

An Innovative Approach to Steam Production through Solar Thermal Technology with Tube-In Flat Plate Collectors

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Abstract - This review study assesses the contemporary solar water heating technologies and their applications. Hot water is utilized in various settings, including residential, commercial, and industrial. A variety of resources, such as coal, diesel, and gas, are used for generating steam and heating water. Solar energy is the primary alternative to traditional energy sources. The solar thermal water heating system is designed to capture the significant amounts of free thermal energy from the sun. This system is intended to provide the necessary energy. The size of these systems is influenced by the availability of solar radiation, the desired temperature of the user, the system's location, and other factors. Thus, it is essential to design the solar water heating system based on these considerations. Following a review of the existing literature, the construction, organization, applications, and sizing of the solar thermal system are analyzed. Solar energy is one of the most cost-effective and environmentally sustainable forms of renewable energy. Despite the advancements in various technologies for harnessing energy from renewable sources in India, the most challenging aspect remains maximizing the thermal energy derived from solar radiation. Solar power is one of the most basic and user-friendly forms of renewable energy.

Keywords: Industrial Purpose, Steam Production, Conventional System, Solar Thermal System, Thermal Energy.

I. INTRODUCTION

The construction, organization, applications, and sizing of the solar thermal system are examined after a review of the literature that is currently available. One of the cost-free, environmentally friendly types of renewable energy is solar energy. The most difficult procedure involves getting the most thermal energy possible from solar radiation, despite the fact that India has developed many technologies for obtaining energy from available renewable sources. One of the most basic and user-friendly renewable energies is solar power.

Solar thermal collectors are used to do this. Solar heating equipment is typically put on terraces since they receive more sunshine there. In an insulated storage tank, the heated water is kept for domestic, commercial, and industrial uses. For every 100 liters per day of solar water heating capacity, it is known that a typical solar water heating system can save up to 1500 units of electricity annually.

Any solar energy collection system built for operation in the low temperature range, from ambient to 60, or the medium temperature range, from ambient to 100, uses flat plate collectors to generate heat. A well-designed flat plate collector provides heat for a long time at a relatively low cost. The flat plate collectors are essentially heat exchangers that convert incident solar radiation into the sensible heat of a working fluid, such as liquid or air. In that the surface may be grooved, flat, or of different shapes as the absorbent surface, along with some sort of heat removal system such tubes or channels, the phrase "flat plate" may be rather misleading. With the least amount of time and money spent on labor and materials, flat plate collectors are used to convert as much solar radiation as possible into heat at the highest temperature attainable.

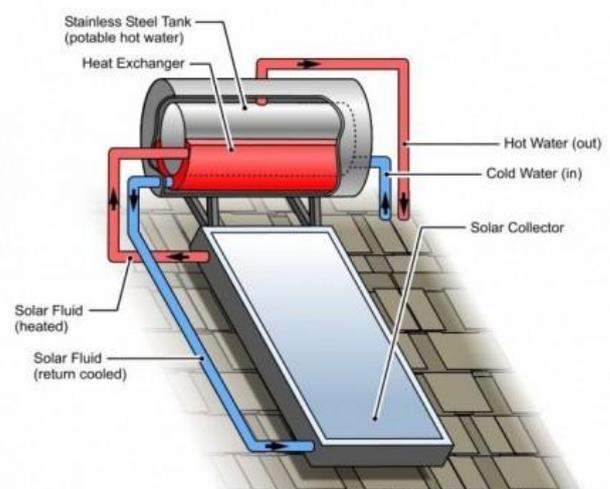


Figure 1: Evacuated tubes

1.1 Evacuated tube collector:

The flat plate collectors are essentially heat exchangers that convert incident solar radiation into the sensible heat of a working fluid, such as liquid or air. The term "flat plate" may be a bit deceptive because the absorbent surface may be grooved, flat, or of different shapes, along with some sort of heat evacuation system like tubes or channels. Flat plate collectors are used to convert as much solar energy as possible into heat at the greatest temperature feasible with the least amount of time and money spent on labour and materials.

1.2 Solar Collector

Types of Solar Collectors: Solar collector can be classified by many ways. On the basis of flat plate arrangement, it can be classified as:

1. Lower bounded tube collector: Tubes are bounded below the plates as shown in figure 2.
2. Upper bounded tube collector: Tubes are bounded above the plates as shown in figure 3.
3. Tube-in flat plate collector: Tubes are in between the plates as shown in figure 4.

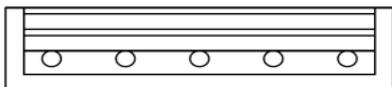


Figure 2: Lower bounded tube collector

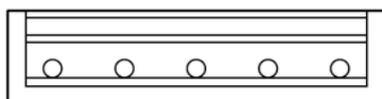


Figure 3: Upper bounded tube collector

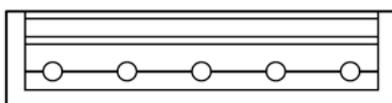


Figure 4: Tube-in flat plate collector

1.3 Methodology

A continuous water supply is connected to the collector, which is often installed towards the sun and installed on a roof or open land. Through the tubes, the water moves while absorbing solar heat and heating up. In a tank, the hot water is kept for later use. Because the storage tank is insulated and heat losses are minimal, the water in the tank stays hot overnight. Basic testing tools including flowmeters, manometers, pyrheliometers or pyranometers, and a few thermocouples are included in the experimental setup. Direct sun radiation is measured with a pyrheliometer, while diffused

solar intensity is measured using a pyranometer. Solar intensity depends on many angles like declination angle of sun, hour angles, tilts of plane from horizontal etc. It also relies on whether or not clouds are present since, in foggy conditions, solar intensity cannot incident on the surface of the planet. In most cases, the reflectivity value is not precisely determined, necessitating the employment of a pyrheliometer or pyranometer. To determine flow rate, a flowmeter is employed. It is necessary to understand pumping capacity and fluid flow velocity. The total pressure loss due to heat transfer and flowing in bends is measured using a manometer. The temperature can be measured locally at any point using thermocouples. We are computing the entrance and outlet fluid temperatures to the Collector using thermocouples.

