

Accepted Manuscript

A thermosyphon solar water heating system for sub zero temperature areas

N. Abas, N. Khan, A. Haider, M.S. Saleem

PII: S0165-232X(16)30163-X
DOI: doi: [10.1016/j.coldregions.2017.08.012](https://doi.org/10.1016/j.coldregions.2017.08.012)
Reference: COLTEC 2439
To appear in: *Cold Regions Science and Technology*
Received date: 22 August 2016
Revised date: 10 August 2017
Accepted date: 29 August 2017



Please cite this article as: N. Abas, N. Khan, A. Haider, M.S. Saleem , A thermosyphon solar water heating system for sub zero temperature areas, *Cold Regions Science and Technology* (2017), doi: [10.1016/j.coldregions.2017.08.012](https://doi.org/10.1016/j.coldregions.2017.08.012)

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.

A Thermosyphon Solar Water Heating System for Sub Zero Temperature Areas

N.Abas¹, N. Khan², A. Haider³, M. S. Saleem³

¹Department of Electrical Engineering, University of Gujrat, Hafiz Hayat Campus
naemkalair@uog.edu.pk

²Department of Electrical Engineering, COMSATS Institute of Information Technology,
Islamabad
nasrullahk@yahoo.com

³Department of Electrical Engineering, University of Management and Technology, Sialkot
aun.haider@skt.umt.edu.pk

³Department of Electrical Engineering, University of Management and Technology, Sialkot
muhammad.shoaib@skt.umt.edu.pk

Abstract

Heating without global warming is a key challenge being faced by world community today. In this regard, harvesting solar energy to meet domestic hot water demand of cold regions is attempted as an alternative design solution. Low solar insolation, chilly winds and sub-zero temperatures have been identified as major hindrances in harnessing solar energy in cold regions. A thermosyphon driven supercritical CO₂ fluid based solar water heating system is developed for use in subzero temperature areas. The solar collector consists of parallel U-tubes inserted in fins inside the evacuated glass tubes. Special arrangements in manifolds and evacuated glass tubes were applied to make it possible to stop the reverse thermosyphon. Optimal heat transfer refrigerants were studied for this solar heating system. At ambient temperature range of 30 to 35°C range, CO₂ refrigerant easily attains 75°C with collector efficiency ranging from 80- 85%. When the hot refrigerant is passed through helical coil counter flow type heat exchanger, the inlet water temperature increases from 26 to 55°C giving off a temperature gradient of 29°C, resulting in efficient heat transfer of system. The system provides 23°C greatest temperature difference (GTD), 14°C lowest temperature difference (LTD) and 18.13°C log mean temperature difference (LMTD). This innovative solar water heater can perform adequately in subzero

Download English Version:

<https://daneshyari.com/en/article/5779382>

Download Persian Version:

<https://daneshyari.com/article/5779382>

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