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A Review on Heating System of Solar Water

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Abstract

Hot water is required in every home, particularly during the winter, for various activities such as bathing, washing, and other purposes, and it is also required in many industries for the production of their products. Traditional methods of heating water have been used since ancient times, but they use a lot of fossil fuels or electricity, which has an effect on the economy of every home or business. However, since solar radiation is abundant, it is the primary alternative to a traditional source of energy that can be harnessed and used for water heating. This form of water heating is both environmentally friendly and cost-effective. The size of a solar system is determined by the amount of sunlight available, the temperature required, the location of the solar system, and other factors. This paper provides an overview of the different ways in which solar radiation can be used to heat water.

Keywords: *Solar energy collector, Nuclear Fusion, Active and passive system, Solar heater*

INTRODUCTION

As the world's population grows, so does demand for fossil fuels, resulting in a steady increase in fossil fuel prices. The demand for these energies is expected to rise in the future, necessitating immediate research and development of a new alternative to fossil fuels, as well as a greater emphasis on renewable energy research.

Since the beginning of human existence on this planet, the sun has been regarded

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as the most strong force and primary source of life. Many trials have been carried out in order to maximise the use of this source of energy, which is the best renewable energy we have at the moment. On this planet, it is an incredibly strong and inexhaustible source of energy. The Sun's energy, in the form of heat and light, comes from a process called nuclear fusion, which takes place deep within the sun's heart. Protons or hydrogen nuclei fuse together within the sun, resulting in the creation of helium. This fusion process releases a tremendous amount of energy, which helps to sustain the sun's temperature at its highest.

A solar heater is a system that uses solar energy to produce steam for both domestic and industrial purposes. In comparison to other energy sources, this heating operation has no negative impact on our atmosphere, making it an environmentally sustainable alternative for today's world, which is grappling with issues such as global warming, pollution, and so on. The temperature and energy level needed to carry out everyday activities can differ. For domestic hot water supply, 50 to 60 degrees Celsius is generally considered suitable (SOPAC Technical Report 1999).

LITERATRURE REVIEW

SIVAKUMAR et. al.(2005) designed a solar heating system which is "elliptical heat pipe flat plate solarcollector" and tested it with a collector tilting at an angle of 11o with the horizontal .He analyzed the effect of ratio of condenser length (Lc) and evaporator length (Le) of heat pipe, different mass flow rate of cooling water and different temperature of cooling water. In his experiment total 5 elliptical heat pipes with stainless steel wick were used as transport tube in collector. InContainer material, copper tube has been used which was filled with methanol as working fluid of heat pipe that was fitted into absorber plate of solar collector. By this whole arrangement he studied the efficiency of "elliptical heat pipe solar collector" and compared the result of the system in different condition. He concluded that elliptical heat pipe solar collector having ration of condenser length and evaporator length of heat pipe of 0.1764 gives higher instantaneous efficiency.

Sivaraman and Mohan (2005) observed the effect of length to diameter ration of heat pipe on efficiency of solar collector by conducting various experiments. Two solar collectors have been manufacturedhaving different value of length to internal diameter ratio.

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Transport tube of solar collector has replaced by heat pipe with stainless steel wick .Container was made from copper and stainless steel whereas wick material and methanol act as working fluid in heat pipe. The heat pipes were designed such that these have heat transport factor of 194watt and thermal energy of 260 Watt. He conducted the experiments in summer by keeping solar collector at an angle of 13 degree with the horizontal. Results shows that solar collector with heat pipe having L/Di ratio of 52.63 is more efficient then solar collector with heat pipe having L/Di ratio of 58.82 .The reason behind the increase in efficiency was increase in heat transfer factor of heat pipe, which increase with reduction in length to internal diameter ratio.

Madani and Hussain (2006) studied a batch type solar water heating system in Bahrain which consists of an evacuated cylindrical glass tube. In this system water running through copper coils will be acting as collectors and it is located within the glass tube. On the other side, prototypes were tested whose result shows that maximum temperature difference between the outlet and inlet of the cylindrical batch system was 27.8 degree Celsius giving maximum efficiency of 41.8%.He also calculated the manufacturing cost of cylindrical batch system which comes out to be $318, which is slightly less costly than the manufacturing cost of typical flat plate collector which is $358.

Mangalet. al. (2010) discussed "evacuated solar water heater" which is latest solar heater based on a thermo siphon principle for heating the water by absorbing solar radiation and using this water for domestic purposes to carry out day to day activities . As evacuation of air from solar tube take place it creates a vacuum, which help in reducing conductive and convective heat loss from the interior of tube. With this the cold temperature and wind have less effect on the performance of evacuated solar water heater and less heat loss will be noticed .Thus fast heating of water takes place as compared to flat plate solar water heater /collector.

Reduction of heat loss many other benefits of evacuated tube solar water system.This model is new for India but it can be used to carry out daily house hold activities and can reduce negative impact of global warming, climate change energy crisis etc.On comparing on the basis of the peak efficiency level only little difference is found between flat plate solar collector

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results into fast heating water in comparison to the flat plate solar water heater/collector. This research paper has given and evacuated type solar collector. Normally flat plate will give higher value but this is during minimal heat loss condition .But on taking average for one complete year evacuated type solar collector may have a clear advantage.

CONCLUSION

From this study we can get the following conclusion:

- Solar water heating system can help in reducing the energy demand for a household.
- A solar water heater is a long-term investment that may be costly initially but can reduce overall cost.
- Solar water heating systems can also be used to directly heat swimming pool water, with the added benefit of extending the swimming season for outdoor pool applications.
- Depending on the range of temperature use, solar thermal applications can be divided into the three broad categories:

1. Low-temperature applications (below 100°C), such as solar drying, hot water supplies, cooking.
2. Medium-temperature applications (below 150°C), such as refrigeration, industrial process heat, etc.
3. High-temperature (above 150°C) applications, such as electricity generation.

- Heat pipe based solar water heating can be influenced by nature of the refrigerant, due to the environmental concerns.
- Elliptical heat pipe solar collector having Lc/Le ratio of 0.1764 achieved higher instantaneous efficiency.
- The cost of manufacturing the cylindrical batch system to be $318, slightly less expensive than typical flat plate collectors of $358.
- When averaged over a year evacuated tube collector have a clear advantage over flat plate collector.
- The natural convection heat pipe system is capable of heating water to 100°C.

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