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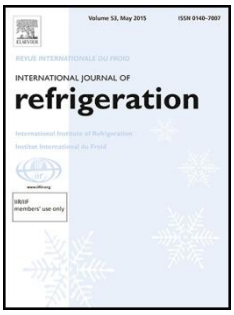

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Author: Elamin Mohamed, Saffa Riffat, Siddig Omer

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Low-temperature solar-plates-assisted heat pump: A developed design for domestic applications in cold climate.

Elamin Mohamed [a b*], [a] Saffa Riffat and [a] Siddig Omer

[a] The University of Nottingham Main Park, Department of Architecture and Built Environment, Lenton Firs Building, Nottingham, NG7 2RD, UK
[b] Omdurman Islamic University, Faculty of Engineering, Khartoum, Sudan

*Corresponding author: amin_eissawi@alumni.nottingham.ac.uk
Tel:+44-(115)-8467263
Mobile: +447404581119

Highlights

- Developed design for heating system using solar assisted-heat pump cycle and R-407C as working fluid is proposed.
- Positive influence of using indoor collector in absorbing wasted heat.
- Comparison of experimental and mathematical modelling for predicting cycle process and measuring COP's.

Abstract

Solar energy and wasted heat in buildings are capable of supplying enough energy to answer the total demand of energy in dwellings. However, fluctuation in fuel prices and gas emissions are main driving forces behind efforts. In this experimental study, a direct expansion solar-assisted heat pump system (DX-SAHP) using a bare ternary 'retrofitted collectors with black paint' is investigated at the laboratory with a solar simulator and tested for domestic hot water (DHW) and space heating under quasi-static conditions. Unglazed solar collector absorber plates are used as an evaporator, and these are comprised of two aluminium plates which are placed externally while another plate is mounted internally in the loft space of the house, where operating liquid from the heat pump is directly evaporated. The Influence of outside temperature, solar irradiation and/or waste heat on the heating performance of DX-SAHP is investigated. The impact of the parameters such as the inlet temperature and the mass flow rate of the heat transfer fluid are also assessed. Preliminary results elucidate that the refrigeration cycle can be a promising substitute for space heating and hot water when compared to the heat pump systems. This design technique results in higher solar collector/evaporator efficiency and lower system losses due to low evaporating temperature.

***Keywords**:* Solar-plates-assisted, Heat pump, Space heating, Hot water, Low temperature applications.