs in Europe. This is an extrapolation from data in the UK and Germany and refers to public sewers only.

<table>
<thead>
<tr>
<th>Rehabilitation Need</th>
<th>% of Total</th>
<th>Km</th>
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<tbody>
<tr>
<td>None</td>
<td>54</td>
<td>1,201,500</td>
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<tr>
<td>Long term</td>
<td>20</td>
<td>445,000</td>
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<tr>
<td>Medium term</td>
<td>14</td>
<td>331,500</td>
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<tr>
<td>Short term</td>
<td>10</td>
<td>232,500</td>
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<tr>
<td>Immediate</td>
<td>2</td>
<td>44,500</td>
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<tr>
<td>Total</td>
<td>100</td>
<td>2,225,000</td>
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</tbody>
</table>

Table 1. Sewer Rehabilitation Needs Estimate, Europe


<table>
<thead>
<tr>
<th>Country</th>
<th>Km Public Sewers</th>
<th>Rehabilitation of CIPP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CIPP</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>246</td>
<td>29</td>
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<tr>
<td>Belgium</td>
<td>140</td>
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<td>Czech Rep.</td>
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<td>630</td>
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<td>Russia</td>
<td>1,500</td>
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<td>Spain</td>
<td>114</td>
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<td>Switzerland</td>
<td>186</td>
<td>10</td>
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<tr>
<td>Total</td>
<td>1,921</td>
<td>29</td>
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</tbody>
</table>
COMPARISON of CIPP Trenchless Technology Methods using UV-LIGHT CURED CIPP and HOT-WATER/STEAM CURED CIPP Systems for Sewer Pipe Installations

Resources: Water / Raw materials / Waste / Energy...

Control unit for UV-light Curing (NO boiler requirement)
Liner winched in place (NO need scaffolding)
Transportation of the liner (NO need refrigeration / ice)

UV Light Cured CIPP System (UVC)

Boiler required for Hot Water/Steam Cured.
Scaffolding for inversion of liner.
Refrigeration (Ice) required during storage and transportation of the liner.

Hot Water / Steam Cured CIPP System (HWSC)

Cure Characteristic UV Light Curing Hot-Water and Steam Cur

Resin Type ISO NPG Polyester or Vinyl Ester (VE) Unsaturated Polyester & VE-resins

Catalyst UV Initiator Peroxide (Hazard Chemical)

Liner Storage Condition Light Roof at Room Temp.
Cool or Iced - avoid Direct Sun

Liner Storage Temperature 5 - 35 ºC 5 - 10 ºC

Storage Life ~ 6 months 1-3 days, for some steam cured versions some weeks

Installation Equipment Mobile or Truck Mounted Boiler Truck + Scaffold Tower

Cure Process Control Monitor time, temperature, pressure, LT speed and no. of lights Monitor Input/output/and interface pipe temperature

Installation Time 4 - 6 hours 6 - 24 hours

Inspection CCTV during curing process

Cannot inspect till cooled, drained and liner ends removed

Waste Disposal Cured Off cuts + inner foil Off cuts + styrene contaminated cured water

Uniformity of Cure Generally good

Increased risk of variability

Shrinkage after Cure Minor Can be significant

Short Term Bending Stress

MPa 150 50

Short Term Flexural Modulus MPa 9,000 - 12,000 2,200 - 2,800

Long Term Flexural Modulus MPa 5,500 - 7,000 620 - 1,400


Summary Comparison of UV and Heat Cure Characteristics

<table>
<thead>
<tr>
<th>Property</th>
<th>UV Cured</th>
<th>Heat Cured</th>
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</thead>
<tbody>
<tr>
<td>Winched-in-place (WIP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeline rehabilitation - UV Cured CIPP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeline rehabilitation - Hot Water/Steam Cured</td>
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</tbody>
</table>

Waste Disposal Cured Off cuts + inner foil Off cuts + styrene contaminated cured water

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Pipeline rehabilitation - UV Cured CIPP

Camera inspection before curing

Ho Chi Minh City 11-12th March

Light tunnel

UV cured CIPP - practical solutions and advantages

- UV-CIPP liner systems & key differences,
- With its extended shelf life up to 6 months, and quality controlled production from its production plant, high liner quality can be deployed anywhere in the region without requiring any elements of local production
- Shrinkage during the curing process, minimum annular gap
- Small wall thickness of the cured liners met the objective of enhancing flow capacity
- Cost effective and environmental friendly, low carbon footprint

BKP Berolina Polyester GmbH & Co. KG

Company and Partners

Products of BKP

Surface protection for steel pipes

Material for spot repair inks

CIPP (cured in place pipes) has established itself as a compelling and now leading method for trenchless pipeline rehabilitation. The procedure for liner production from fiberglass reinforced plastic (FRP), developed and patented by BKP is unique worldwide. Our high-quality composite combines high chemical resistance with light strength and extreme longevity. By independent experts the Berolina-Liner System is certified excellent quality.
Benefits:
- Pre-impregnation under closely controlled factory conditions
- High structural strength
- Thin wall - reduces loss of capacity
- Reduced time for operatives working in confined spaces
- Reduced manpower requirements during installation
- No requirement for curing water
- Less energy consumption
- No waste products from the curing cycle to be disposed off, i.e., water, etc.
- Air conditioned transport is NOT needed

Installation partner of the Berolina-Liner System...

Benefits:
- Quick process - important when working within limited installation time
- Easy handling - the liners are pre-packed, sealed and crated after manufacture ready for use
- No handling of chemicals at site
- Simple one step curing regime
- Very good expansion behaviour
- Lateral can be easily found and reopened immediately after curing
- Liner can be stored up to six months without loss of quality
- Quality control before dispatch
- Abrasion surface with high resin content - is not considered for static calculation

Thank You for Your Attention ...

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