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Design and Construction of a new Bin model solar instant water heater

N.Sethupathi[1], K.Vikramprasad[2], P.Mahalingam[3], P.Maadeswaran[4]
Assistant professor, PG & Research department of Physics, Arignar Anna Govt. Arts College Namakkal-637002 Tamilnadu, India[1].
Ph.D., Research Scholar, PG & Research department of Physics, Arignar Anna Govt. Arts College Namakkal-637002,Tamilnadu, India[2].
Assistant professor, PG & Research department of Chemistry, Arignar Anna Govt. Arts College Namakkal-637002,Tamilnadu, India[3].
Assistant professor, Department of Energy studies, Periyar University,Salem-636011, Tamilnadu, India[4].
sethupathi2011@gmail.com[1] , kvikramprasad89@gmail.com[2] ,mahalinghamp@yahoo.com[3] ,mades_saamy@yahoo.co.in[4]

Abstract- Generally we have many kinds of solar water heaters in modern world. Solar water heating concepts is one of the backbones for energy conversion field. Here, a novel design of bin model solar instant water heater was fabricated and now the proposed water heating system is traditionally not available. Also this heater is different from others because of its cost is low, it is environmental friendly the fabrication, maintenance is simple and the water heating time is very lesser in good climatic conditions. Bin model solar water is specially made for large scale hot water heater needs and it is framed also suitable for domestic usages. So we frame the bin model water heater to solar energy evolve, eventually, in future the setup has good response for giving hot water in proper climatic conditions. The suggested bin model solar instant water heater is easy to construct and heat vindications and it is suitable for any kind of good thermal conductivity absorber plates. We contemplate to analysis some configurations as well as got excellent outcomes in fabrication and implantation parts. In this paper, we mentioned the design and construction parts, economic considerations, temperature setup in experiment and dimensions of bin model solar instant water heater with important dimensions and epic materials are mentioned.

Keywords- Solar energy, Instant water heater, Bin model, Designing, Constructions.

1. INTRODUCTION

Solar energy with its unlimited authority and independent form of pollution and picking contingent may be the clarifications to hot water and efficiency points of the rural areas. The sun's energy had many wonders. We frankly said that there is no department that did not use this energy. In agriculture, food provision, water purification, we used this energy and we can say this energy as men's friendly. If a country want to be well developed country, in that dream becomes true, it determines how they consequently use their natural resources, especially sun's energy. In India as an emerging empire goes forward to a well enriched nation. The only thing was solar energy usages is miserably in rural areas. Especially the matter of course of things by people's using advanced machinery automations, less charge values, more usage, etc. we have to encourage commonality to use contrivance having solar potential or machinery automations left out disturbing the context elements, the indigenous sun has providing extended energy to mentioned world. The most dence important things were sun's energy and water we are going to excite views that link these two collaterals[1].Consider the rural precinct less investment as well as urban people can easily use this bin model solar water heater is discussed in this research paper. On the further hand bin model solar water heater is very purposive immediate hot water occasional. In this work the novel description bin imitation solar instant water heater was designed. This work is going to analyze the economics features, conviction and properties of novel bin model solar instant water heater. This work is developed and handled in Indian climatic conditions[2]. It is one of the best charts for fast hot water needers. Its design and convictions are very compact. This type of water heater saves energy and reduces time for hot water process.

2. EXPERIMENT SETUP

2.1 *Designing and Implantations*

The complete arrangement of bin model solar instant water heater's construction was made in Arignar Anna Government Arts College – Namakkal-2. The latitude angle of the location is 11° 10′23 sec north, The longitude angle is 78° 10′23 sec east. Bin model solar instant water heater forge and necessity in this work called the External tray, Inner tray, reflectors, collector path and absorber compass range. The nonspiritual conducting material that is saw dust was pressed into service extra space in external bin surface precinct. The bin model solar instant water heater was placed in open area. The location is without umbra. The entire system was watched and noted in each and every day by good climatic conditions. The bin exemplary solar instant water heater is not needed any kind of depot and it just

has water inlet and outlet tanks. The bin model solar instant water heater is one of the aces and in complex ideas of the formal sun water heaters. In addition, the digital water flow meter was also used for quantity of water. The major aspiration and hint is to get a simple design and fast heat water yield[3].

