



# International Journal on Recent Researches In Science, Engineering & Technology

(Division of Mechanical Engineering)

A Journal Established in early 2000 as National journal and upgraded to International journal in 2013 and is in existence for the last 10 years. It is run by Retired Professors from NIT, Trichy.

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Research Paper

Available online at: [www.jrrset.com](http://www.jrrset.com)

ISSN (Print) : 2347-6729

ISSN (Online) : 2348-3105

Volume 3, Issue 5,  
May 2015.

JIR IF : 2.54

DIIF IF : 1.46

SJIF IF : 1.329

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## Investigations on the Performance of Solar Water Heaters and Vapour Absorption A/C Systems Using Phase Change Materials

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**Abstract:** Solar energy is one of the most available forms of energy on the Earth's surface, besides; it is very promising and generous. The earth's surface receives a daily solar dose of  $10E+8$  KW-hr, which is equivalent to 500 000 billion oil barrels that is one thousand times any oil reserve known to man. The solar energy has some attractive features such as its system requiring minimum maintenance and operation cost, and it does not have negative effects on the environment. Another important feature of solar energy is; its ability to satisfy rural areas where conventional energy systems might be not suitable or uneconomical. Air conditioning is one of the major consumers of electrical energy in many parts of the world. The demand can be expected to increase because of the changing working times, increased comfort expectations and global warming. With more air conditioning units, the electricity demand has been rising thereby increasing the use of fossil fuels and nuclear energy. A drastic change, therefore, should be implemented in the energy structure of the developed countries. Environmentally friendly and energy efficient technologies should be introduced in which the environmental impact of the conventional air conditioning system is minimized. Solar cooling is a possible technological alternative to conventional air conditioning systems that has recently attracted a growing interest. A solar assisted absorption cooling system as a sustainable solution for cooling systems. Since the solar energy is available for only a fraction of the day and its availability depends on several factors such as latitude and sky clearness, the storage of it is an important concern. Thermal energy storage is a practical way in conserving the solar energy as it can reduce the discrepancy between the energy supply and demand. Latent heat storage units (LHSU) using Phase Change Materials (PCMs) are promising candidates as heat storage media. Rising energy costs are generating new interest in thermal energy based refrigeration systems. These can compete with electrical energy based refrigeration systems if the source of heat energy is waste heat or solar energy. These systems are relevant to India because there is huge potential demand for refrigeration in rural areas also. India is among the world leaders in agricultural production however much of our produce goes waste due to absence of proper storage facilities. Refrigeration is thus vitally important for our country. Milk produce is also adversely affected due to lack of refrigeration. Cool drinking water is unavailable to the people in non-electrified villages. Medical facilities are also adversely affected due to break in the cold chain as the medicines move from the production zone to the rural areas. Usage of CFCs affects the environment adversely.