IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 7.105 ⁜ Vol. 9, Issue 6, June 2022

DOI: 10.17148/IARJSET.2022.9649

# DESIGN AND FABRICATION OF SOLAR COOKER

**Megharaj Kencharaddi[1], Ronson A C[2], Charan D B[3], Gaurav C S[4], Hemanth Suvarna[5]**

Department of Mechanical Engineering, Alva's Institute of Engineering and Technology,

Mijar, Moodbidri, DK- 574225. [1-5]

**Abstract:** The sun's energy is truly strong. Sunlight based energy is sustainable and it's free. We can utilize it to make power, to warm structures and to cook. The field of cooking consumes numerous non-renewable energy sources like gas and wood. Million individuals can't track down sufficient gas or potentially wood to cook, so utilizing sun-based cookers is really smart. During this work, we planned, fabricated and concentrated on an illustrative sunlight-based cooker. The trademark conditions and the trial results are given [1]. In this paper, a careful audit of the accessible writing on sun-based cookers is introduced. The survey is acted in a topical manner to permit a simpler correlation, conversation and assessment of the discoveries got by analysts, particularly on boundaries influencing the exhibition of sun-based cookers. The survey covers a noteworthy outline of sun-based cooking innovation, point by point depiction of different sorts of sun-oriented cookers, calculation boundaries influencing execution of sun-based cookers, for example, sponsor mirrors, coating, safeguard plate, cooking pots, heat stockpiling materials and protection. In addition, thermodynamic appraisal of sun-oriented cooking frameworks and subjective assessment of warm result presented by sun powered cookers are investigated exhaustively. Complex plans of sun powered cookers/broilers with and without heat stockpiling material are represented and moreover potential techniques to have the option to improve the power results of sun-oriented cooking frameworks are introduced. Practicality investigation, natural effects and future capability of sun powered cookers are likewise thought to be in the review [2].

## 1.0 INTRODUCTION:

The advancement of sun-oriented energy change gadgets and their application is turning into a need nowadays. The foremost inspirations of such a concern are the dangers of contamination brought about by the utilization of regular energy sources and the astronomic ascent of cost of these energy sources, like oil. Among the procedures of sun-oriented energy transformation, the photothermic energy transformation strategy was seen as extremely encouraging, modest and thus simple to create. To work at high temperatures, it is important to think the episode sun powered radiation. This could be accomplished utilizing gatherer called sun-oriented concentrator. The sunlight-based energy concentrating frameworks involves an intelligent surface in illustrative structure expected to thin the sun powered energy on an engrossing surface, which makes it conceivable to have a solid expansion in heat. The benefit of such a strategy is to create high temperatures adjusted for warming, sun powered kitchens and creation of power by Stirling motors. Centering authorities are planned to deliver a lot higher temperatures than those from level plate authorities (Habeebullah et al;1995) [1]. Wood, biomass and non-renewable energy sources are being utilized as cooking energizes worldwide for huge scope. These components make ecological perils as well as lead fast deforestation, an Earth-wide temperature boost, and exhaustion of regular assets. To determine these issues, ecological offices are buckling down in looking through environment agreeable arrangements. Indeed, even the top energy utilization nations proposed to use environmentally friendly power sources rather than petroleum products. An investigation of National Renewable Energy Laboratory (NREL) in joint effort with USAID uncover that Pakistan has sun-oriented energy capability of 2.9 million MW. Pakistan is an arising country, with populace of in excess of 180 million, confronting cut off energy emergencies. Measurements mirrors that energy import bill of Pakistan for homegrown area is41% of all out bill. To defeat previously mentioned issue and energy emergencies of Pakistan, cooking through sustainable power assets like sun-oriented energy, sun-based cooking, found as an expected arrangement [2].

