

**There's more to LOGSTOR technology
than meets the eye**



LOGSTOR district heating pipe systems

[We document the difference]

LOGSTOR

There's more to appearance than meets the eye

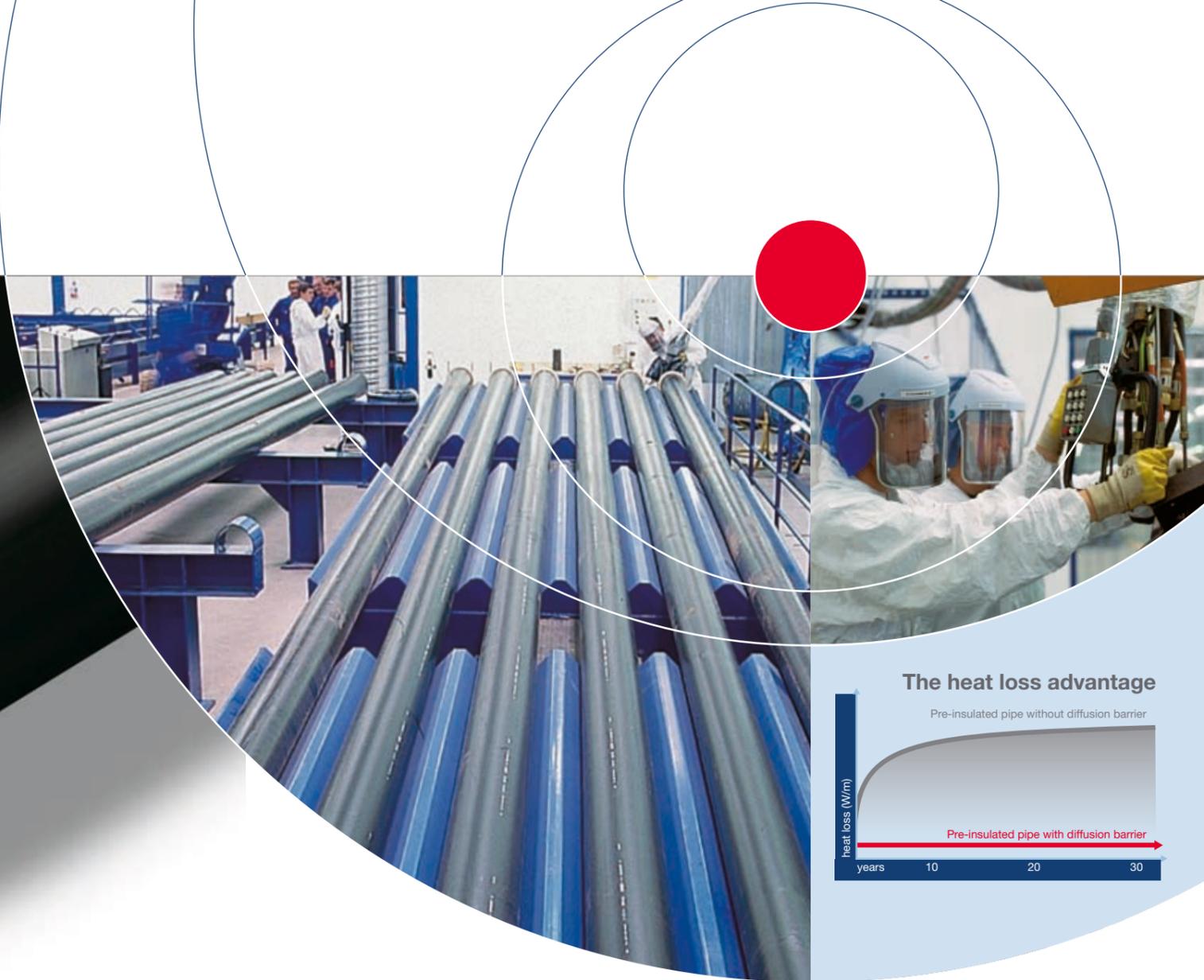
Outer casing made of high-density polyethylene

Diffusion barrier made of aluminium foil

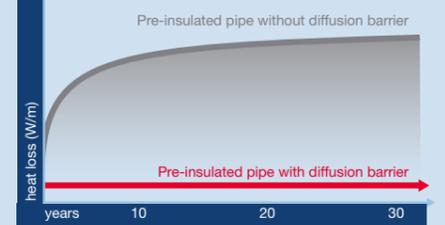
Polyurethane foam insulation for use in temperatures from -60°C to $+140^{\circ}\text{C}$

Copper wires that monitor for leaks

Service pipe made of steel, copper, PEX or aluminium/PEX



The heat loss advantage



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.

