



## Purmerend's district heating resurrection at steep returns

### NEW 'SLIMNET' FOR 4,000 HOMES IS BLUEPRINT FOR THE FUTURE

In September 2015, the multiannual renovation project for 4,000 homes concluded for the city of Purmerend, the Netherlands. The cooperation between Thermaflex and local district heating company Stadsverwarming Purmerend saw the successful end of SVP's 'SlimNet' program, aimed at reviving Purmerend's deteriorated district heating network. The network could be fully re-engineered, and renovated with Thermaflex' smart, and sustainable Flexalen plastic piping system. Annually, heat losses have been cut by the equivalent consumption of 1,400 homes, water losses by the equivalent of 7 Olympic-sized pools, and the number of unplanned reparations by 84%. The power of innovation for the renovation of the 4,000 residential buildings lay in the co-creation of all parties involved.

Purmerend, a Dutch city with about 80,000 inhabitants, is situated just north of Amsterdam. In 1981, the local municipality started the construction of a district heating network under the newly established Stadsverwarming Purmerend. The project coincided with a decade of extensive new construction projects in the city in order to accommodate the overflow from Amsterdam. As was quite common in the 80's, a steel pipe system was chosen for the construction of the heating network, using insulation shells for the insulation of the entire system, solely aimed at minimizing heat loss. The total investment for the district heating network accounted for a lifetime of 25 years.

#### Sticky situation

Purmerend is situated in an area with a high groundwater table. From time to time, water exposure exists in the crawl spaces underneath many of the residences. This moisture would be absorbed by the insulation sheath of the piping system. The drenched insulation material really took the wind out of the sail for the expected heating efficiency. *"But that wasn't the biggest problem"* says Martijn van Lier, Technical Manager at SVP, the moisture had a disastrous effect on the steel pipes. Serious corrosion occurred much earlier than expected. More and more we started to experience breaks and leakages in the system. Every year we had to intervene more frequently to carry out emergency reparations. The originally expected lifetime appeared to be an illusion.

SVP's research in 2007-2009 concluded that the network showed uncontrolled hydraulic characteristics and steep heat and water losses. On top of that, the reparations that were carried out proved unsustainable due to the general deteriorative conditions of the steel pipes. The declining heat system not only caused rising costs for SVP, but especially also

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caused ever-increasing damage and discomfort for its 25,000 costumers. There were districts where disruptions took place more than 10 times in a short period of time. This was often the case during the cold winter months, when the heat supply for residences was sincerely needed. *Van Lier: "Sure, residents show understanding for an incidental disruption. But in large parts of our system the situation was running out of control. We had to take action, because this way the continuity of the district heating was at risk."*

In 2009, an emergency plan was drafted. A complete renovation of the heating network for 4,000 residences in the period of 2010-2015 was crucial.

### **Limited time, limited space**

The work situation was a whole different ballgame from the original district heating network. This time, there wouldn't be a new construction, but a complete renovation of an existing situation. All the houses were inhabited, so the proceedings were to be set within the shortest possible timeframe. On top of that, the crawl spaces beneath the houses are extremely small (less than a meter tall with a very narrow entry). An installer is supposed to conduct his works while lying down under physically quite strenuous conditions. Minimal connection work underground and inside the residences were key among SVP's wishes.

An exploration for the alternatives failed to provide SVP with a ready-made solution. In 2009, not one product appeared to be available that was precisely cut out for the job. *"In our situation, a plastic piping system was recommended. It is highly resistant against humid conditions, and can also be delivered in long lengths. This was an important asset in our existing environment so as to minimize the disturbance for the residents" declares Van Lier.*

### **All-in-one**

SVP got to talking with Thermaflex, a Dutch producer of distribution systems for thermal energy. Together with Eneco, one of the largest energy suppliers in the Netherlands, Thermaflex had started the renovation of the Schollebaar district in Capelle aan de IJssel. The Flexalen plastic pipe system was being installed there for the heat distribution. SVP could identify well with Eneco's situation. This initiated talks with Thermaflex.

What characterizes the Flexalen piping system is that it's an all-in-one solution, including the readily insulated Polybutylene (PB) pipe with Polyethylene foam (PE). Important properties are the flexibility of the pre-insulated pipe and the fact that PE does not absorb moisture. This system thus largely fulfilled SVP's needs, yet it lacked just a few more elements. How would the work be conducted in the hardly accessible parts of the residences? There was a desire to minimize the number of connections needed. Wouldn't it be possible to make the connections in advance, so that on-site operations would be much less?

