

## Accepted Manuscript

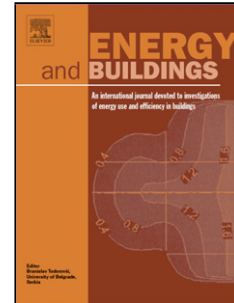
Title: SOLAR SYSTEMS AND THEIR INTEGRATION  
WITH HEAT PUMPS: A REVIEW

Author: Raghad S. Kamel Alan S. Fung

PII: S0378-7788(14)00961-X  
DOI: <http://dx.doi.org/doi:10.1016/j.enbuild.2014.11.030>  
Reference: ENB 5499

To appear in: *ENB*

Received date: 9-9-2014  
Revised date: 7-11-2014  
Accepted date: 10-11-2014



Please cite this article as: R.S. Kamel, A.S. Fung, SOLAR SYSTEMS AND THEIR INTEGRATION WITH HEAT PUMPS: A REVIEW, *Energy and Buildings* (2014), <http://dx.doi.org/10.1016/j.enbuild.2014.11.030>

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.

# SOLAR SYSTEMS AND THEIR INTEGRATION WITH HEAT PUMPS: A REVIEW

Raghad S. Kamel<sup>1\*</sup>, Alan S. Fung<sup>1</sup>

<sup>1</sup>Department of Mechanical and Industrial Engineering, Ryerson University, 350 Victoria Street, Toronto, Ontario, Canada M5B 2K3

\* Corresponding author. Tel.: +1 416 979 5000x7833.

E-mail addresses [raghad.kamel@ryerson.ca](mailto:raghad.kamel@ryerson.ca) (R.S. Kamel), [alanfung@ryerson.ca](mailto:alanfung@ryerson.ca) (A.S. Fung)

## ABSTRACT

This paper presents a review of the available literature on solar systems (solar thermal collectors and Photovoltaic–Thermal (PV/T) collectors) and their integration with heat pumps. Most of the research covered in this review show that the dominant source of solar assisted heat pumps (SAHPs) is liquid with a thermal storage; direct expansion or indirect expansion. SAHPs are mostly used for heating purposes. Few studies investigated the possibilities of combining a solar system with an air source heat pump (ASHP). The integration of a PV/T system with a heat pump, which provides both thermal energy and electrical power, existing in most researches is PV-evaporator type, which is the evaporator of the heat pump. It is required to control the mass flow rate of the refrigerant to prevent remaining liquid refrigerant at the outlet of the PV-evaporator due to the fluctuation of solar radiation; consequently, the system works inefficiently. It is possible to overcome this issue by separating the PV/T unit from the heat pump evaporator. There is a lack of investigations of connecting an air-based solar system (especially PV/T system) with an ASHP, including air-based thermal energy storage.

## KEYWORDS

Heat pump, Photovoltaic, solar collector, PV/T system

Download English Version:

<https://daneshyari.com/en/article/6732554>

Download Persian Version:

<https://daneshyari.com/article/6732554>

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