

Comparison of a usual heat-transfer-station with a hydraulic modified version under the aspect of exergy saving

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Abstract

In this investigation, a usual heat-transfer-station (HTS) with a domestic warm water (DWW) storage is compared with a modified, more advanced HTS, where the DWW storage is used for further cooling of the primary return of the district heating network (DHN). The question posed in this article is, whether a slight change in the hydraulic system and control strategy can profitably reduce the return temperatures in periods with space heating.

Especially in rural areas with a low specific heat demand, the economical operation of DHN is challenging. To cope with this challenge, this paper focusses on non-retrofitted single-family homes as heat consumers, which accounts for a high proportion of houses in rural areas. The return temperatures are a decisive factor for reducing heat losses and improving the overall efficiency. The hydraulic setup of a HTS has a great impact on the level of return temperatures. The question will be answered on an exergetic basis and a comparison of the return temperatures.

In the research article, the hydraulic system of the advanced HTS is described. The simulation models are built for an initial simulation-based estimation of the advantage of the advanced heat-transfer-station and are modelled with *Modelica*. The heating and DWW demand is taken from the VDI 4655 profiles.

For a fair comparison of the both HTS, the same state of charge should be ensured. It can be shown that the HTS, which uses the return temperature of the heating system for preheating the DWW, can almost satisfy the DWW demand by charging from this return flow.

In the outlook, the further steps for this comprehensive investigation are described. Therefore the research article refers to current research of DHN simulation with *Modelica* and Hardware-in-the-Loop simulations.