All LOGSTOR pre-insulated pipe systems use a unique type of cyclopentane-blown, CFC-free polyurethane foam that prevents energy escaping from the service pipe inside.

The exceptionally fine cell structure of this insulating foam, combined with its remarkable consistency, reduces energy losses to an absolute minimum. It is equally effective over the entire temperature spectrum from -60°C to $+140^{\circ}\text{C}$.

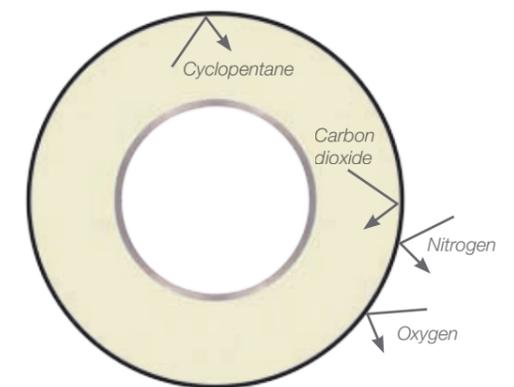
This brings you the dual benefits of helping reduce your CO₂ emissions, and making end-to-end savings in transporting liquids by pipe throughout the 30-year service life that LOGSTOR systems guarantee.

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.

The diffusion barrier advantage



There's more to responsibility than meets the eye

Challenge

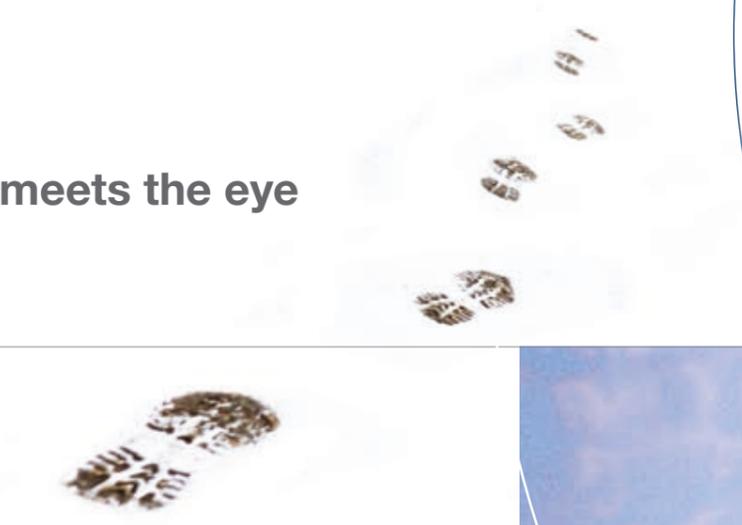
One of the major arguments in favour of district heating is that it provides cost-effective heating with a smaller end-to-end environmental impact than other methods.

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.



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

The emissions advantage



There's more to costs than meets the eye

Challenge

Any district heating network is a major infrastructure investment where the pay-offs, both financial and environmental, are long-term. Experience shows that the service life costs of even apparently similar pipe systems can vary greatly.

The initial investment – in terms of the up-front costs of purchasing and laying the pipe – is usually the prime concern for the contractor. However, these initial costs normally only amount to as little as 10% of the overall costs that accumulate over the service life of the system.

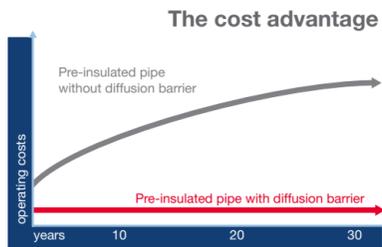
The biggest share of the service life costs of a system – by far – normally has to be met by the operator. These stem from heat loss as district heating water passes through the pipe. In some of the most extreme cases we've experienced, such heat loss has accounted for as much as 80% of the total costs of a district heating network in the course of its service life.