2.2 *Inner tray*

The extents of the inner tray are baits

1. Inner tray length = 100 cm
2. Breath = 100 cm
3. Height = 2.5 cm
4. The total capacity of inner tray = 25 litre

The inner tray is the heart of the bin model solar instant water heater and it is made by stainless steel. The inner tray was displayed in the Fig. 1. The inner tray's internal path was spited by one barrier with top of rubber layer and the split distance is 50 cm approximately from one end of the tray with the length of 85 cm. The barrier is also of stainless steel material, with slight bend because of without air lock benefits. The height of inner bin is 2.5 cm. This gap is useful to fast water flow towards one end to another end. Inner tray has a hole at middle to measure the temperature at central part of the tray and the edges having holes for contact into bin they fitted by bolts and nuts. The patrician clove is also helps in breeze compression of water towards one stub to another end. The solar energy which is captured by reflectors and fall on the inner tray with black colour absorber plate , and then the inner tray is commuted into hot water. The inner tray was wholly bounded by copper sheet with the thickness of 0.7 mm. In that crib, copper takes in the thermal conductivity was extremely good for solar water heating properties and it was coated by good quality black paint, also mounted with the copper sheet is touching the water and giving the solar heat directly into outcome water with very small heat loss. The inner tray can be placed in an outer bin. On the other, hand the inner tray is so called the main part of the bin model solar water heater. In our next cases, the copper sheet restored by aluminum as collecting unit[4,6].

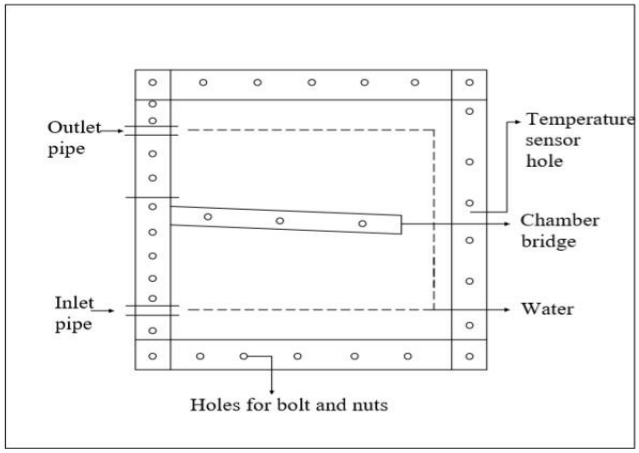

Fig. 1.(a) Block diagram of Inner tray

(b) Inner tray with rubber layers

2.3 *External bin*

The external bin is also made by stainless steel. The external bin is displayed in below Fig.

(c) Inner tray with black paint coated copper cover

2. The external bin have epic specifications that is
   1. Outer tray length = 137 cm
   2. Breath = 137 cm
   3. Height = 15 cm

The reflecting stands are made by stainless steel of 2.5 square pipe with the several splits on top. The external bin having twin cleft, because half inch sewer will be inserted, one is inlet and another one is outlet. The outer tray has three holes for the measurement of temperatures. The external bin ceiling was completely covered by transmitting glass cover of thickness 0.5mm. The reflecting material we used the inbuilt is stainless steel sheet door in 4 numbers attached with plane mirrors and a over lock is joined at each sides. Its thickness and length are denoted below.

Thickness of glass = 5 mm
Length = 132 cm
Breath = 132 cm
Type of glass = Ordinary float

The reflectors are attached in separate stands corresponding with external Bin and the stands will be connected in external bin. The reflecting setup i normally adjustable by Sun's radiation angle and th adjustable system is manual setup. The inner tray i inserted by external bin, but not perfectly matched, the have some gaps, in that space filled by the non conducting material name of saw dust. The saw dust i used that weight 10 kg approximately.

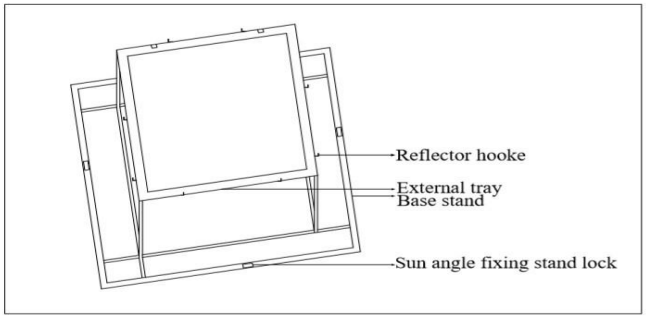

Fig.2. (a) Block diagram of External Bin

(b) External Bin without sawdust and glass

The fulfilled setup was keeping an audit delicately. The proposed bin model solar instant water is shown below Fig. 3.

