

# Investigation of cold storage using phase change material

## Graduate



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**Initial Situation:** Due to fluctuating and rising energy prices, the demand for storage options is increasing. Especially in Denmark are the energy prices during the summer higher than in the winter. Data centres are facing their main energy demand during summer. Due to these reasons, they are looking for solutions to store cheap energy.

The aim of this thesis is to test a new model of a PCM cold storage, which is used for cooling of data centers. For this purpose, a variable heat source and heat sink and a monitoring system was used. Tests were conducted and analysed regarding key performance parameters such as thermal power supply to and from the storage as well as its energy content.

**Approach:** First a literature study of different applications of PCM cold storages was carried out. Afterwards the test setup was prepared for the test cycles. This includes testing the measurement equipment, connecting the storage with the test set up, building the insulation layer and filling the storage with PCM. Once this was done, the test cycles began. Finally, the data were analysed.

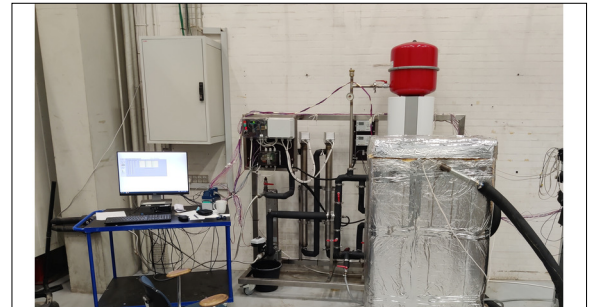
**Result:** Different applications of PCM storages are already available on the market or are under development.

The measured energy content of the investigated storage, when heated up from 10 °C to 25 °C amounts to 15 kWh.

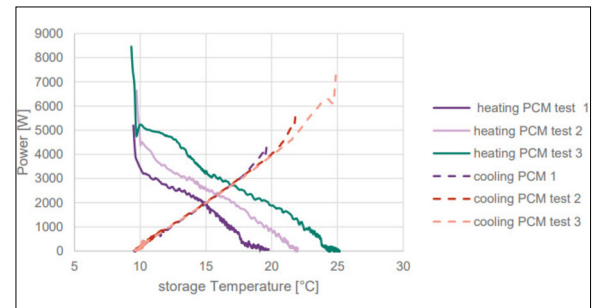
The UA-Value of the heat exchanger is 450 W/K at a flow rate of 13.3 l/min.

Subcooling depends on how much the PCM was heated up and it is bigger than described in the datasheet of the PCM.

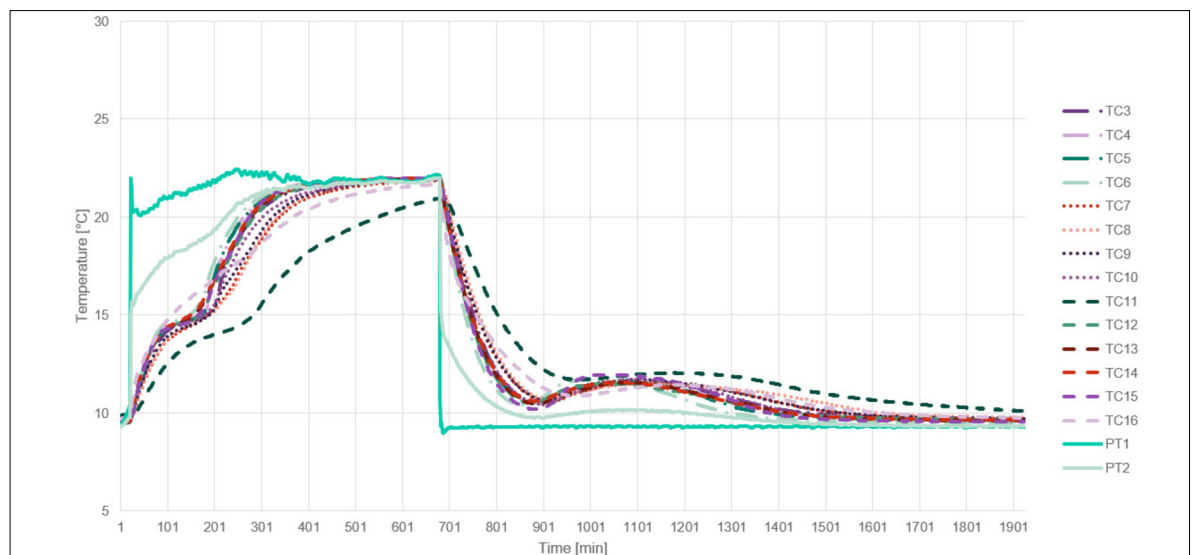
**Test set up with storage**  
Own presentation



**Power curves**  
Own presentation



**Temperature curve of PCM test cycle 2**  
Own presentation



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**Subject Area**  
Thermo- and  
fluidynamics, Building  
technology, Building  
physics, General  
energy technology