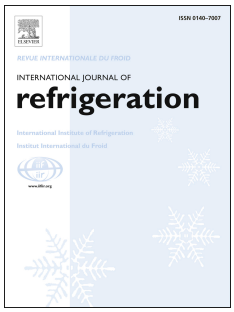
Accepted Manuscript



Theoretical study of a thermoelectric-assisted vapor compression cycle for air-source heat pump applications

Lin Zhu , Jianlin Yu

PII: S0140-7007(14)00347-8

DOI: 10.1016/j.ijrefrig.2014.12.001

Reference: JIJR 2931

To appear in: *International Journal of Refrigeration*

Received Date: 9 September 2014

Revised Date: 20 November 2014

Accepted Date: 1 December 2014

Please cite this article as: Zhu, L., Yu, J., Theoretical study of a thermoelectric-assisted vapor compression cycle for air-source heat pump applications, International Journal of Refrigeration (2015), doi: 10.1016/j.ijrefrig.2014.12.001.

Theoretical study of a thermoelectric-assisted vapor compression cycle for air-source heat pump applications

Lin Zhu, Jianlin Yu*

Department of Refrigeration & Cryogenic Engineering, School of Energy and Power Engineering, Xi'an Jiaotong University, Xi'an 710049, China

ABSTRACT

This paper proposes a thermoelectric-assisted vapor compression cycle (TVCC) for applications in air-source heat pump systems which could enhance the heating capacity of the system. Performances of TVCC are calculated and then compared with that of basic vapor compression cycle (BVCC). The simulation results show that when coefficients of performance (COPs)of the two cycles are almost equal, the TVCC under maximum COP condition of the thermoelectric modules still performs better than BVCC by 13.0% in heating capacity through selecting the appropriate intermediate temperature. In addition, the TVCC can also achieve an improvement of 16.4%-21.7% in both the heating COP and capacity when compared with the BVCC with an assistant electric heater that is provided with the equivalent power input of thermoelectric heat exchanger. Thus, the TVCC could be beneficial to the applications in small heat pumps if there is always need for auxiliary electric heat.

Keywords: Heat pump; Heating capacity enhancement; Thermoelectric modules; Vapor compression cycle.

* Corresponding author. Tel.:+86-29-82668738. Fax:+86-29-82668725. Email: yujl@mail.xjtu.edu.cn