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Heating and cooling with paraffin-water mixtures

Determining the potential uses and limits of PCM fluids

There is now an alternative to using water as a heat transfer medium in district heating and building systems: fluids consisting of a paraffin-water mixture. These offer theoretically higher heat capacities in a narrow temperature range than water. However, until now there has been a lack of calculations and experience in terms of their practical use. The BINE-Projektinfo brochure “Designing heat distribution with slurries” (18/2015) presents the results of basic measurements and simulations with the new heat transfer media. This now enables the mixtures to be better characterised and potential applications to be revealed.

The researchers simulated and calculated the use of PCM (Phase Changing Material) fluids for a district heating network, a single family home with underfloor heating, a cooling ceiling, a solar thermal system and a heat pump system, and tested the fluids experimentally. The assessments took into account not only the higher thermal capacities relative to water but also factors such as the impact on the pump output, supply and return temperatures, heat losses and the exergy efficiency. The studies showed under which conditions PCM fluids reach their limits and which prospects they offer. Promising applications include their use in cooling ceilings and district heating networks. PCMs utilise the latent heat that is released when a material changes its physical state (e.g. solid → liquid).

By changing their composition, PCM fluids can be specifically adjusted to meet the requirements of the respective application area. This enables them to be potentially used in a temperature range between minus 20 and plus 110 °C. This research project was a collaboration between the E.ON Energy Research Centre at RWTH Aachen University and the Fraunhofer Institute UMSICHT.

The BINE-Projektinfo brochure, which can be obtained free of charge from the BINE Information Service at FIZ Karlsruhe, is available online at www.bine.info or by calling +49 (0)228 92379-0. The brochure cover and additional images can also be downloaded from this web portal in the press section.

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