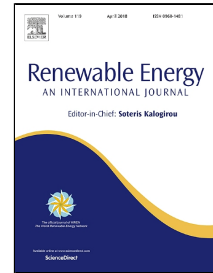


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The thermal characteristics and performance of a ground heat exchanger for tropical climates

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1 **The thermal characteristics and performance of a ground heat exchanger for tropical**
2 **climates**

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13
14 **Abstract**

15
16 This paper presents the thermal characteristics and performance of ground heat exchanger
17 (GHE) based on the mathematical model for tropical climate conditions. The case study is
18 undertaken with the depth of ground, z of 2 m, air inlet temperature of 35 °C, air mass flow
19 rate of 0.02 to 0.2 kg/s and different sizes of internal pipe diameters (ID). The effectiveness of
20 the GHE is analyzed at 0.8, 0.9 and 0.99. The performance results of the GHE show that the
21 flow rate of 0.02 kg/s gives great fluid temperature (T_f) reduction in the pipe compared with
22 higher flow rates. However, the outlet temperature (T_{out}) of air at the end of the 25 m length of
23 pipe with different flow rates tend to reach the same point with a maximum difference of only
24 0.36 °C for the range of the flow rates. Meanwhile, the rates of heat transfer relatively increase
25 as the flow rates increase. Effectiveness of 0.9 has been identified that it is possible and
26 achievable to be obtained with the 25 m length of the pipe. This finding has confirmed that the
27 GHE has a great potential and good performance to be implemented in tropical climate
28 countries.

29
30 **Keywords:** Ground heat exchanger; Passive cooling; Heat transfer; Annual outlet
31 temperature; Thermal characteristic.

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