

Accepted Manuscript

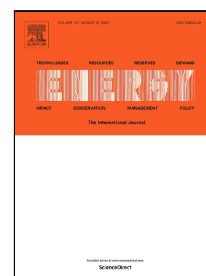
Investigation on the thermal behavior of energy piles and borehole heat exchangers: A case study

Qiang Zhao, Baoming Chen, Maocheng Tian, Fang Liu

PII: S0360-5442(18)31501-9
DOI: 10.1016/j.energy.2018.07.203
Reference: EGY 13468
To appear in: *Energy*
Received Date: 03 November 2017
Accepted Date: 30 July 2018

Please cite this article as: Qiang Zhao, Baoming Chen, Maocheng Tian, Fang Liu, Investigation on the thermal behavior of energy piles and borehole heat exchangers: A case study, *Energy* (2018), doi: 10.1016/j.energy.2018.07.203

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Investigation on the thermal behavior of energy piles and borehole heat exchangers: A case study

Qiang Zhao ^{a, *}, Baoming Chen ^{b, c}, Maocheng Tian ^b, Fang Liu ^c

^a School of Physics and Technology, University of Jinan, Jinan, P. R. China

^b School of Energy and Power Engineering, Shandong University, Jinan, P. R. China

^c School of Thermal Energy Engineering, Shandong Jianzhu University, Jinan, P. R. China

Highlights:

- Spiral-tube energy piles were compared with double U-tube borehole heat exchangers.
- Constant-flux and operation thermal behavior of two type of GHEs was investigated.
- Short-term thermal response of energy piles is more rapid than that of boreholes.
- Heat transfer performance of energy piles is more efficient than that of boreholes.
- Regular fluctuation in fluid temperatures and heat transfer rates were observed.

Abstract: Constant-flux and operation thermal behavior of ground heat exchangers are meaningful for system design and control strategy of ground-coupled heat pump systems. Based on a ground-coupled heat pump project, four thermal performance tests and an operation test were conducted to compare the constant-flux and operation thermal behavior of spiral-tube energy piles with that of double U-tube borehole heat exchangers. The thermal performance of energy piles is more efficient than that of borehole heat exchangers. A large radial scale of heat source, a long heat exchange tube per unit depth of holes and a backfilled material with large thermal conductivity is helpful to improve the heat transfer efficiency of ground heat exchangers. The short-term thermal response of energy piles is more rapid than that of borehole heat exchangers. The short-term thermal resistance of energy piles is much less than that of borehole heat exchangers. In operation test heat transfer rate per unit length of pile and per unit length of pipe for energy piles is greater than those for borehole heat exchangers. The regular fluctuations in fluid temperature and heat transfer rate in operation should be determined by heating capacity of heat pumps and thermal loads of buildings.

Keywords: Energy piles; Borehole heat exchangers; Constant-flux thermal behavior; Operation thermal behavior.

* Corresponding author at: School of Physics and Technology, University of Jinan, Jinan, P. R. China.

Email address: sps_zhaoq@ujn.edu.cn (Q. Zhao)

Download English Version:

<https://daneshyari.com/en/article/8070803>

Download Persian Version:

<https://daneshyari.com/article/8070803>

[Daneshyari.com](https://daneshyari.com)