There’s more to LOGSTOR technology than meets the eye

LOGSTOR district heating pipe systems
At first glance, one long pre-insulated district heating pipe looks much like any other. Beneath the surface, however, there can be a world of difference in the insulation, protection and monitoring technologies built into them.

These differences are critical for energy efficiency and can help you dramatically reduce the CO₂ emissions that stem from your district heating operations.

And there are also major differences in what it costs to operate different makes and types of pipe – differences that accumulate dramatically over the course of a 30-year service life.

LOGSTOR pre-insulated pipe is manufactured under carefully monitored factory conditions. This means we can make 100% sure the insulation foam is consistent, and that the service pipe, insulation and outer casing are bonded together perfectly. All joints and fittings are also designed to make sure there are no weak points.

New LOGSTOR technologies make sure the gases that provide such exceptional insulation – as low as lambda 23 – stay within the pipe, and that their performance remains constant, regardless of the passage of time.

A special diffusion barrier keeps the cyclopentane and carbon dioxide inside the insulation, and prevents any nitrogen or oxygen from the soil or air penetrating into it. You benefit because the foam doesn’t deteriorate and its insulating properties remain constant throughout the 30-year service life laid down in the EN253 standard. This is particularly important for small-diameter pipes up to DN 200.
There’s more to responsibility than meets the eye

Challenge
One of the major arguments in favour of district heating is that it provides cost-effective heating with a smaller end-to-end environmental impact than other methods.

But any reductions in emissions that you achieve by generating heat efficiently at a central location, or by utilising waste heat from CHP or industrial facilities, get wiped out if heat then goes to waste en route to the individual user.

Solution
LOGSTOR pre-insulated pipe systems are quite simply the most energy-efficient solution available anywhere in the world. They make sure as much of the generated heat as possible gets from source to user, with no leaks and with the absolute minimum of heat loss, even over very long distances. The less heat lost, the less the environmental impact.

This enables you to significantly reduce the CO₂ emissions of the district heating solutions you provide. And, of course, to boost the overall saleability of district heating technology now that environmental impacts are so high on the agenda.

The emissions advantage

Specifying the use of a diffusion barrier on 5 kilometres of Ø 20/90 SteelFlex house entry pipe with lambda 23 insulation means you achieve significant reductions in CO₂ emissions compared with the results of using an identical pipe configuration not fitted with a diffusion barrier. See illustration below.

See the calculations at www.logstor.com/documentation

<table>
<thead>
<tr>
<th>Years</th>
<th>CO₂ reductions</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>270 tons CO₂</td>
</tr>
<tr>
<td>20</td>
<td>680 tons CO₂</td>
</tr>
<tr>
<td>30</td>
<td>1145 tons CO₂</td>
</tr>
</tbody>
</table>
The economic benefits of district heating systems mean looking far beyond the initial costs of buying the pipe and laying it. To get the full picture, you have to include the overall cost of operation, repair and maintenance over the entire service life of the system. Only then do the big differences between even apparently similar solutions really become clear.

LOGSTOR solutions make it possible for you to dramatically reduce your operating costs by virtually eliminating the need to top up and replace lost heat. The heat loss from LOGSTOR pre-insulated pipes fitted with a diffusion barrier is as much as 15-30% less than if the diffusion barrier is omitted from the specifications. These cost savings are attributable to major savings over the service life of the system.

**Detailed example**

The example is for a district heating system with flow and return temperatures of 120°C and 70°C, respectively, and with all relevant types of pipes, with and without diffusion barrier, and with different insulation thicknesses.

### Assumptions for calculations
- **T flow/return 120°C/70°C**
- Pumping costs: 1% of heat supply
- Energy price: 0.05 EUR/kW
- Natural gas as energy source
- Effective interest rate: 4%
- Service life 30 years
- Service life cost

### CO2 emissions

CO2 emissions are considerably lower for continuously produced pipe with high insulation quality and fitted with a diffusion barrier than for traditionally produced pipe without a diffusion barrier.

<table>
<thead>
<tr>
<th>Solution</th>
<th>CO2 emissions (tons CO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TwinPipe, Series 1</td>
<td>Traditional</td>
</tr>
<tr>
<td>TwinPipe, Series 2</td>
<td>With diffusion barrier</td>
</tr>
<tr>
<td>TwinPipe, Series 2</td>
<td>Traditional</td>
</tr>
</tbody>
</table>

