

HEAT TRANSFER CAPACITY OF A HEAT EXCHANGER MODULE FOR SEASONAL HEAT STORAGE

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Theoretical investigations have shown that a solar heating system with a collector area of 36 m² can fully cover the yearly heat demand of a low energy house in Denmark if the solar heating system is based on a 6000 l seasonal heat storage with sodium acetate trihydrate (SAT) supercooling in a stable way. The heat storage is divided into a number of separate modules. A sandwich heat storage test module has been built with the phase change material (PCM) storage box in between two plate heat exchangers. The plate-heat-exchange at the top of the PCM storage box is used for discharge of the module while the plate-heat exchanger at the bottom is used for charge of the module. The test module has a length of approx. 2060 mm and a width of approx. 1330 mm. The height of the plate heat exchangers is 13 mm. Fluid flow in the plate heat exchanger is regulated by a number of parallel baffles.

Thermal experiments have been carried out to investigate the heat exchange capacity from and to the PCM module. Fluid flow and heat transfer in the test module are theoretically investigated by Computational Fluid Dynamics (CFD) calculations. The heat transfer rate between the PCM box and the heating fluid/cooling fluid in the plate heat-exchangers is determined. The CFD calculated temperatures are compared to measured temperatures. Based on the studies, recommendations on how best to transfer heat to and from the seasonal heat storage module are given.