Modern pre-insulated pipes.

Optimize your green solution and minimize Total Cost of Ownership.

Peter Jorsal, Product & Academy Manager
June 4th 2020
What is modern today……?

4th generation District Heating

As low heat loss as possible from the pre-insulated pipes

No change of properties during life time

Information on a running basis about the condition of the pipe system

“Modern” choice of pipe system (TCO)

Secure your assets
As low heat loss as possible leading to as low CO2 emission as possible

That materials in the pre-insulated pipe system can be recycled at end of life time (steel, PUR, PE, other)

Use of recycled materials when producing new pre-insulated pipes

Circular economy
The right choice of pre-insulated pipe system

Total Cost of Ownership perspective

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June 4th 2020
12 different choices of pre-insulated pipe systems

- Available pipe systems
- Pair of pipe
  - Series 1
  - Series 2
  - Series 3
- TwinPipe
  - Series 1
  - Series 2
  - Series 3

- All these variants can be delivered with or without diffusion barrier
  - The diffusion barrier secures that heat loss properties will remain the same during life time

- => 12 different choices for the same project
Markets for pair of pipe

Pair of pipe series 1

Pair of pipe series 2

Pair of pipe series 3

Series 1 pair of pipe is 60% of the total market of pair of pipe

Series 1 pair of pipe is the pipe system with the worst insulation properties
Markets for TwinPipe – Lowest TCO with TwinPipe

TwinPipe series 1

TwinPipe series 2

TwinPipe series 3

TwinPipe represents 35% of the total sales in dimensions where Twin is possible.

In Denmark it is more than 70%, in Poland it is 5%.

*Lowest possible* heat loss with TwinPipe.
We still see many energy companies that make their choice of pipe system based on

“We do what we do because this is what we always have done”

“Price is what you pay. Value is what you get.”

— WARREN BUFFETT —
Total Cost of Ownership includes

• Investment (CAPEX)
  • Pre-insulated pipes
  • Excavation and asphalt
  • Pipe handling, welding and jointing
  • Consulting, design
  • Supervision

• Operation (OPEX)
  • Heat loss cost
  • Pumping cost
  • Repairs
  • Maintenance
  • Surveillance
TCO – 12 different pipe scenarios for the same project

<table>
<thead>
<tr>
<th>DN</th>
<th>80</th>
<th>96</th>
<th>60 m DN 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN</td>
<td>65</td>
<td>192</td>
<td>60 m DN 40</td>
</tr>
<tr>
<td>DN</td>
<td>50</td>
<td>96</td>
<td>60 m DN 40</td>
</tr>
<tr>
<td>DN</td>
<td>40</td>
<td>276</td>
<td>60 m DN 40</td>
</tr>
<tr>
<td>DN</td>
<td>32</td>
<td>120</td>
<td>60 m DN 40</td>
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</table>

<table>
<thead>
<tr>
<th>DN</th>
<th>780</th>
<th>m trench</th>
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</thead>
</table>

96 m DN 80 96 m DN 65 96 m DN 65 96 m DN 50 96 m DN 32 96 m DN 40 60 m DN 32
TCO – 12 different scenarios – other assumptions

<table>
<thead>
<tr>
<th>Choose language:</th>
<th>UK (£)</th>
<th>Currency:</th>
<th>Euro</th>
<th>Factor for complexity</th>
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</thead>
<tbody>
<tr>
<td>T flow:</td>
<td>80</td>
<td>Change rate</td>
<td>1</td>
<td>Factor for pipe installation (1-3) 1.25</td>
</tr>
<tr>
<td>T return:</td>
<td>40</td>
<td>Interest [%]</td>
<td>2</td>
<td>Factor for excavation (1-5) 1.5</td>
</tr>
<tr>
<td>T soil:</td>
<td>10</td>
<td>Period [years]:</td>
<td>50</td>
<td>(Lowest factor is very easy; highest is extremely complicated)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Price energy</td>
<td>0.06</td>
<td>Euro / KWh</td>
</tr>
</tbody>
</table>

The diagram illustrates the cost distribution across different factors, highlighting the optimal district heating pipe configuration.
CO2 emission – comparison between 3 different solutions

**Compare CO2 emission**

<table>
<thead>
<tr>
<th></th>
<th>CO2</th>
<th>Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pair of pipe S1</strong></td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td><strong>Twin S3 - Conti</strong></td>
<td>0.38</td>
<td>0.67</td>
</tr>
<tr>
<td><strong>Pair S3 - Conti</strong></td>
<td>0.62</td>
<td>0.44</td>
</tr>
</tbody>
</table>

**Percentage Savings**

- Pair of pipe S1: 100% (1.06 KTon)
- Twin S3 - Conti: 36% (0.67 KTon) vs. 64% (1.06 KTon)
- Pair S3 - Conti: 59% (0.62 KTon) vs. 41% (1.06 KTon)
Secure your assets
Secure your assets – already in the planning phase

- The premium choice of type of joints will be weld joints
  - Focus on documentation
- Educate joint fitters and supervisors
- Supervision – supervision – supervision
- Always choose an active surveillance system
  - Minimum requirement to the condition of the surveillance system at handover
  - As built drawing
- In this way you secure flawless operation without repairs and break down
What do you accept?

We see
• Missing education of joint fitters
• Lack of supervision
• Passive or no alarm systems and missing focus on hand over

Resulting in
• Very expensive repairs not found or located in due time
• Risk of break downs
• Lower life time
Information from the network - Today

Peter Jorsal, Product & Academy Manager
June 4th 2020
Surveillance principles

- **Insulation resistance**
  - Moisture in the PUR foam

- **Wire resistance**
  - Broken wire

- **Galvanic voltage**
  - Moisture from inside or outside

- **Impedance (TDR)**
  - Location of fault
Surveillance in wells

• Surveillance on
  • Water level
  • Temperature
  • Pressure
Dashboard – LOGSTOR Detect

- Management tool
- Web based
- With one click you have the total overview
  - Status on all detectors
  - Where (Google maps)
  - What
  - Precise fault location
The future
What is modern in the future?

• Always base your choice on Total Cost of Ownership
• Be green and think circular
• Digitalization of the pre-insulated network
  • Pressure
  • Temperature
  • Condition
• Run your system in a smart way based on information and facts
  • Result will be reduced heat loss
  • Whole networks or sections with lower temperature
• Value for the Energy company
Visions for the future – green solutions

- Always base your choice on **Total Cost of Ownership**
- Chose the solution with lowest possible heat loss
  - Leads to **lowest CO2 emission**
  - Develop systems with even **lower heat loss**
- Use recycled materials when producing new products
- **PUR & Plastic Funded projects**
  - RePURpose for recycling of PUR foam
  - Reinvent for use of renewables (bio based polyols)
  - RHQI for Recycling of High Quality Industrial plastic
- LOGSTOR has started this journey
Thank you for your attention