Solution

The economics 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 advantages accumulate to major savings over the service life of the system.

Investment costs:	Pipe material
	Civil works
	Pipe installation
	Inspection
+ Operating costs:	Pumping costs
	Heat loss
+ Maintenance costs:	Inspection/monitoring
	Service/repairs
=	Service life cost



Detailed example

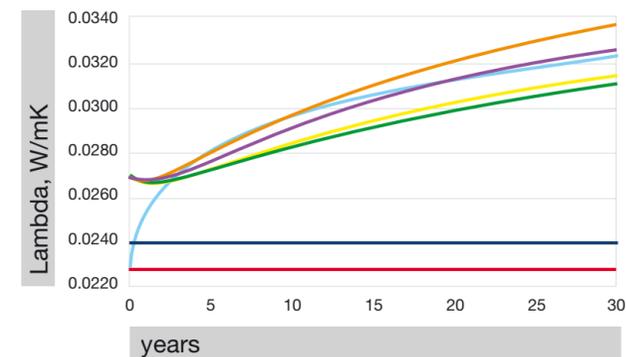
The example is for a district heating system with flow and return temperatures of 120°C and 70°C, respectively, and with all relevant types of pipes, with and without diffusion barrier, and with different insulation thicknesses.

T flow/return 120°C/70°C system that provides 4 MW of heating effect

The pipe system includes:

- 2 x 1000 m DN 150
- 2 x 1000 m DN 100
- 2 x 2000 m DN 80
- 2 x 500 m DN 50 straight pipes (5 consumers/250 kW each)
- 2 x 5000 m Ø 20 mm AluFlex/SteelFlex (200 consumers/10 kW each)

Alteration of PUR insulation properties over time



- SteelFlex 20/90, with barrier, average W/mK 0.0230
- SteelFlex 20/90, no barrier, average W/mK 0.0299
- DN 80/160, no barrier, average W/mK 0.0301
- DN 150/250, no barrier, average W/mK 0.0290
- DN 50 to DN 150, ContiPipe with barrier, average W/mK 0.0240
- DN 50/125, no barrier, average W/mK 0.0308
- Dn 100/200, no barrier, average W/mK 0.0293

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.

