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EXPERIMENTAL STUDY OF AN ANNULAR PCM STORAGE FOR LOW TEMPERATURE APPLICATIONS

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PURPOSE OF THE ABSTRACT

Thermal energy storage technology using phase change materials (PCM) has a great interest in the valorization of untapped energies. If the optimization of heat transfer (by convection and/ or by conduction) is a recurring problem for thermal engineers, the phase change of the PCM requires advanced research to understand aim better the thermal energy storage in PCM materials, which is a key step in developing a latent storage system. The purpose of this work is to achieve an experimental study to understand and analyze multiphysics phenomena of phase change and their influence on the behavior of the regenerator. Therefore, an experimental prototype with A shell and tubes exchanger has been developed using RT 55 PCM wax. This technology seems promising for our application for the production of hot water. The results obtained have shown that a charge / discharge cycle includes for phases. During charging, the injection configuration modifies the behavior of the PCM melting edge, by injecting the heat transfer fluid through the bottom of the heat exchanger. During the discharge, the injection side has low influence on the thermal fields, the advance of the solidification front. Additionally, Thermal exchange with ambient air is an important parameter in the design of an MCP regenerator. Furthermore, due to the gravitational field and the presence of convective effects, the horizontal configuration provides a considerable decrease in the full melting time of the PCM compared to the vertical case. The solidification process further is much slower than the melting process.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

Thermal energy storage | Latent heat | Phase change material

BIBLIOGRAPHY