## 2.0 HEAT PRINCIPLE:

The central support for a sunshine-based box cooker is to warm things up - cook food, clean water, and sanitize instruments - to show a couple. A light assembled box cooks regarding the grounds that inside the holder is warmed by the energy of the sun. Light, both brief and reflected, enters the sunlight-based box through the glass or plastic top. It goes to warm energy when it is consumed by the dull safeguard plate and cooking pots. This hotness input causes the temperature inside the sun arranged box cooker to ascend until the hotness loss of the cooker is equivalent to the sun-

  

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 7.105 ⁜ Vol. 9, Issue 6, June 2022

DOI: 10.17148/IARJSET.2022.9649

based hotness gain. Temperatures adequate for arranging food and it are helpfully accomplished to cleanse water. Given two boxes that have relative hotness upkeep restricts, the one that has greater augmentation, from more grounded daylight or extra daylight through a reflector, will more intensity inside. Given two boxes that have indistinguishable hotness gain, the one that has more hotness support limits - better defended dividers, base, and top - will appear at a higher inside temperature. The going with warming standards will be viewed as first [3].

1.Heat increase
2.Heat misfortune
3.Heat capacity

**2.1Heat gain by greenhouse effect:**

This impact brings about the warming of encased spaces into which the sun radiates through a straightforward material like glass or plastic. Apparent light effectively goes through the glass and is ingested and reflected by materials inside the encased space. The light energy that is consumed by dull pots and the dim safeguard plate under the pots is changed over into longer frequency heat energy and emanates from the inside materials. The greater part of this brilliant energy, since it is of a more drawn-out frequency, can't go back out through the glass and is hence caught inside the encased space. The mirrored light is either consumed by different materials inside the space or, on the grounds that it doesn't change frequency, goes back out through the glass. Basic to sun oriented cooker execution, the hotness that is gathered by the dim metal safeguard plate and pots is led through those materials to hotness and cook the food [3].

**2.2 Heat loss:**

The Second Law of Thermodynamics communicates that heat for the most part goes from hot to cold. Heat inside a sun situated confine cooker is lost three head ways: Conduction, Radiation, and Convection

**Heat loss by conduction:** The handle of a metal dish on a stove or fire becomes hot through the trading of hotness from the fire through the materials of the skillet, to the materials of the handle. Likewise, heat inside a daylight-based box is lost when it goes through the particles of tin foil, glass, cardboard, air, and security, to the air beyond the case. The sun based warmed shield plate conducts hotness to the bottoms of the pots. To thwart loss of this intensity through conduction through the lower part of the cooker [2].

**Heat loss by Radiation**: Things that are warm or hot - - blazes, stoves, or pots and food inside a daylight-based box cooker - - discharge heat waves, or send hotness to their ecological variables. These hotness waves are sent from warm articles through air or space. By far most of the splendid pots and base plate. Though the clear glazing's genuinely trap most of the splendid hotness, a few breaks directly through the covering. Glass traps splendid hotness better than most plastics [2].

**Heat loss by Convection:**Particles of air move all through the container through breaks. They convect. Warmed air particles inside a sun-based box escape, fundamentally through the breaks around the best, a side "broiler entryway" opening, or progression blemishes. Cooler air from new moreover enters through these openings [2].

**2.3 Heat Storage:**

As the thickness and weight of the materials inside the safeguarded shell of a sun arranged box cooker increase, the constraint of the case to hold heat increases. Within a case including significant materials like rocks, blocks, profound holder, water, or profound food assortments will invest in some opportunity to heat up because of this additional hotness storing limit. The coming energy is taken care of as hotness in these profound materials, toning down the warming of the air in the holder. These thick materials, blamed for hotness, will send that hotness inside the case, keeping it warm for a longer period at the day's end.

## 3.0 DESIGN OF SOLAR COOKER:

**PRINCIPLE:** There are an assortment of kinds of sun-based cookers: more than 65 significant plans and many varieties of them. The fundamental standards of all sun-based cookers are [3];

**Concentrating sunlight**: Some gadget, normally a mirror or some kind of intelligent metal, is utilized to focus light and hotness from the sun into a little cooking region, making the energy more thought and subsequently more potent [3].

**Converting light to heat**: Any dark within a sunlight-based cooker, as well as specific materials for pots, will work on the adequacy of transforming light into heat. A dark container will ingest practically the entirety of the daylight and transform it into heat, significantly working on the viability of the cooker. Likewise, the better a dish conducts heat, the

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 7.105 ⁜ Vol. 9, Issue 6, June 2022

DOI: 10.17148/IARJSET.2022.9649

quicker the broiler will work [3].

