INVESTIGATION OF BEESWAX THERMAL PROPERTIES FOR HEAT ACCUMULATION

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Nowadays, the most common substance for heat accumulation is water. Accumulated heat quantity can be increased by increasing the water temperature or enlarging the accumulation tank size. Increasing the water temperature the heat losses increase and the system efficiency decreases and it cannot be done in all situations, for example, increasing accumulation tank sizes cannot be done because of limited place or admissible weight.

The aim of the research is to increase the accumulated heat quantity using phase change heat of beeswax. In practice several phase change materials (PCM) are known, such as: paraffin, fatty-acids, organic and inorganic salt hydrates, organic and inorganic eutectic compounds. [1, pp. 59] Theoretically isotherm heat storage, in accordance with phase change temperature can be achieved by these materials.

The conditions of using phase change materials are: relatively high latent heat, high heat conductivity (more than 0.5 W/m°C), and the material melting temperature should be in the functional interval (30°C < T < 90°C), congruent melting, minimal supercooling, chemical stability, economic efficiency and aspects of environmental protection. [2, pp. 253] In the course of the experiments some phase change materials were examined. The specific heat at the solid and liquid state, phase transition temperatures, crystallization-decrystallization heat quantity and thermal linear expansion coefficient were determined for beeswax in the experiments.

To determine phase change heat experimental equipment was built. The temperature was measured using the Picotech TC-08 thermocouple data logger which was connected to computer. Specific heat and phase transformation heat were determined using the acquired temperature chart. To use beeswax in accumulation tanks also the coefficient of expansion should be known. The coefficient of

expansion was determined measuring the volume changes at heating and phase transition time.

Reference

1. Watanabe T., Kikuchi H., Kanzawa A., Enhancement of charging and discharging rates in a latent heat storage system by use of PCM with different melting temperatures, Journal of Heat Recovery Systems, (1993), pp. 57—66.
2. Zalba B., Marin J. M., Cabeza L. F., Mehling H., Review on Thermal Energy Storage with Phase Change Materials, Heat Transfer Analysis and Applications Applied Thermal Engineering, (2003), pp. 251—283.