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NUMERICAL ANALYSIS OF THE UNDERGROUND WATER FLOW ON THE BOREHOLE HEAT EXCHANGERS PERFORMANCE

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The key issue in the designing borehole heat exchangers (BHE) is the long-term performance of the system. The performance directly reflect the economical profitability and depend on large number of construction and working parameters.

The objective of present work is to performed long-term analysis of the BHE focus on the effect of the underground water flow on the borehole heat exchangers performance.

The mathematical model of the flow and heat transfer in borehole heat exchanger and surrounding area has been constructed. For present study the underground water flow has been model in 10 or more meter thick horizontal layer located at few tested levels under surface. Four flow speeds has been considered. Flow speed of U_g=2,0; 20,0 and 200,0 m·year^{-1}, and 1.0 m·h^{-1} which represents all range types of flow diffusion dominated, mixed flow and convective dominated flow. Because presented system depend on large number of parameters some realistic different scenario possible to occur and taking in the account most important and typical parameters like rock formation, construction of the borehole heat exchangers, heat pump model, working parameters (circulation rates), thermal load will be presented. Preliminary obtained experimental data versus numerical data will be also presented.

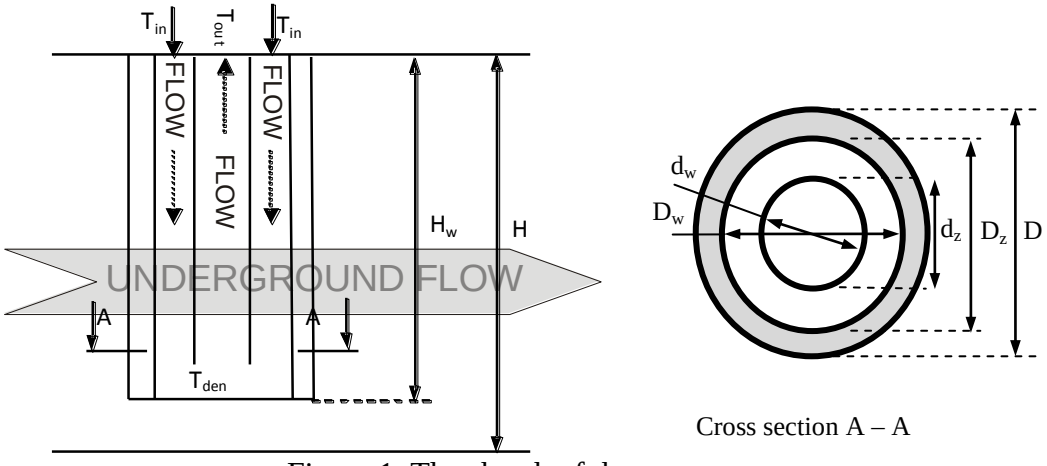

Figure 1. The sketch of the geometry.

The numerical analysis of the geothermal system required equations for flow, heat conduction and convections occurring in heat exchangers and in surrounding soil. To study this mathematical model and numerical procedures has been constructed for the geometry presented in Fig.1. The hot fluid with temperature T_{in} is injected down the annulus of the heat exchanger and let it flow up in central tube with outlet temperature T_{out}. The space between

outer tube and soil is cemented on full length. For condition presented here soil is consider as porous material in which underground flow occur.

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