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Registering as: Presenting Author

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Presentation Title: ‘‘Experimental validation of a CFD model for spiral Ground Heat Exchangers’’

Abstract (max 300 words):

With the recent advancement of Renewable Energy Systems, one such expression – Shallow Geothermal Energy – frequently finds application in the form of Ground Source Heat Pumps (GSHPs). GSHP systems are used for space heating and cooling via tubes directed into the ground. Vertical Ground (or Borehole) Heat Exchangers (GHEs) with different configurations (mainly of U-tube, double U-tube type) extract or reject heat into the ground. Spiral or Helical type GHEs have been introduced as an alternative to reduce the depth and hence the cost of GSHP systems. It was only recently that such GHEs have been used in the foundation piles, identified as Energy Piles. Energy piles are reinforced concrete foundations with helical pipes whereby the buildings foundations are utilized to provide space heating and cooling. In general, the sheer experimental set-up and testing of a GHE is expensive and time consuming, therefore computational investigation is preferable. To

this end the current paper introduces a three-dimensional mathematical model using the COMSOL Multiphysics software, based on the convection-diffusion equation. The related parameters are adjusted to present actual parameters taken from experimental data. Hence, the computational model is validated against available experimental data. The validated model is subsequently adapted to match the Mediterranean conditions in Cyprus. An investigation of the important implications of the design of GHEs, such as variable pitch length and spiral tube length is also conducted.

Topic: Hydroelectricity, Geothermal & Solar Energy

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