A Review on Analysis of Solar Water Heater system

[1]D. Venu, [2]T. Tripuraih, [3]Y. Satya Gourinadh, [4]A. Krishna Karthik, [5]A. Jagadeesh Reddy, [6]S. Venkateswara Rao

[1,2,3,4,5] *Student in Mechanical Engineering Dept, NRI Institute of Technology, Vijayawada, Andhra Pradesh, India*

[6] *Assistant Professor in Mechanical Engineering Dept, NRI Institute of Technology, Vijayawada, Andhra Pradesh, India*

Abstract **The current solar water heating technologies and their uses are examined in this review study. Hot water is being utilized in home, commercial, and industrial settings. For the purpose of producing steam and heating water, a variety of resources, such as coal, diesel, and gas, are employed. The main alternative to conventional energy sources is solar energy. The method to capture the large amount of unrestricted free sun thermal energy is the solar thermal water heating system. The solar thermal system is made to supply the necessary energy. The size of the systems is determined by the amount of solar radiation available, the customer's preferred temperature, the location of the system, and other factors. As a result, it is essential to design the solar water heating system according to the aforementioned factors. 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.**

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.

1.1Evacuated 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.

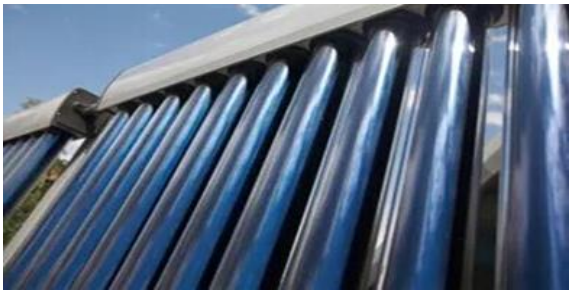

Fig.1: Evacuated tubes

1.1 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:

i. Lower bounded tube collector: Tubes are bounded below the plates as shown in figure 2.

ii. Upper bounded tube collector: Tubes are bounded above the plates as shown in figure 3.

iii. Tube-in flat plat collector: Tubes are in between the plates as shown in figure 4.

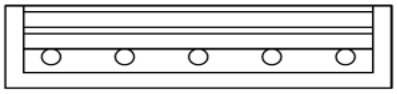

Fig 2: Lower bounded tube collector

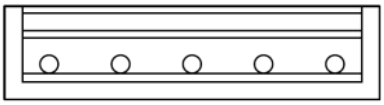

Fig.3: Upper bounded tube collector

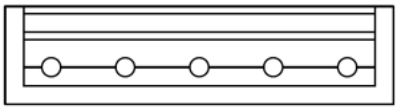

Fig-4: Tube-in flat plate collectorme

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.

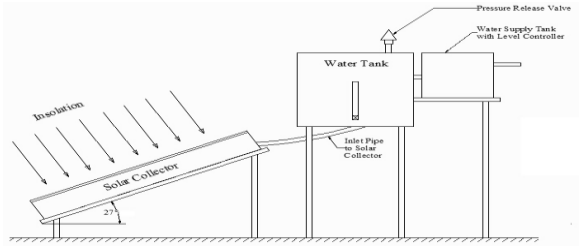

Fig 5: Line diagram of solar water heater.

II. LITERATURE REVIEW

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

[2] 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]

[3] 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]

[4] 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]

[5] 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]

[6] 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]

[7] 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]

[8] 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]

[9] 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]

[10] 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. 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.

REFERENCE

[1] S.Vasanthaseelan ,P.Manoj Kumar, R. Anand kumar , K. Hari Ram. “INVESTIGATION ON SOLAR WATER HEATER WITH DIFFERENT TYPES OF TURBULATORS” material today proceeding,https://doi.org/10.1016/j.matpr.2021. 05.53, pg:no 1-609 May 2021.

[2] Ahmed Sh. Sadiq and Ala’a. Jassim, “THE PERFORMANCE OF SOLAR STILL USING HEATING PIPE EVACUATED TUBES AT BASRAH CLIMATE”, JCBPS, Vol. 7, No. 1; pg:no :071- 083, E- ISSN: 2249 –1929, issued on 2019.

