ANALYSIS OF THERMAL BEHAVIOUR OF THE THERMAL STORAGE UNITS FOR SUBSTANCES WITH PHASE CHANGES

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ABSTRACT

The Phase Change Thermal Storage Units (PCTSU) are constituent parts of heating / cooling installations using heat carriers prepared by traditional or solar heating / cooling systems. The paper introduces the mathematical model specific to the phase change process specific for the most representative geometrical forms: plane, cylinder and spherical. The analytical solutions obtained are specific to heat transfer in the variant of heat carrier temperature variation in time and space as well as in the simplified variant of heat carrier uniform temperature. For practical reasons the solutions presented as calculus examples are approximated by linear functions of temperatures as against $\beta$ parameter defined according to the substance specific heat and to the phase change latent heat. Starting from the analytical solutions the paper introduces engineering dimensioning methods of PCTSU using phase change front average propagation velocity and the heating carrier flow regime.

Key words: phase change, latent heat, phase change front, process length, dimensionless numbers