

Local Heating Networks: Low-Temperature Networks with High-Performance Pipes as Energy Efficiency Drivers



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With the EU looking into becoming carbon-neutral by 2050 and the Paris Agreement aiming to limit the global rise in temperature to under 2 °C, climate-friendly and carbon-neutral solutions are important points of focus across all industries. Heating plays an important role in Europe's path to carbon neutrality: More than a third of EU's greenhouse gas emissions originate from building energy use. With central heat generation, low-temperature distribution and flexibility regarding the energy source, local heating networks that are equipped with high-performance pre-insulated pipes constitute a useful approach to making heating more energy-efficient and sustainable.

The heating and cooling of buildings is one of the main contributors to CO₂ emissions and overall energy consumption in the European Union. Local and district heating networks offer many advantages in terms of the buildings' energy efficiency and convenience for the occupants. They are particularly suitable for urban, densely populated areas, and considering 74.3 percent of the European population lives in cities, heating networks offer a promising solution. However, only about 12 percent of EU citizens—mostly in Northern, Central, and Eastern Europe—are currently served by local and district heating systems. This is well below the feasible market share, which is estimated to lie between 60 and 80 percent of the heat market in various countries. In comparison, local and district heating networks

cover more than 50 percent of the heating demand in Scandinavian and Baltic countries. On the contrary, the biggest opportunity for network growth is mainly in Central and South-West European countries. Consequently, district and local heating networks offer a large but untapped potential in improving the climate and energy performance of European communities, especially when they operate on low temperatures.

Low-temperature Local Heating Networks: A Prime Example of Energy Efficiency

The impact of community-level energy systems on the level of sustainability and energy efficiency of buildings has recently been the subject of an increasing amount

of research, in particular by the International Energy Agency's Energy in Buildings and Communities (IEA BCS) and District Heating and Cooling (IEA DHC) programmes. Particularly interesting is the IEAs research on the optimised performance of energy supply systems. It outlines a low-exergy approach, meaning a heat supply from sustainable energy sources and through efficient systems, for communities, and related considerations to optimise energy supply. According to the IEA's findings from 2019, climate-neutral heating consists of three main technological elements:

1. Energy-efficient buildings whose clever design, improved insulation levels, and smart heating controls reduce the overall heat demand and minimise thermal losses.
2. Efficient heating networks, designed to use a maximum of renewable energy sources and enable the heat generator to operate at maximum

efficiency. In addition, insulation, smart management, and low temperature levels minimise thermal losses.

3. Sustainable energy sources: Supplying the heat from centralised or decentralised renewable low-carbon or carbon-neutral heat sources.

Appropriately designed local and district heating networks meet these criteria, especially in densely populated urban areas. In particular, the most promising and efficient supply technologies are the ones that allow a flexible supply of different heat demands with a maximal share of low-valued, local, and renewable energy sources. A common feature of these heating networks is that they operate at as low temperatures as possible, without increasing flow rates and pumping energy in amounts that would offset the benefits of thermal efficiency. Low-temperature local heating networks are a prime example of such efficiency in action.

Pipe System Crucial in Heating Network's Efficiency

Together with energy source and heat generator, the pipe system that connects them with the buildings lies at the heart of every heating network. Its capacity and insulation performance are crucial factors in the system's overall energy efficiency. In general, the size of the network and the temperature at which it operates determine the choice of pipe material. For large-scale district heating networks that operate at high temperatures of 120 °C or even higher, steel pipes with big diameters are the industry standard. Local heating networks, in comparison, usually operate on low temperatures of a maximum of 80 °C, which together with the shorter distances help to minimise thermal losses. The industry standard for these small and medium-sized local networks are pre-insulated PE-Xa plastic pipes, insulated by PE-x (soft) or PUR (hard) foam. Pre-insulated plastic pipes boast a good thermal loss performance, are durable since they do not corrode, and are flexible and easy to install. This also makes them the ideal solution for renovation purposes, where a part or a whole network needs to be renewed. In addition, lower temperatures also extend the plastic pipes' expected lifetime: At an operating temperature of 80 °C, the pipe is expected to last more than 30 years, at 70 °C more than 50 years and at an operating temperature below 60 °C, the expected lifetime even exceeds 100 years, according to European standards.



Source: Uponor

Due to their compact insulation material and low bending radius, the new Ecoflex VIP pipes are particularly flexible and easy to install on site.

High-Performance Pipes for Efficient Networks

With the pre-insulated Ecoflex Thermo VIP pipes, Uponor recently launched an industry innovation that takes these advantages one step further. Thanks to their unique hybrid construction, Ecoflex Thermo VIP pipes have an improved thermal loss performance of up to 60 percent compared to soft-foam insulated pipes with a comparable outer diameter and up to 38 percent compared to hard foam insulated products. This is mainly due to its innovative insulation material, the vacuum insulation panels (VIP) with a Lambda value of only 0.004 W/mK, the lowest on the market. The panels do not only boost thermal insulation performance in the pipes, but also reduce their outer diameter by up to 30 percent compared to conventional soft-foam insulated products. Consequently, Ecoflex Thermo VIP pipes allow for faster installation due to their flexibility and low bending radius. Installers can

save up to 20 percent of installing time compared to stiff pre-insulated pipes and up to 60 percent compared to the installation of steel pipes.

Low-Temperature Local Heating Networks: the Path to Energy Efficiency

With optimised heat generation, low-temperature distribution and flexibility regarding the energy source used, local heating networks constitute a major factor in making heating more energy-efficient and sustainable. Together with high-performance pipe systems like Ecoflex VIP with its outstanding insulation performance, they can make an important and positive contribution towards the EU's net-zero goals. All in all, low-temperature local heating networks show much potential to become the standard sustainable heating solution in urban areas. ■

Customer Reference: District Heating Scheme, Scunthorpe

Originally built in the 1960's, the Market Hill housing estate in Scunthorpe is made up of ten maisonette blocks, each home to eight flats, and three high rises with 76 flats each. Heating and water is supplied to all the properties by a district heating system, but due to excessive corrosion and leaks, the piping needed replacing. This full system refit had to be undertaken with minimum disruption to the 350 residents and with no relocation into temporary accommodation. Due to its increased lifespan and potential for long, joint-free runs, which makes it quicker and easier to install, Uponor's Ecoflex pre-insulated pipe system was a perfect fit for Market Hill. Another reason for choosing Uponor's plastic piping over a steel alternative was that its system could be run alongside the existing mains, and work in tandem with old mains that were still active. This flexibility meant that the



Source: Uponor

Due to its increased lifespan and flexibility, which made it easier to install in confined spaces, Uponor's Ecoflex pre-insulated pipe system was the perfect fit to update the heating network at Market Hill housing in Scunthorpe, UK.

building work disruption was kept to a minimum and residents could remain in their properties. Overall, 1,500 metres of pipes were installed, and the residents in Scunthorpe now benefit from a community-level, efficient heating network with high-performance pipes that operates at a flow temperature of 80 °C.