

CREATE project

Compact RETrofit Advanced Thermal Energy storage - An economically affordable, compact and loss-free heat battery for existing buildings.

The CREATE project is a research project funded by the European Commission under the Horizon 2020 programme. The consortium consists of eleven partners from eight different European countries and it is led by AEE – Institute for Sustainable Technologies. The project started in October 2015 and will last till September 2019.

The main aim is to develop and demonstrate a heat battery, i.e. an advanced thermal storage system based on Thermo-Chemical Materials (TCMs), that enables economically affordable, compact and loss-free storage of heat in existing buildings. In this manner, the CREATE system will be able to store surplus of heat from summer to winter.

DEVELOPMENT OF THE CREATE SYSTEM

A database of approximately 600 hydrate reactions of salt hydrates was created in order to select a the most suitable material for the Thermo-Chemical Material. Based on characteristics such as energy density, charging and discharging temperature, the salt potassium carbonate (K_2CO_3) was selected as the preferred TCM for the CREATE system. More than twenty different TCM composites of K_2CO_3 were manufactured on lab-scale and extensively characterized. The composite with the highest energy density in particle beds was selected for further upscaling. A production run of 100kg batches was successfully performed, proving that industrial production is within target range.

The entire system is based on seasonal storage of solar energy. The heat storage process is possible due to dehydration (discharging) and hydration (charging) of the salt in a closed system under vacuum. Heat from the solar collector is used to dehydrate salt while water vapour is released, condensed at evaporator/condenser (EC) unit and stored in the water reservoir. In winter, the water from the water reservoir is pumped to the EC and evaporated there. Then the vapour is flowing to the salt and the salt is hydrated.

PROJECT PROGRESS

The most challenging part of the project proved to be handling of the volume expansion/shrinking of the salt during the hydration and dehydration process and the provision of constant heating power.

So far, the main project's achievements revolved around (i) improvement of the salt performance such

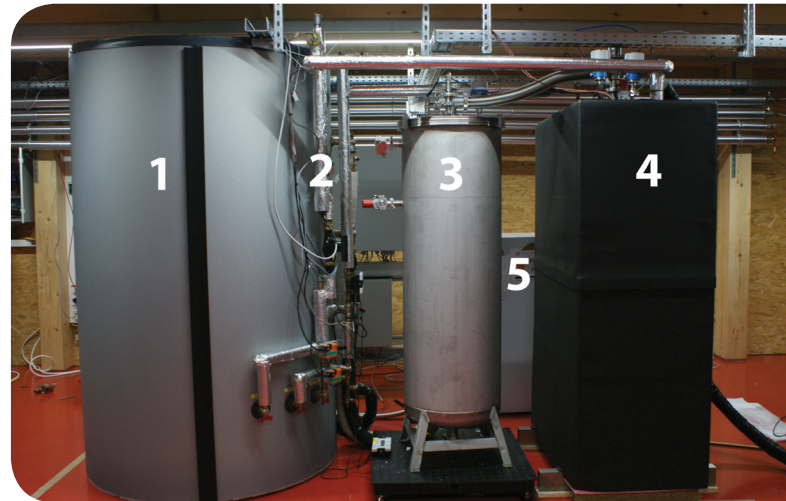


Figure 1: The test set-up for experiments with one CREATE storage module. Buffer storage tank, 2. Heating rod, 3. Evaporator/Condenser (EC), 4. Storage module, 5. Heat pump

as power, stability and energy density; (ii) development and optimization of a prismatic shaped absorber vessel to improve stackability and space requirements; (iii) development and optimization of low-cost evaporator/condenser; and (iv) optimization of the full-scale system on basis of lab experiments and annual simulation.

DEMONSTRATION

Implementation of the CREATE concept is foreseen in typical European dwellings. To demonstrate the applicability of the thermochemical storage solution and its operation in real-life conditions as well as to receive an early user feedback, the CREATE system will be installed in a full-scale into an orphanage in Warsaw, Poland. The climate at the location is characterized by cold winters and warm summers. The demonstration is planned to start in summer 2019. ●

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