### PUR insulation properties over time

<table>
<thead>
<tr>
<th>Lambda, W/mK</th>
<th>Purchase cost of pipes (€)</th>
<th>Maintenance (€)</th>
<th>Cost of electricity losses (€)</th>
<th>Pumping costs (€)</th>
<th>Civil works (€)</th>
<th>Operating costs (€)</th>
<th>Total cost (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN 50 to DN 150, ContiPipe with barrier, average W/mK 0.0240</td>
<td>1500</td>
<td>1000</td>
<td>5000</td>
<td>2000</td>
<td>5000</td>
<td>3000</td>
<td>1000</td>
</tr>
<tr>
<td>DN 50/125, no barrier, average W/mK 0.0308</td>
<td>1800</td>
<td>1000</td>
<td>5000</td>
<td>2000</td>
<td>5000</td>
<td>3000</td>
<td>1000</td>
</tr>
<tr>
<td>Dn 100/200, no barrier, average W/mK 0.0293</td>
<td>1600</td>
<td>1000</td>
<td>5000</td>
<td>2000</td>
<td>5000</td>
<td>3000</td>
<td>1000</td>
</tr>
<tr>
<td>DN 80/160, no barrier, average W/mK 0.0301</td>
<td>1700</td>
<td>1000</td>
<td>5000</td>
<td>2000</td>
<td>5000</td>
<td>3000</td>
<td>1000</td>
</tr>
<tr>
<td>DN 150/250, no barrier, average W/mK 0.0290</td>
<td>1800</td>
<td>1000</td>
<td>5000</td>
<td>2000</td>
<td>5000</td>
<td>3000</td>
<td>1000</td>
</tr>
<tr>
<td>SteelFlex 20/90, with barrier, average W/mK 0.0230</td>
<td>1000</td>
<td>1000</td>
<td>5000</td>
<td>2000</td>
<td>5000</td>
<td>3000</td>
<td>1000</td>
</tr>
</tbody>
</table>

**CO2 emissions**

- Initial CO2 emissions for the production of each type of PUR insulation material.
- CO2 emissions for the energy consumption of the pumps.
- CO2 emissions for the cooling of the insulation materials.
- CO2 emissions for the use of natural gas as an energy source.

**PUR insulation properties over time**

- Lambda, W/mK: Thermal conductivity of the PUR insulation material.
- PUR insulation properties vary over time due to alteration processes in the PUR matrix.
- Table shows PUR insulation properties after 5, 10, 15, 20, 25, and 30 years.
- Assumptions for calculations: T flow/return 120°C/70°C, Pumping costs: 1% of heat supply, Energy price: 0.05 EUR/kW, Effective interest rate: 4%, Service life: 30 years.
LOGSTOR pre-insulated district heating pipe

<table>
<thead>
<tr>
<th>Type of pipe</th>
<th>Diameter</th>
<th>Guaranteed lambda value, W/mK</th>
<th>With diffusion barrier</th>
<th>Insulation properties remain constant</th>
<th>Advantages in brief</th>
</tr>
</thead>
</table>
| FlexPipe Flexible pipes                        | Ø 15–110 mm            | 0.023                         | Yes                    | Yes*                                  | • Available with different insulation thicknesses, Series 1, 2 and for relevant pipes Series 3.  
• Built-in diffusion barrier prevents deterioration of insulation properties.  
• Diffusion barrier is standard in FlexPipes – energy losses are greatest for small-diameter pipes.  
• Available with service pipes made of steel, PEX, aluminium/PEX or copper.  
• Diffusion barrier is standard in FlexPipes – energy losses are greatest for small-diameter pipes.  
• Available with service pipes made of steel, PEX, aluminium/PEX or copper.  
• Requires less civil works and fewer joints. |
| TwinPipe Flexible pipes                        | Ø 15–50 mm             | 0.023                         | Yes                    | Yes*                                  | • Provides best possible insulation value.  
• Available with two different insulation thicknesses, Series 1 and 2.  
• Built-in diffusion barrier prevents deterioration of insulation properties.  
• Diffusion barrier is standard in FlexPipes – energy losses are greatest for small-diameter pipes.  
• Available with service pipes made of steel, PEX, aluminium/PEX or copper.  
• Requires less civil works and fewer joints. |
| TwinPipe Continuously produced straight pipe   | Ø 26.9–114.3 mm        | 0.024                         | Yes                    | Yes                                   | • Provides best possible insulation value.  
• Available with two different insulation thicknesses, Series 1 and 2.  
• Built-in diffusion barrier prevents deterioration of insulation properties.  
• Available with service pipes made of steel or copper.  
• Requires less civil works and fewer joints. |
| TwinPipe Continuously produced straight pipe   | Ø 26.9–219.1 mm        | 0.027                         | No                     | No                                    | • Provides best possible insulation value.  
• Available with two different insulation thicknesses, Series 1 and 2.  
• Built-in diffusion barrier prevents deterioration of insulation properties.  
• Available with service pipes made of steel or copper.  
• Requires less civil works and fewer joints. |
| ContiPipe Continuously produced straight Axial process | Ø 26.9–219.1 mm    | 0.024                         | Yes                    | Yes                                   | • Continuous production technology provides best possible insulation properties.  
• Available with three different insulation thicknesses, Series 1, 2 and 3.  
• Built-in diffusion barrier prevents deterioration of insulation properties.  
• Diffusion barrier optional on larger-diameter pipe sections.  
• Service pipe made of steel.  
• Can be used with all types of joints. |
| ContiPipe Continuously produced straight Spiral process | Ø 323.3–1016 mm    | 0.026                         | Optional               | Optional                              | • Continuous production technology provides best possible insulation properties.  
• Available with three different insulation thicknesses, Series 1, 2 and 3.  
• Built-in diffusion barrier prevents deterioration of insulation properties.  
• Diffusion barrier optional on larger-diameter pipe sections.  
• Service pipe made of steel.  
• Can be used with all types of joints. |
| Straight, single pipe Traditionally produced   | Ø 26.9–1219 mm         | 0.027                         | No                     | No                                    | • Available with three different insulation thicknesses, Series 1, 2 and 3.  
• Available with service pipes made of steel, or copper. Other types are optional.  
• Can be used with all types of joints. |

* The special diffusion barrier used for pipe sections with PEX service pipe allows minor changes.