



# **iJRASET**

International Journal For Research in  
Applied Science and Engineering Technology



---

# **INTERNATIONAL JOURNAL FOR RESEARCH**

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

---

**Volume: 11    Issue: VII    Month of publication: July 2023**

**DOI: <https://doi.org/10.22214/ijraset.2023.54533>**

**[www.ijraset.com](http://www.ijraset.com)**

**Call:  08813907089**

**E-mail ID: [ijraset@gmail.com](mailto:ijraset@gmail.com)**

# An Appraisal for the Working of Solar Water Heater System on Tribal of Himalayan Areas

Ar. Varisha Tamhid  
(M.ARCH)

**Abstract:** As the study proposed an appraisal for the working of Solar Water Heater System on tribal of Himalayan Areas is important to learn the power of nature. Our nature blessed us with so many blessings and one of them is sun. The continuous change in climate that affects the ambient temperature and water in so many ways. So it's our time to take an action to save our nature's earth by utilising different locally available materials, techniques to stop such activities that harm us and our surrounding. As water is one of the important and basic requirements for everyone. And in hilly areas where the temperature is low, the basic requirement is hot water. As the basic source of income for the local residents at these areas are mostly depend on tourist visits. So their restful environment and needs must be a provision. As the Solar water Heater system is costly way as one time investment but later it helps in several ways. Solar energy is one the best alternative way to replace the traditional requirement to heat the water like coal, gas, diesel etc. This system is designed to meet the energy demands. The size of the system depend upon the availability of the solar radiation, temperature and the orientation of the building. The given comprehension helps to understand the requirement and its working.

**Keywords:** Solar energy, solar water heater, himayan areas, nature, ambient temperature, Tourist place, One time investment.

## I. INTRODUCTION

In today's world where everything is deteriorating at its peak level, our nature has blessed us with a great source of energy i.e sun. Sun has been a powerful presence throughout the history of human existence on earth. As solar energy is an alternative source among all energy sources. Due to continuously, ascending use and rising prices on traditional energy sources like coal, gas, petrol, diesel, oil etc. affects the local residents and middle class peoples. So now people recommend to save the money [which is not easy to make] by utilising the proper of of nature's giving sources in which one of them is SUN. Sun is a renewable source of energy which can be utilised for heating the water in every areas may be residential, commercial, industrial, official, hotels applications. Energy becomes the most important role in human existence as all depend upon the technology and its application which help to ease in their working life styles. It is estimated that to heat the water the energy required for atleast 25% from the total energy consumption[1]. Thus system becomes the cheapest and easy to clean, easily affordable for residential and all purposes to provide hot water for different purposes. The supply and the use of effective energy plays a balance and great role in Society's growth and development. As it is very well known that energy is divided into two main category like Renewable and Non Renewable. Renewable is an energy that nature's give us and can be easily renew (wind, sunlight, moving water etc). So solar energy is one of them. The BRAC University construction include the hot solar water heater system[2]. A system has a higher effectiveness value which is completely applied. It is effective when the temperature gap is provided between the solar fan and the tank provided with an insulating layer.

## II. SOLAR WATER HEATING SYSTEM

It is made of several components like heat exchanger, pump, solar collectors, storage tank and back up storage tank. It is easily convert the heat of sun into energy that heat up the water (the area where the rays of sun directed heat up the level of temperature of fluid.



Fig 1. Cross section of storage tank [2]

The system is divided into two active and passive. The passive system help to heatup the water by circulating it in between elevated storage tank and collector. It follow a rule that liquit heats up it slow down the density . The liquid turns into lighter. It is low cost but less efficient. Thermosyphon system is a best example for this type of water heating system. The active system consist of electric pumps , valves, controllers to heat the liquid through solar collectors. So this system termed with another name as forced water circulation system. indulge with two system like open loop and closed loop[1]. The water heating system enhance the efficiency to transfer heat rate to open environment when come in contact with barriers, pipe in helping to decrease the speed of the liquid[3]. Generally the roof system produces hot water with capacity of 25litre/day with 60degree temperature in hot days of summers with 28degree ceiling temperature [4]. If we heat the water by covering the system with phase change material than 5-7 degree of benefit in prolonged stored water [5]. The technology consist of three main categories like collecting, storing and utilising energy. A hot water supply with temperature in between 50-60 degree for domestic purpose is to be acceptable (SOPAC Technical Report,1999)[6].

Certain factors that affect the performance of solar water heater system like : ambient condition of surrounding, tilt and orientation of the collector , orientation of the building so that maximum solar radiation can be achieved, the flow rate for fluid transport and the collector array arrangement. This system helps to decline the demand of domestic energy which is saved from utilities of power. Obviously it is estimated to be a long term investment. Helps to reduce the electrical energy, cost savings from heating up the water. It can also be directly used in swimming pools . Higher demand to trap more heat from high temperature it increases the demand of more expensive system [6].