In future, the readings and measurements will be taken by the LP PYRA 03 Pyranometer measuring for solar radiation, water flow meter for measuring water inlet and outlets, temperature sensors for measuring temperature and Electronic watch instruments for measuring time[7].

(c) External Bin complete setup

2.4 *Precise of recommended bin model solar instant water heater*

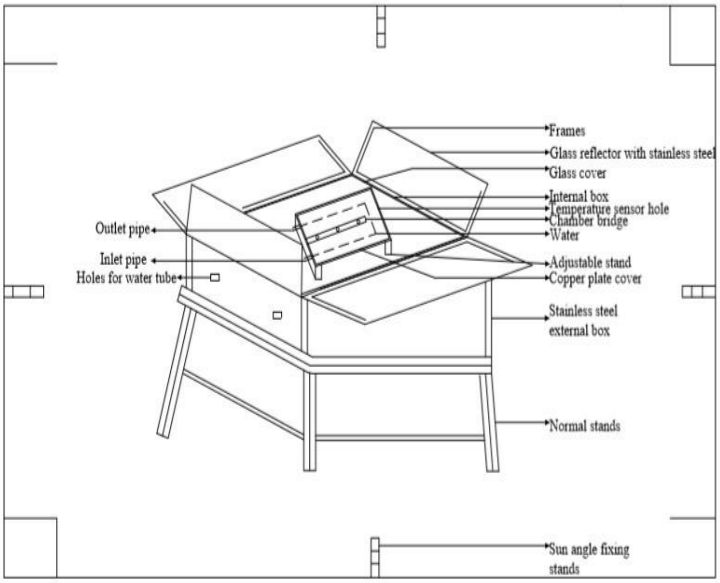

Fig. 3. (a) Proposed design of Bin model Solar instant water heater

(b) Side view of Bin model solar instant water heater

3. ECONOMIC AND CLIMATIC CONDITIONS

The bin model solar water heater has a very good property like, simple design with all the parts are readily available in market, required to pay lesser amounts. We suggested the bin model solar water heater's price range is very low, compared to spare mercantile water heaters. We tabulate the components price list in Table 1 of all the parts of sanctioned system. The element exaction will be the decisive factor for rural people's development. In that way solar energy and solar water heating systems are good for our nation. The price of entire bin model solar instant water heating system is at the time of work was 42,371 INR including all taxes.

(c) Top view of Bin model solar instant water heater

Table 1. Economic analysis for proposed system.

S.NO	Property	Value in INR
1	Stainless steel	24,000
2	Copper, Aluminium sheet	6896
3	Reflecting glass	5636
4	Water flow meter	2989
5	Other charges	2850
Total		**42,371**

The extractions were denoted in addition to all the baggages and pursuit charges. All the equipments are purchased in Coimbatore Tamilnadu- India. The water heater will be placed in roof top of Arignar Anna Govt. Arts college, Namakkal-637002, Tamilnadu, India. The price wise this is a deserving and archiving system. This model is friendly for any climatic regions conditions and during rainy days at least we can get 50% of results compared to sunny days. Shade region is biggest enemy for bin model solar instant water heater[8].

4. RESULTS AND DISCUSSION

The setup will be monitored carefully, perfect maintenance and the current design of collection part of inner tray is splited by one barrier. The future potential work going to be conducted is inner tray that is called collection section will be attached by 0.8 mm Copper, Aluminum plates, and the studies will be made on various climatic conditions. The inner tray will be designed three barriers, in that case the water flow will be increased and heat harvesting will be sooner as well as possible. The three barriers of collection section is made up by stainless steel. The heat contact of copper or aluminium is more attached with collector sections. In this above design of bin model instant water heater, we expect the results of 20° C temperature raise for 20 litre water output in 10 minutes on sunny days. In this paper, we discussed only about the design of single bridge inner tray and entire setup of Bin model solar instant water heater.

5. CONCLUSION

This is completely innovative setup. In that paper focused on the design and construction part of Bin model solar instant water heater. This design helps to produce hot water for any climatic conditions. The aim of this work is to construct a fast solar hot water yield from a simple design. Our design does not need sun tracer and storage tank. All the materials are readily available in cities and the collector area built by stainless steel with reflecting mirrors at the top of copper plate. Cost wise, it is low and economical system. Therefore utilization of our design may be much useful for large industrials, hotels, hospitals, colleges and schools. This water heater is also useful for Home appliances and rural areas. The bin model water heater is framed normally by using various materials as our wish. The performance studies of Bin model solar instant water heater will be analyzed in future.

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