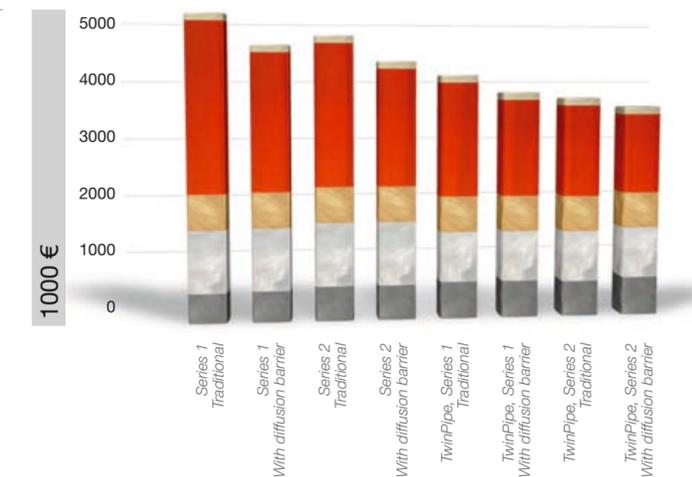


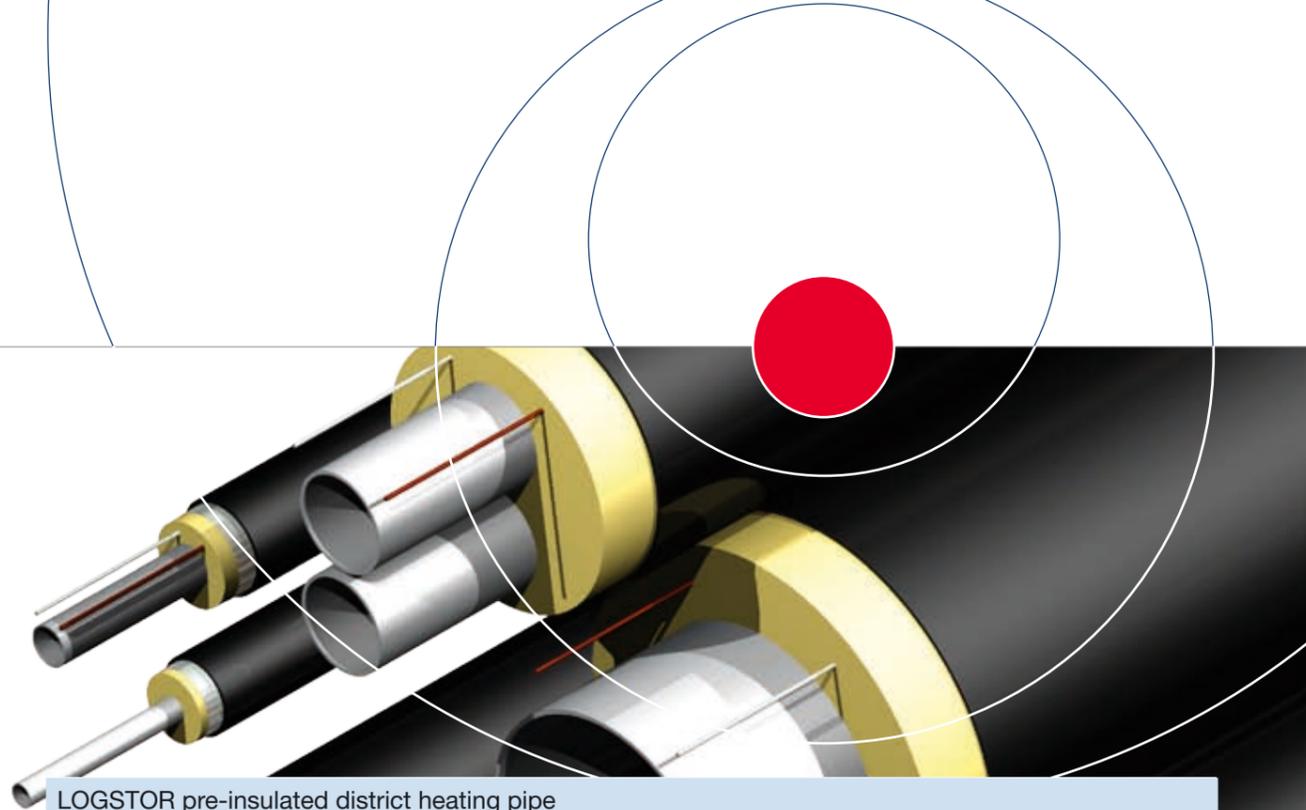
Service life cost

Assumptions for calculations

T flow/return 120°C/70°C
 Pump energy 1% of heat supply
 Natural gas as energy source
 Energy price 0.05 EUR/kWh

Price of electricity 0.10 EUR/kWh
 Effective interest rate 4%
 Service life 30 years





LOGSTOR pre-insulated district heating pipe

Type of pipe	Diameter	Guaranteed lambda value, W/mK	With diffusion barrier	Insulation properties remain constant	Advantages in brief
FlexPipe Flexible pipes	Ø 15–110 mm	0.023	Yes	Yes*	<ul style="list-style-type: none"> 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.
TwinPipe Flexible pipes	Ø 15–50 mm	0.023	Yes	Yes*	<ul style="list-style-type: none"> 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 PEX, aluminium/PEX or copper. Requires less civil works and fewer joints.
TwinPipe Continuously produced straight pipes	Ø 26.9–114.3 mm	0.024	Yes	Yes	<ul style="list-style-type: none"> 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 PEX, aluminium/PEX or copper. Requires less civil works and fewer joints.
TwinPipe Traditionally produced straight pipes	Ø 26.9–219.1 mm	0.027	No	No	<ul style="list-style-type: none"> Available with service pipes made of steel or copper. Requires less civil works and fewer joints.
ContiPipe Continuously produced straight, single pipe Axial process	Ø 26.9–219.1 mm	0.024	Yes	Yes	<ul style="list-style-type: none"> 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, single pipe Spiral process	Ø 323.3–1016 mm	0.026	Optional	Optional	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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.