

Accepted Manuscript

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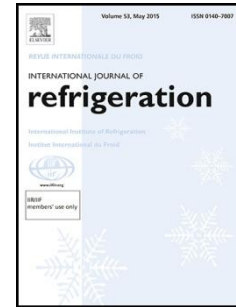
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PII: S0140-7007(17)30004-X

DOI: <http://dx.doi.org/doi: 10.1016/j.ijrefrig.2016.12.020>

Reference: IJIR 3514

To appear in: *International Journal of Refrigeration*



Please cite this article as: Kejuan Wei, Wenxin Li, Jiarong Li, Yong Wang, Lu Zhang, Study on a design method for hybrid ground heat exchangers of ground-coupled heat pump system, *International Journal of Refrigeration* (2017), <http://dx.doi.org/doi: 10.1016/j.ijrefrig.2016.12.020>.

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Study on a Design Method for Hybrid Ground Heat Exchangers of Ground-Coupled Heat Pump System

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Highlights

- Method to select the optimal load ratio of hybrid GHEs of GCHP system for design is introduced.
- The design calculation method of hybrid GHEs of GCHP system is put forward.
- The influence of mixing outlet water temperature on heat transfer is discussed.
- Combined calculation method is more accurate than the independent one.

Abstract: The hybrid ground heat exchangers (GHEs) of ground-coupled heat pump (GCHP) system refers to a GCHP system using both vertical and horizontal GHEs. With the proposed optimal load ratio of horizontal to vertical GHEs, three-dimensional numerical heat transfer GHE models were established using independent heat transfer calculation method, and a design method for hybrid GHEs of GCHP system was put forward and then applied in one project. A combined heat transfer calculation method considering the mixing outlet water temperature was proposed and validated by a built experimental platform, which shows an improvement in accuracy prediction compared to the independent heat transfer calculation. It indicates the mixing outlet water temperature plays an important role in calculation accuracy and should serve as the boundary condition in modelling. The heat transfer performance of GHEs can be characterized by the independent heat transfer results in a certain range of load ratio.

Keywords: ground-coupled heat pump system; the hybrid ground heat exchanger; mixing outlet water temperature; load ratio; heat transfer performance

Nomenclature

Abbreviations

CFD	Computational Fluid Dynamics
GHEs	Ground heat exchangers
GCHP	Ground-coupled heat pump

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