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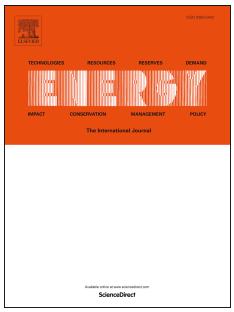

Experimental validation of heat transport modelling in district heating networks

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Experimental validation of heat transport modelling in district heating networks.

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Abstract

District heating networks (DHN) are generally considered as a convenient, economic and environmental-friendly way to supply heat to a large amount of buildings. Some modelling methods are required to consider the dynamic behaviour of district heating networks to design them correctly, spare the investment costs and limit the heat losses related to the use of a too high operating temperatures. For the same reasons, the DHN control or retrofit of installations also requires the assessment of the DHN dynamic behaviour. To achieve this, the heat transport in DHN, which is one of the key issues in the behaviour of a whole centralized heating system, has to be correctly modelled. Previous work evidenced current limitations of one dimensional finite volume method to model heat transport in pipes and proposed an alternative method considering the thermal losses and the inertia of the pipes. The present contribution intends to experimentally validate this model on a test rig available at the Thermodynamics laboratory of the University of Liège (ULg, Belgium) and on an existing district heating network. For both experimental facilities, the current model shows good agreement between the experimental data and the simulation results for a large range of water velocities. Moreover, it is shown that the thermal inertia of the pipe has a significant influence on the outlet pipe temperature profile.

Keywords: District Heating Network, DHN, pipe, dynamic simulation, heat transport, experimental validation.

1. Introduction

District heating networks (DHN) appeared in Europe since the 14 th century (in France) [1] and they have been developed since 1950 [2]. Nowadays,