Sr. No.	Capacity of System	Name of Supplier	FOR Cost (Rs.)	Deptt. Charges @5%	Total Cost (Rs.)	Subsidy @ 30% (Rs.)	Net Beneficiary Share (Rs.)
1	100LPD	M/s. Solchrome Private Limited, 61, Sec-V, Pawanoo-	27,700/-	1,385/-	29,085/-	8,310/-	20,775/-
2	200LPD	--DO--	44,200/-	2,210/-	46,410/-	13,260/-	33,150/-
3	500LPD	--DO--	1,02,500/-	5,125/-	1,07,625/-	Nil	1,07,625/-
4	1000LPD	--DO--	2,02,300/-	10,115/-	2,12,415/-	Nil	2,12,415/-
5	2000LPD	--DO--	3,94,800/-	19,740/-	4,14,540/-	Nil	4,14,540/-

Fig : List of Approved rates of solar water heater system with heat exchanger type in areas of Himachal[7]

Sr. No.	Capacity of System	Name of Supplier	FOR Cost (Rs.)	Deptt. Charges @5%	Total Cost (Rs.)	Subsidy @ 30% (Rs.)	Net Beneficiary Share (Rs.)
1	100LPD	Solchrome Private Limited, 61, Sec-V, Pawanoo-	24,800/-	1,240/-	26,040/-	7,440/-	18,600/-
2	200LPD	--DO--	42,300/-	2,115/-	44,415/-	12,690/-	31,725/-
3	500LPD	M/s Inter Solar System (P) Ltd. 901-A, Indl. Area, Phase-II, Chandigarh	98,300/-	4,915/-	1,03,215/-	Nil	1,03,215/-
4	1000LPD	Solchrome Private Limited, 61, Sec-V, Pawanoo-	1,92,500/-	9,625/-	2,02,125/-	Nil	2,02,125/-
5	2000LPD	--DO--	3,80,300/-	19,015/-	3,99,315/-	Nil	3,99,315/-

Fig : List of Approved rates of solar water heater system without heat exchanger type in areas of Himachal[7]

Subsidy is available only with 100LPD and 200LPD solar water heating system for domestic purposes.[7]

### III. CASE STUDY

Case has been taken from the himalayan tribal region name as Almora, Uttarakhand, which is located on a ridge of southern edge of the kumaon hills of the himalaya rage. The water which is installed at the roof of the hotel is extensively used for the purpose of domestic water heating applications like Geyser. It is an evacuated tube type of collector. It is consist of solar panel frame with a big cylinder and many glass tubes parallel in row. These tubes inner part covered with a coating which is selected to recieve large amount of solar radiation so that heat loss can be minimised.



These types of water heater system is mainly used in cooler ambient temperature areas and low light is available like in Almora . Here the peak hours to recieve the maximum amount of heat is from 11am to 2pm. But the sunrays start to fall from 7 am upto 5pm. The average time to recieve heat is 9-10 hours maximu. As the Almora is a tourist place with green valley , peace and good source of coriander farming . The system is alligned towards the south at 33degree at the roof of the buidig which is a 2 storey building. It generates about 16-18 units per day. As in Himalayan areas the availability of light, food and water is very costly. But this system help in many ways but a large investment of one time can be done.

### IV. CONCLUSION

Now a days it is a need to understand for long period investment to recieve the innovative design procedure to select, install and monitor the system as per availability of solar radiation and the conditions of the surrounding. Thus to select the perfect system according to the suitability of the climate, water usage, cost budget etc. In this study we find that Solar Water Heater System is economical , effective, safe but need one time heavy investment and leave for atleast 18-20 years to enjoy. Maintenance and proper cleaning helps to increase to decrease its efficiency in percentage.

### REFERENCES

- [1] D. B. Jani, Marwadi Chetan , A Review on Water Heating Applications that Uses Renewable Solar , August 2018.
- [2] Manisha jouhri, P. S. Dhakar, A Review Study on Solar Water Heating Systems, June 2019.
- [3] Mohamed Abu Waseem, "Numerical analysis of absorber tube of solar parabolic trough collector with and without insertion by using Ansys Fluent", Journal of Engineering Research and Application, Vol. 8, Issue 12, Dec 2018, pp 01-04.
- [4] D Prakash, "Thermal analysis of building roof assisted with water heater and insulation material", Indian Academy of Sciences, 2018



- [5] S. Sadhishkumar, "Thermal performance of water-in-glass evacuated tube solar Collector with and without phase change material", Indian Journal Sciences, 20(2), 193-201, 2018.
- [6] Tadvi Sachin Vinubhai, Jain Vishal R, A Review: Solar Water Heating Systems, April 2014.
- [7] HP Government Energy Development Agency List of Approved rates of solar water heater system (FPC and ETC type) firms for carrying work of SWHS in H.P. State, September 2020.



10.22214/IJRASET



45.98



IMPACT FACTOR:  
7.129



IMPACT FACTOR:  
7.429



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24\*7 Support on Whatsapp)