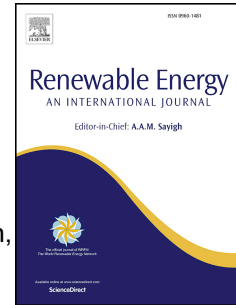


# Accepted Manuscript

Solar heating and cooling: Present and future development

T.S. Ge, R.Z. Wang, Z.Y. Xu, Q.W. Pan, S. Du, X.M. Chen, T. Ma, X.N. Wu, X.L. Sun, J.F. Chen



PII: S0960-1481(17)30585-2

DOI: [10.1016/j.renene.2017.06.081](https://doi.org/10.1016/j.renene.2017.06.081)

Reference: RENE 8948

To appear in: *Renewable Energy*

Received Date: 12 January 2017

Revised Date: 14 May 2017

Accepted Date: 22 June 2017

Please cite this article as: Ge TS, Wang RZ, Xu ZY, Pan QW, Du S, Chen XM, Ma T, Wu XN, Sun XL, Chen JF, Solar heating and cooling: Present and future development, *Renewable Energy* (2017), doi: 10.1016/j.renene.2017.06.081.

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 Heating and Cooling: Present and Future Development

T.S. Ge, R.Z. Wang\*, Z.Y. Xu, Q.W. Pan, S. Du, X.M. Chen, T. Ma, X.N. Wu, X.L. Sun, J.F. Chen

Institute of Refrigeration and Cryogenics, Shanghai Jiao Tong University

Key Laboratory of Power Mechanical Engineering, MOE China

800 Dongchuan Road, Shanghai, 200240, China

\*Email: rzwang@sjtu.edu.cn, Tel: +86-(0)21-34206548, Fax: +86-(0)21-34206548

## Abstract

Using conventional fossil fuels causes both energy crisis and environmental pollution. Renewable energy with the merits of almost unlimited availability and environmental-friendliness provides a perfect solution to the problem. Solar energy is widely recognized as one of the most important renewable energy resources due to its even distribution, safety and serving as sources for others. In past decades, global solar thermal capacity increases rapidly and now it has been widely used worldwide to provide heating and cooling. To understand the current progress of relevant technologies and the future development, this paper briefly summarizes the current situation of solar heating and cooling, and then some new achievements in related areas and potential future market penetration are discussed. It is found that solar hot water heating system's development is in fast lane in recent years with evacuated tube solar collector dominating the mass market. How to integrate solar collecting system with different types of buildings is the main research and development direction for solar building heating system. Large-scale district water heating system and solar PVT system as the most promising solutions attract extensive attentions. For solar cooling, efforts have been made to improve the efficiency of conventional solar thermal cooling methods in terms of adsorption and absorption technology. In addition to technical development, economic analysis of solar heating and cooling system is also discussed. Return of investment period is widely adopted to evaluate the economic performance. Results reveal that low initial cost and advantageous allowance are the most efficient ways to make solar heating and cooling system economically attractive.

**Key words:** Solar energy; Solar heating; Solar cooling; Development; Economic analysis.

## 1. Introduction

Energy has already become a crucial issue for humankind. We are still heavily relying on traditional fossil energy such as coal, natural gas and oil, which accounts for 78.3% of global energy consumption in 2014 [1]. However, fossil energy is not unlimited and we are going to run out of it if the trend continues. Meanwhile, fossil energy is mainly utilized in the form of direct combustion to produce electricity as well as thermal energy. This method causes severe environmental problems such as air pollution and intensive CO<sub>2</sub> emission. Renewable energy with the merits of unlimited resource and cleanness can help us to overcome the problems caused. The renewable energy includes solar, wind, geothermal etc., in which solar energy is recognized as an important one due to its characteristics of even distribution and cleanness.

Solar energy reaches to the earth surface by radiation and there are two ways to utilize, one is solar collector to

Download English Version:

<https://daneshyari.com/en/article/6764390>

Download Persian Version:

<https://daneshyari.com/article/6764390>

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