[3] 3D Harun, M I Maulana, Akhyar “THE EFFECT OF SOLAR WATER HEATER PERFORMANCE BY VARIATION OF THE PLATE SHAPED” Conference on Innovation In Technology And Engineering Science, Doi:10.1088/1757-899X/602/1/01208, pg.no:1-7, 2019

[4] M.M. Hadjiata, M. Hazmounea, S. Oualia, A. Gamab, M.R. Yaichea,“DESIGN AND ANALYSIS OF A NOVEL ICS SOLAR WATER HEATER WITH CPC REFLECTORS”, Journal Of Energy Storage, VOL.NO:203–210 , 19 January 2018 .

[5] Muhammad Suleman Malik, Muhammad Arsalan Malik, Haseeb Ali Shah, Adnan Anwar Khan Afridi “FABRICATION OF FLAT PLATE SOLAR GEYSER WITH FLAT GROOVED HEAT EXCHANGER HAVING SPECIAL EXIT SYSTEM”. International Journal of Engineering Works, Vol. 4, Issue 10, Pg.no. 172-177, ISSN: 2409-277, October 2017,

[6] P. Balamurugan, S.P.Premkumaran, S.Raj Kumar, R. Rajapandian ,“SOLAR WATER HEATER THROUGH ALUMINIUM FOIL”, (IRJET) journal E-ISSN: 2395-0056, Volume: 04 Issue: 10 pg.no 1-7, Oct-2017,

[7] Prakash Kumar Sen, Nishita Kispotta, Shailendra Kumar Bohidar, “STUDY ON SOLAR WATER HEATER AND ITS SYSTEM

PERFORMANCE", IJARSE JOURNAL, Vol. No.4, pg.no:23-27, Special Issue (01), April 2015, ISSN-2319-8354(E). 37

[8] Tadvi Sachin Vinubhai, Jain Vishal R, Dr. Keyur Thakkar, "A Review: Solar Water Heating Systems", National conference on emerging vista of technology in, 21 CENTURY pg.: no 1-7, APRIL 2014.

[9] Christopher J. Koroneos, Evanthia A.Nanaki "Life cycle environmental impact assessment of a solar water heater". JULY 24, 2012., ELSEVIER., 37 (2012) 154e161.,

[10] B. Sivaramana N. Krishna Mohan. "Analysis of Heat Pipe Solar Collector with different Heat Pipe Parameter" International engineering journal., JAN 8

[11] Akyurt, M., 1984. Development of heat pipes for solar water heaters. Solar Energy 32 (5), 625–631.

[12] Mirasgedis, S., Diakoulaki, D., Assimakopoulos, D., 1996. Solar energy and the abatement of atmospheric emissions. Renewable Energy 7 (4), 329e338.

[13] Kudish AI, Evseev EG, Walter G, Preiebe T. Coaxial tubular solar collector constructed from polymeric materials: an experimental and transient simulation study. Energy Convers Manage 2003; 44:2549–66.

[14] Morrison JE, Braun JE. System modeling and operation characteristics of thermosyphon solar water heater.Sol Energy 1985;34:389–405.

[15] Abogderah, M M and Ismail, K A R. 1988.Performance of a heat pipe solar collector, *Solar Energy*, 120:51 – 59.

[16] Hammad M 1995. Experimental study of the performance of a solar collector cooled by heat pipes, Energy Conversion Management 36: 197 – 203.

[17] Soin R S, Raghuram an S and Murali V, 1987. Two phase water heater model and long-term performance, *Solar Energy* 38: 105 – 112.

[18] Parida, Bhubaneswar, S_ Indian, and Rancho Golic. "A review of solar photovoltaic technologies." Renewable and sustainable energy reviews 15.3 (2011): 1625-1636.

[19] D. Mangal & D.K. Lamba, & Gupta, & K. Jamb, "Acknowledgement of Evacuated Tube Solar Water Heater Over Flat Plate Solar Water Heater" International Journal of Engineering, (IJE),2012, 4,.279

[20] Sinha, S. & Tiwari, G.N. " thermal evaluation of concentrator, assisted solar desalination system" Heat recovery system,1992,12,481, 1992"