

# Cost Effective District Heating & Cooling Networks

## New Ways of Installing District Heating Pipes (1999: T3.2)

The investments into new district heating networks in Central and Northern Europe is estimated to be about half a Billion US\$ per year. With new laying technologies it seems to be possible to reduce the overall costs by 10 to 15%. The savings expected to be 50 to 75 Mill. US\$ explain the utilities' interest in these developments.

The installation of pre-insulated plastic jacket pipes is widely standardized, see CEN standards as well as the manufactures' guidelines for design. The pipelines are built from prefabricated material and laid Side-by-Side inside the trench according to well approved techniques. Common practice is to divide the building costs into three blocks:

- civil costs,
- material costs,
- installation costs.

The material costs can only be influenced a small degree by further rationalization of the production. For increased cost-effectiveness the civil-work block seems to be worthwhile to consider, since civil costs make about 50% of the overall costs and they still account for about 30% in Northern Europe where these costs are traditionally known to be low.

Two ways of construction have been established which primarily reduce the volume of earthworks for the pipelines and also influence their installation. One of these techniques arranges the pipes not horizontally (Side-by-Side) but vertically on top of each other (Piggy-Back laying), whereas the other combines two medium pipes in one jacket pipe (Twin-Pipe). Piggy-Back Laying has been practiced for 7 years while Twin-Pipes are in use for 15 years. Both techniques allow smaller trenches and thus lower the required efforts for civil-work.

Thus the highest potential for cost-reductions of district heating networks lies in the earthworks. By using advanced pipe-laying techno-

logies the trench's cross-sectional area may be shrunk considerably. In contrast to the conventional Side-by-Side laying of pipes the earth masses and costs can be lowered significantly by putting the two pipes on top of each other or using only one plastic jacket for the supply and return pipes as is the case with the Twin-Pipe system.

The Piggy-Back laying requires a narrower trench which has to be excavated a little deeper than with conventional Side-by-Side laying. The pipeline is designed using standard equipment specified by EN 253.

The Twin-Pipe system is used up to a medium pipe diameter of DN 150. It also requires a narrower trench. In addition, the Twin-Pipe features improved thermal insulation and requires only half the number of pipe-runs when compared to conventional DH-pipe systems. The new laying technologies show some cost advantages versus the standard methods within the considered diameter range of less than DN 150. The cost benefit is about 10 to 20 %. The Piggy-Back laying is cheaper even with pipe diameters of DN 200 and larger.

The cost-advantages of the new laying alternatives have been calculated for conditions that apply in Germany and Finland. This means, high resp. low, civil costs on the one hand and construction with vertical, resp. sloped, trench-walls on the other hand.

The German conditions roughly result in equal costs for Piggy-Back or Twin-Pipe systems. Here, the overall costs for both techniques are about 85 % of those of standard laying. When combined with the well-established cold installation technique the costs can be further reduced to about 70-75%.

In Finland, the situation is more in favor of the Twin-Pipe system (81%) over the Piggy-Back laying with its 92% of the reference costs.

Taking the benefits of the improved insulation into consideration costs for the Twin-system would reduce to 71% of the reference.

In this report the technical specialties of the two techniques are described and possible savings are demonstrated.