Introduction of building-specific heat distribution centers

May 26 2016

Introduction of building-specific heat distribution centres would bring improved efficiency, savings and lower emissions to Chinese district heating

VTT Technical Research Centre of Finland Ltd and Nuorkivi Consulting analysed the suitability of Finnish heat distribution centres for Chinese conditions. China, which is already the world's biggest user of district heating, currently uses traditional joint district heating centres. China could benefit from energy-efficient and better functioning district heating. Introduction of building-specific heat distribution centres would result in 10-20% savings in energy costs and reduction in CO2 emissions.

Building-specific heat distribution centres are not very well known in China. The World Bank implemented a pilot project on district heating in the Liaoning Province in China, where almost a hundred building-specific district heating centres were installed in ten sites.

The Chinese Ministry of Housing, Urban and Rural Development (MoHURD) requested Finland to analyse the results and draw up a handbook on building-specific district heating centres to support the heating reform currently being promoted by MoHURD. VTT and Nuorkivi Consulting took advantage of the results from the EUR 360-million project that the World Bank funded in 2014-2016.

China would benefit from energy-efficient and better functioning district heating

The use of building-specific heat distribution centres allows direct distribution of heat to buildings and building-specific adjustment of heating. The benefit is that the long delay between the joint distribution centre and separate houses is eliminated. Water flow is also reduced by 60-80%, which significantly reduces pumping expenses. In addition, the traditional method is prone to corrosion, because water rich in oxygen can enter the secondary pipeline after the joint distribution centre. These problems are eliminated and the service life of the system can be extended, because a primary network ending at a building-specific heat distribution centre is a closed system.

The buildings must be equipped with radiator-specific thermostatic valves in order to enable functioning of building-specific heat distribution and adjustable flow rate pumps in old buildings. The radiator can thus be adjusted according to heating requirements and the pump according to the need for water circulation.

Savings in investments and operating costs

In the pilot projects, it was observed that building-specific heat distribution centres produced major savings in energy consumption compared to the traditional Chinese district heating system based on joint distribution centres with 2 to 6 pipes and 30 to 40 houses connected to the network. The use of building-specific heat distribution centres saves investment costs on district heating networks, because only two pipes are needed instead of several. "We estimated that, depending on the method of implementation, 10-20% of energy can be saved," says Kari Sipilä, Principal Scientist at VTT.

The change would also save coal and electricity, and reduce CO2 emissions.

When the heat distribution system is changed to a building-specific one, the investment costs increase 2.5-fold compared to those of joint distribution centres. Savings can however be achieved by optimising the network in such a way that the overall costs of the building-specific system can be even lower than when using a traditional construction model. As the operating costs of a building-specific system can be lower or at most the same as those of a traditional joint distribution centre, the life cycle costs of a building-specific system can be significantly lower. The investments made divided by the savings achieved annually, when calculated without interest, place the payback period at approx. 6.5 years, which may well vary from case to case.

On the basis of the results obtained, the World Bank is in the process of launching a continuation project in Hebei Province. "Our goal is that Finnish companies would be involved in the implementation of these projects. This is a great opportunity. We must have good technical competence and a competitive price level," Kari Sipilä emphasizes.

The project was funded by Finnish Energy, Finpro - Beautiful Beijing, the City of Turku, Alfa Laval Nordic Oy, Högfors Valves Oy, Kolmeks Ltd, Enoro Oy, Oilon Oy, Vexve Oy, VTT, and Nuorkivi Consulting.

The results have been compiled into a publication that has also been published in Chinese. Minister Kimmo Tiilikainen handed over the report in China in March 2016. The Chinese ministry MoHURD distributes information on the project to such organisations as engineering offices and district heating companies in the area of Northern China.

More information: www.vtt.fi/inf/pdf/technology/2016/T250.pdf