Whitepaper

Engineering functionality

J.T. van Wijnkoop

Awareness of the total costs of heating & cooling networks is rapidly increasing. Optimisation and smart designs offer more options and choices to important added value. Thermaflex focusses on minimizing "total cost of ownership" and maximizing the speed of implementation of these networks. A support program for innovative network design, available to all professional designers/engineers, offers the right solution/tool in combination with Flexalen network concepts.

Starting in 1976 as a manufacturer of insulation materials, Thermaflex has since built extensive knowledge in creating highly efficient and sustainable thermal distribution networks. This has driven innovations to develop optimal solutions, anticipating the markets' needs.

In addition[1] to the published papers for the DHC congress in Tallinn in 2010[2], Thermaflex has continued to look for smart network solutions. As minimising the thermal energy losses was the main topic of the congress in 2010, the addition is now sought in the total energy consumption of thermal networks for heating and cooling. By looking at all required energy requirements, both thermal, the energy losses, and electric, required for the pumps, Thermaflex is now also able to fully integrate the usage of the network in the optimisation. This, of course, includes the usage of the connected buildings and seasonal changes.

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[1] Especially paper 4: Heat loss analysis and optimization of a flexible piping system

[2] In cooperation with Liandon, Thermaflex published 5 papers at the '12th International Symposium on District Heating and Cooling, September 5th to September 7th, 2010, Tallinn, Estonia' (click for link):

Paper 1: Verification of heatloss measurements, *J.T. van Wijnkoop*$_1$*, E. van der Ven*$_2$, $_1$ Liandon B.V, $_2$ Thermaflex International Holding B.V. (click for link)

Paper 2: Heat loss of flexible plastic pipe systems, analysis and optimization, *EJ.H.M. van der Ven* $_1$*, R.J. van Arendonk* $_2$, $_1$ Thermaflex International Holding B.V , $_2$ Liandon B.V. (click for link)

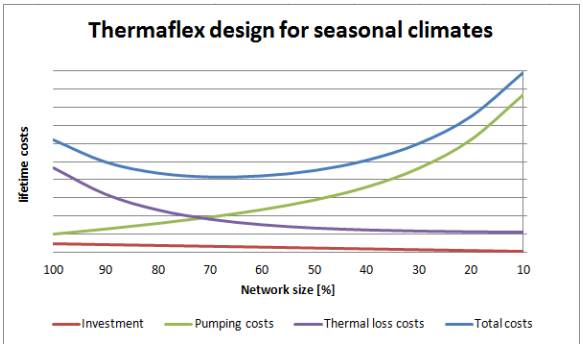
Paper 3: Comparison of competitive (semi) flexible piping systems, *I.M. Smits*$_1$*, J. Korsman*$_1$*, J.T. van Wijnkoop*$_1$ *and E.J.H.M. van der Ven*$_2$, $_1$ Liandon B.V., $_2$ Thermaflex International Holding B.V. (click for link)

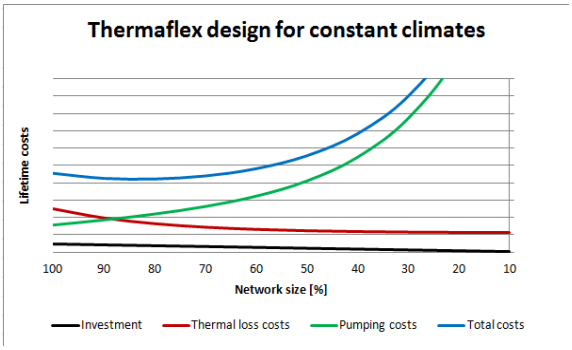
Paper 4: Heat loss analysis and optimization of a flexible piping system, *J. Korsman*$_1$*, I.M. Smits*$_1$ *and E.J.H.M. van der Ven*$_2$, $_1$ Liandon B.V., $_2$ Thermaflex International Holding B.V. (click for link)

Paper 5: Paper 5 New economical connection solution for flexible piping systems, *C. Engel, GJ. Baars,* Thermaflex International Holding B.V. (click for link)

Engineered for geographic location and climate

The usage of thermal networks strongly varies depending on the climate of their location. For instance a cooling network in a tropical climate will run at a higher load factor than a heating network located in a climate with clear seasonal changes. This difference in operation is reflected in the total cost and therefore can be an optimisation criterion. By looking at the usage, the most effective balance can be determined between investment, thermal losses and required pump energy as shown in the graph below.

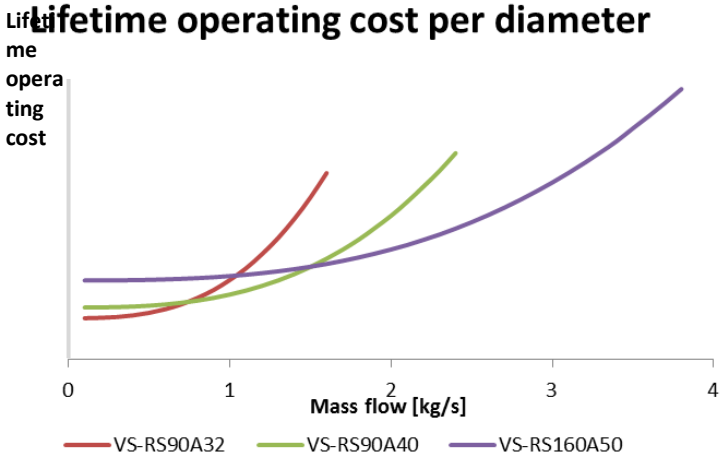




In the graphs the basic idea for the design philosophy is shown. The more constant the climate and therefore energy demand, the more efficient a larger dimensioned network will be. Where there is a huge difference between the summer and winter, a smaller dimensioned network will result in a lower cost of operation. For each project several scenario's can be worked out.

Designed to stakeholder wishes and requirements

Designing the most effective network starts with calculating the most efficient mass flow per diameter under the specific cost circumstances, combining thermal losses, pressure drop and initial investment for every pipe size with local energy prices. This way it is clear which size to use for all mass flow situations in the main branch of the network. After the main branch is dimensioned, the sub-branches are added matching the main branch pressure drop, so that no additional energy is required.



The input for this way of pipe selection can also be based on emissions, which enables the design of a Flexalen network with the lowest possible carbon footprint. The specifications per meter product are becoming of secondary importance when looking at the network as a whole (holistic), because when looking at the total cost of ownership, alongside long term sustainability, it is the bigger picture that counts. Network designs can therefore be based on entire functionality, not just products, and take benefits for all stakeholders into consideration.

Implementation is just as important as a good design.

Apart from network design, the realisation phase of projects is just as important. Implementing optimal performing systems, in the shortest possible time, at the lowest cost of ownership is key.

In the realisation phase of the project, a large difference can be made by integrating the beneficial product specifications in the initial design. For instance, the shortest routes and minimal number of connections are chosen from step one. Combined with extensive prefabrication and work preparation, this leads to the shortest and fault free realisation of the project.

From the start of implementation, the benefits already start to surface in terms of investment returns, significantly reducing the payback period of the network.

In close cooperation with customers, installers and engineers, an optimum balance is sought between the initial investment costs, network parameters, implementation time, contribution of benefits, and exploitation costs.

Further information:

Questions concerning the paper can be addressed to:

Thermaflex International Holding B.V. Veerweg 1
5145 NS Waalwijk
The Netherlands

www.thermaflex.com