Title:	Numerical Study of Natural Convection Heat Transfer in A PCM Rectangular Storage Unit with Horizontal Pipe
Authors:	Maher Al-Maghalseh & Professor Khamid Mahkamov ¹ Faculty of Engineering and Environment, Northumbria University, Newcastle, UK E-mail: maher.al-maghalseh@northumbria.ac.uk
Abstract:	A numerical investigation has been carried out to determine the heat transfer coefficient by natural convection during melting process of Phase Change Material (PCM) in Latent Heat Thermal Energy Storage System (LHTESS). The storage unit consists of a rectangular container with a horizontal pipe and PCM filled around the pipe. Paraffin wax with melting temperature 60 °C was used as a PCM in the investigation because it is appropriate for low temperature thermal storage applications. ANSYS/FLUENT software was used in simulating three dimensional models of temperature distribution, melting fraction, and flow fields during the melting process. The temperature variation of the PCM is presented as a function of time as well as the heat transfer coefficient as a function of the temperature difference. Numerical correlations were obtained, presenting the dimensionless Nusselt number as a function of the Rayleigh number for natural convection of PCM during melting process.

KEYWORDS: PCM; thermal storage system; paraffin; solar energy, natural convection.