International Current Journal of Engineering and Science (ICJES)
Volume 3, Issue 10, pp 5-8, October-2024
DOI: https://doi.org/10.47001/ICJES/2024.310002
ISSN (Online): 2583-7257

Solar Thermal Based Steam Production System with Tube-In Flat Plate Collector

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Abstract **- Current solar water heating systems and their uses are examined in this review study. In homes, businesses, and industries, hot water is utilized. A variety of resources, including coal, diesel, and gas, are utilized to produce steam and heat water. Solar energy is the primary substitute for conventional energy sources. Solar water heating is the best method to make the most of the abundant amount of free solar thermal energy. The required energy will be supplied by the solar thermal system. The amount of solar energy that is available, the customer's preferred temperature, the system's location, and other variables all affect how big the systems are. Consequently, it is crucial to base the solar water heating system's design on the aforementioned considerations. After reviewing the currently available literature, the structure, organization, applications and size of the solar thermal system are studied. 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.**

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

I. INTRODUCTION

The structure, organization, application and dimensioning of the solar thermal system are investigated after reviewing the currently available literature. 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 10000 liters of solar water heating capacity per day, a standard solar heating system is reported to save up to 1,500 units of electricity annually. Flat plate collectors are used to produce solar energy in any solar energy collecting system that is intended to function in the low temperature range of room temperature to 60 degrees or the medium temperature range of room temperature to 100 degrees. Long-lasting heat can be obtained at a reasonable cost using a well-designed flat plate collector. Flat plate collectors are essentially sensible heat of a working medium such as liquid or air. Since the surface can be grooved, flat or variously shaped, such as an absorbing surface, as well as some kind of heat dissipation system, such as pipes or ducts, the term "flat plate" can be quite misleading. Using the least amount of labor and materials possible, flat plate collectors are used to convert the greatest amount of solar radiation into heat at the highest possible temperature.

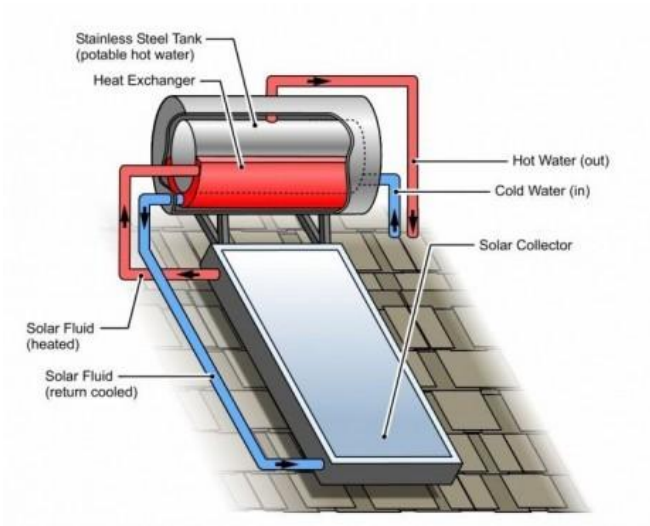

Figure 1: Evacuated tubes

1.1 Evacuated tube collector:

The flat plate collectors are essentially heat exchangers that convert incident solar radiation into the sensible heat of a

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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 collectors can be classified in different ways. Depending on the arrangement of the flat plates, they can be classified as follows:

1. Bottom-bounded tube collector: The tubes are bounded below the plates as shown in Figure 2.
2. Top-bounded tube collector: The tubes are bounded above the plates as shown in Figure 3.
3. Flat plate collector with tubes inside: The tubes are located between the plates as shown in Figure 4.

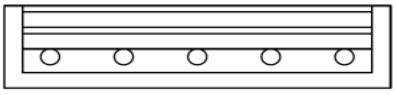

Figure 2: Lower bounded tube collector

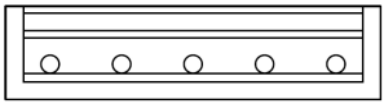

Figure 3: Upper bounded tube collector

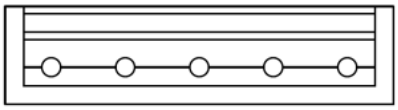

Figure 4: Tube-in flat plate collector

1.3 Methodology

The collector, which usually faces the sun, is placed on the roof or outdoors and receives a continuous water supply. Water moves through the pipes, absorbing solar heat and heating up. Hot water is stored in a tank for later use. Due to the storage tank's insulation, heat loss is negligible, 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. 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.

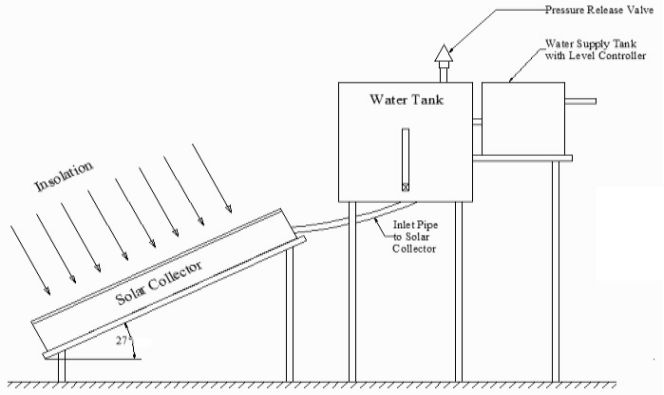

Figure 5: Line diagram of solar water heater

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 Brash 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] 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 yhe 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

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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 to convert solar energy into thermal energy is SOLAR WATER HEATING (SWH), which is considered 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.

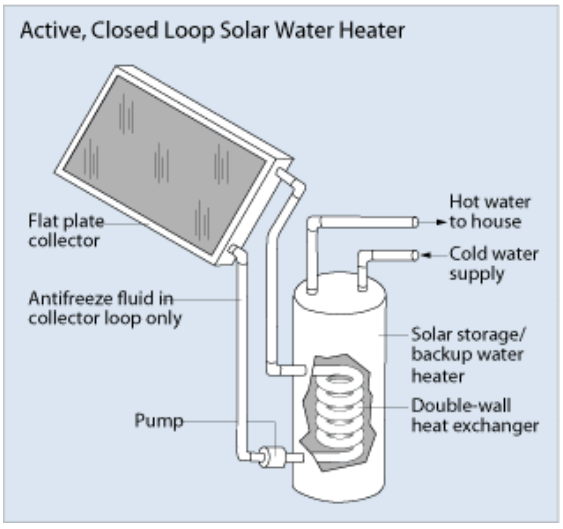

Figure 6: Result Modeule

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.

IV. CONCLUSION

The current study focused on customer satisfaction with solar water heaters, and it can be inferred from the results that solar water heaters are the best option due to their lack of power costs and environmental safety in addition to their financial advantages.

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Citation of this Article:

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