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COMPUTATIONAL INVESTIGATION ON THE EFFECT OF VARIOUS PARAMETERS OF A SPIRAL GROUND HEAT EXCHANGER

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ABSTRACT

Shallow Geothermal Energy, a Renewable Energy Source, finds application through Ground Source Heat Pumps (GSHPs) for space heating/cooling via tubes directed into the ground. Vertical Ground Heat Exchangers (GHEs) of various configurations (mainly U-tubes) extract/reject heat into the ground. Spiral type GHEs constitute an alternative to reduce the depth and hence the cost of GSHP systems. Such GHEs are used in energy piles, which are reinforced concrete foundations with helical pipes whereby heating/cooling is provided. Testing GHEs through experimental set-ups is expensive and time consuming. Hence, a computational investigation is preferred. To this end the current paper introduces a 3D mathematical model, based on the convection-diffusion equation, in COMSOL Multiphysics. The related parameters are adjusted, and the model is validated, against experimental data. The validated model is subsequently adapted to match the Cyprus moderate Mediterranean conditions. A parametric investigation of the important implications in the design of GHEs is also conducted.

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