**Trapping heat**: Disengaging the air inside the cooker from the air outside the cooker has a significant effect. Utilizing a reasonable strong, similar to a plastic sack or a glass cover, will permit light to enter, however when the light is ingested and changed over to warm, a plastic pack or glass cover will trap the hotness inside. This makes it conceivable to arrive at comparative temperatures on cold and blustery days as on hot days [3].

**3.1 SOLAR COOKER BOX**:

It comprises of a protected external and internal box, metallic cooking plate sat inside the crate, twofold glass cover on the cooking plate, and two reflecting mirrors fitted to the different sides of the top of the case and a flexible stand. The cooking plate is protected on the sides and base. The cooker box comprises of a top open dark painted internal box kept inside of the case and the space between the two boxes is loaded up with glass fleece protection. The two thinking about mirrors are put the upper side of the case with an opening among them and are in hold by a turn joint with the cooker box. This is a customary sort of cooker and its length is on various occasions its width and significance are same as that of width. The cooker is to be set going up against sun, keeping longer side vertical skewed position and the propensity of the cooker box can without a very remarkable stretch be changed from 15 degree to 45 degrees concerning the ground by the adaptable stand, associated at the back of the compartment. The reflectors are set along the length of the cooker box cover, one in each side, by turn and holding strip. So, length of reflectors is identical to the length of the glass cover. The widths are comparable to the width of the glass cover. The reflectors are inclined at a place of 115 degree with the substance of the carton cover. The pith of the cooker is to be set inverse to transmit radiation to accumulate the most outrageous energy. This contrary position can be easily achieved fundamentally by the upset of the cooker towards the sun with the assistance of caster wheels, suitablyassociated at the base side of the cooker and by changing the propensity of the cooker by versatile stand of the back. But the spot of the reflectors stays unaltered all through the working period. Dim painted aluminum cooking pots are used and are put one close to the next at the longer side of the cooker on cooking plate. For each cooking plate two bolts went about as turn are fixed at both longer sides of the cooker internal box. The cooking plate is suspended from the completion of the bolts through M.S strips. Length of these strips is comparable to the cooking pot clear and these strips are fixed with the completions of plate agreed with the precise focus spot of the plate as When the cooker box inclination is changed the cooking plate close by cooking pot, for its own weight, pivoted the bolts and reliably remained in level position. To avoid the chance moving of pots, square formed plate, length of which are held comparable to the estimation of pots are used and wraps up of the plate are imploded up [4].

## 4.0 CONCLUSION:

Sun fueled energy is free, biologically great, and consequently is seen as quite possibly the most reassuring elective energy recourses decision. In giving the expected energy, sun fueled cookers can totally or somewhat trade the usage of fuel for cooking in many making regions. Sun controlled cooking has reliably been viewed as a response looking for an issue, or a mechanical game plan made without abhorrence for client needs. In this paper, a review of the available writing [3]. A Solar cooker was produced in consent to the nuances available in journals. Temperature Profiling was done and graphically represented. A illustrative concentrator was joined with its base clouded for most prominent maintenance. Temperature profiling was finished with the illustrative concentrator and it was seen that the concentrator expanded the temperature yield of within cooking encompassing of the sun-controlledcooker [4].

## REFERENCE:

[1] Design and realisation of a parabolic solar cooker m. ouannene, b. chaouachi, s. gabsi Research Unit: Environment, Catalysis and Analysis of ProcessesNational School of Engineers of Gabes (E.N.I.G) - Omar Ibn ElKhattab Street - 6029 Gabès-Tunisia

[2] Parabolic solar cooker dish: design and simulation *Dasin, D. Y., **Asere, A. A. and ***Habou, D. *Mechanical Engineering Department, Federal University of Technology, Yola. **Mechanical Engineering Department, Obafemi Awolowo University, Ile Ife. ***Mechanical/Production Engineering Programme, Abubakar Tafawa Balewa University, Bauchi.

[3] Engineering,design and fabrication of a solar cooker with parabolic concentrate or for heating, drying and cooking purposes M.Balakrishnan, A.Claude*and D.R.ArunKumar

[4]An Overview Study of Solar Cookers Rahul Aadiwal1, Manish Hassani2, Pradeep Kumar