

Modelling and numerical simulation of district heating networks with time-saving solution methods

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Abstract

The main aim of the project is the thermo-hydraulic calculation of district heating networks with an incompressible feed medium by time-saving numerical methods. The modelling of the hydraulic and thermal relations of the various components of the heating network are based on earlier studies on this topic. Graph-theoretical methods are used to describe the topology of the heating system, in which spanning trees play a crucial role. The solution concept is based on sparse-matrix techniques with special data structures, which have been fitted to the particular problem. The main interest of the district heating supplier is a long-time simulation of the heating network combined with an optimization of the heat distribution and the producer's service. They are important for the power station to plan things like fuel supply and intervals of maintenance more efficiently. In the already existing computer codes an arising problem was the need to accelerate the simulation in order to obtain results in an acceptable amount of time on common computers.

The obtained simulation tool makes the calculation of the system states in acceptable short times possible. Furthermore, it approaches more realistically the behaviour of the heating system by considering a time-dependent consumer demand (heat load). Questions regarding the main operation and the flow time behaviour of the heat distribution of the system are also examined.

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