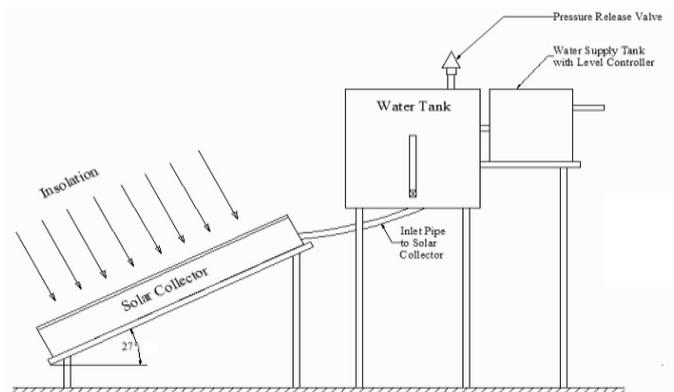


Figure 5: Line diagram of solar water heater

II. LITERATURE REVIEW

The Usage of Different Turbulator's on The Solar Water Heater System, Based on The Different Type of Energy Conservations. [1]

The Usage of The Brush Climate Based Upon the Different Climatic Systems the Solar Water Heater Working on This Usage of The Users on Different Climatic Conditions Different Areas. [2]

Conference on Innovation in Technology and Engineering Science, Based Upon This Conference Paper. The Working Phenomenon of The Solar Water Heater System and Their Usages of It. [3]

The Solar System Working on The Different Types of The CPC Reflector of The Control System and Their Usage of The System with Different Reflectors. [4]

This Solar System Works on The Different Types of The Solar Collectors and Working of The System and The Different Types of The Geysers Which Are Used in The

System of Solar Water Based Upon This. Usage Of the Different Types of Heat Exchangers of The System. [5]

In This Solar System the Material System Should Be Changed and Using of The Aluminium Foil and The Heater Must Be Usage Efficiently on The System of Work. The Solar System Based Upon the Working Different Principles and Usage Phenomenon of The Working. [6]

This Paper Content Based Upon the Usage of Solar Water Heater and Working Principles Can Be Analysed by The System of It. It Would Be the Working of The Solar Water System It May Many of The Working of The System. [7]

The Total Paper Is Based Upon the Solar System Where the Usage Equipment Used for The Different Methodologies Using Organization of The System and It Must Be Basic Phenomenon of The Industrial Purpose Household Etc. This Can Be Analysed by The System.[8]

The Solar Water Environment of The Different Climates of The System. Where The Usage of The Working Impact Must Be Show in The System of The Working Usage Different Purpose of The System.[9]

The Solar Water Heater Must Contain the System of The Different Pipes and The Different Collectors This Are Shown in The System of The Solar Water Heater. This Tells About the Efficiency and The System of Work It Must Be Usage of System.[10]

III RESULT AND DISCUSSION

One of the best methods for converting solar energy into thermal energy is SOLAR WATER HEATING (SWH), which is regarded as a developed and commercialized technology. Greece has ideal circumstances for the use of solar energy thanks to an abundance of solar radiation and a strong technological foundation. Due to economies' reliance on fossil fuels, renewable energy systems utilizing a variety of technologies must be used.

In This Solar System the Material System Should Be Changed and Using of The Aluminium Foil and The Heater Must Be Usage Efficiently on The System of Work. The Solar System Based Upon the Working Different Principles and Usage Phenomenon of The Working.

Inexhaustible and having less of an unfavorable effect on the environment than fossil fuels, renewable energy sources could offer a solution to the issue. Systems that use energy, particularly solar energy, significantly safeguard the environment.

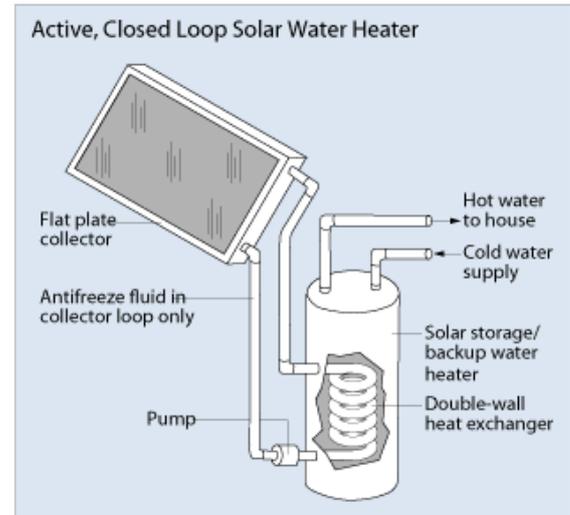


Figure 6: Result Module

IV. CONCLUSION

This study has centered on customer satisfaction related to solar water heaters. The outcomes imply that solar water heaters are the superior alternative, given their lack of energy costs and their safety for the environment, as well as their financial advantages.

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