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## In comes the prefabricated T-connection

The Research & Development department at Thermaflex developed the solution: a new prefabricated T-connection for the branches of the piping system. The innovative concept was patented in 2009 under the name 'Flexalink'. This type of connection is custom-fit in the factory, sealed and 100% tested. The labor-intensive tasks of making and testing on-site connections now belonged to the past. This proved an interesting solution for the complex conditions beneath the houses, and for the situation in Purmerend as a whole. The installer, A.Hak Infranet, was prepared to adopt this new system for the implementation of the renovation project.

Because of the cold Dutch climate, there was no option to shut down the heating system from October to April for its renovation. The viable months were thus limited to just 5, from May until September. The plan was to renovate around 700 homes annually at a rate of 40 per week. The largely prefabricated piping system was put to great use by A.Hak Infranet, the installer. Soon, the installers reached peaks of 55 homes per week – the evidence that good planning in combination with largely prefabricated network sections really pays off. Schedules were kept tight, and deadlines were easily met.

## District Heating 2.0

SVP used the renovation to completely redesign the network. An ideal composition was made for each residential district to maximize returns. *"We didn't just look at the parts to be replaced, but used the opportunity to redesign the complete district heating network. Thermaflex' pipes have smaller diameters, but secured much greater heat returns compared to our old steel system. This way we were able to lower the nominal pressure with almost 1 bar. This meant less water was needed in the network and very attractive energy savings. For our new innovative heating network, we came up with a suitable name: SlimNet"* Martijn explains.

The short production period in between May and September, in combination with renovating the existing environment, posed some serious planning challenges. A section of approximately 40 houses would be simultaneously dealt with. On the basis of the engineering design, Thermaflex was able to always produce the exact necessary material volumes, including the detailed engineering of the readily connected T-pieces. The materials would always be delivered just in time and in conformity with the work schedules. All elements that were to be installed were readily provided with labels that corresponded to the design drawings.

## Raising a crucial support base

Apart from the technique and strategic work planning, special attention was also paid to the communication with the residents and the city. The approval ratings for district heating had sunk to a deep point as a result of the many system failures. Now came a renovation project that would cause even more disturbance. Van Lier: *“We had to tread very carefully. Communication had a key role in this project. That’s why we drafted a communications protocol with a tasked role for the contractor. Every client would be personally visited and informed about the constructions. To gain support, we made sure that every resident would be secured with an emergency hot water supply during the construction works. With full transparency, we illustrated the plans and kept well to our promises. That approach really worked.”*

The fear of grumbling costumers did thus not materialize. Word went around quick that street renovations finished in no time and that, although the in-house construction works were thorough, the execution wasn’t so bad. The residents reacted positively, also because their living comfort improved immediately after delivery. This way, support among the customers grew beyond expectations. This was a critical condition for a successful multi-annual project.

## Facts & figures

4,000 customers out of 25,000 in total have been connected to the new and improved district heating network. The preparation of pre-fabrications went further. Thermaflex and installers have even demonstrated the connection of an entire street in just a single day. From digging the trench in the morning, to rolling out the prefabricated network and connecting the homes, to closing the trench by the end of the day, securing access for citizens again in the evening.

With SlimNet, returns have risen steeply since 2010. Assessments carried out by SVP demonstrated tremendous improvements between 2008 and 2014. Heat losses were cut by almost 10% (from 427,155 GJ to 388.155 GJ). The water supply saw a spectacular reduction by 50% (from 32,683m<sup>3</sup> to 16,840 m<sup>3</sup>) – a direct consequence from the decline in leakages. The amount of unplanned maintenance was also strongly cut by 84% (from 120 in 2008 to 19 in 2014), this of course excludes the renovation itself. The total performance results will in fact be much higher, as the renovation of the latest series of 700 homes last summer has not yet been taken into account. These results can be fully ascribed to the implementation of SlimNet in the renovated parts of the heating network.



## **SlimNet: blueprint for the future**

Stadsverwarming Purmerend has been active since 1981 and supplies over 25,000 users of residential heating and hot water. During the renovation period with SlimNet, SVP invested in a new woodchip-fed biomass plant based on timber extracted from the Dutch forests. The plant has a capacity of 44 MWth and ensures a clean and sustainable heat supply for the citizens of Purmerend.

*“The renovation of these 4.000 residences was a crucial rescue. We will also tackle the other residences over the next few years, but that runs along our regular maintenance scheme. This co-created solution in combination with the new working method result will be continued. SlimNet will remain to be our blueprint. The new biomass plant and the strongly risen returns have put SVP back on the map. From a problem child in district heating in the Netherlands, we are now regarded as an innovative trendsetter. We’ve become a model for the future” van Lier proudly reveals.*

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