DEVELOPMENT OF SOLAR HEATING FURNACE

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ABSTRACT

Sun oriented Energy Technology has a critical part to play in the present Energy and Environment crises. Sunlight based Concentrator Technology has great potential for different applications, including power age furthermore, process heating applications. We have developed a solar heating furnace. The solar heating furnace is a structure that uses concentrated solar power to produce high temperature, usually for industry where the high temperature required for the process. Parabolic surface which is covered by the aluminium foil or mirror concentrate light onto a focal point. This heat can be used to melt steel, nanomaterial, generating electricity, hydrogen fuel or steam generation.

Keywords: Solar Furnace, Solar concentrator, Parabolic Dish, Reflective Mirror.

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1. INTRODUCTION

Energy is necessary for Life and Sun is the main source of Energy for Earth. Sun based Energy changed over and between changed over to and from different structures, supports Life on Earth. The improvement of human capacity to bridle and use energy from different sources has impacted development of Human Life and Civilization. Industrial Revolution came about into extraordinary changes in energy transformation and use designs, which achieved awesome changes in human way of life, financial and political conditions and condition, also. Energy Crisis and Global warming are glaring impacts of the results of those progressions which recognize earnest worry for creating and actualizing cleaner and greener strategies for maintaining Life. Sun based Energy Technology has a noteworthy part to play in this unique circumstance.

Most of the work done so far in the field of Solar Concentrator Technology is for generation of electricity. Solar thermal power systems utilize the heat generated by
concentrating and absorbing incident solar energy to drive a heat engine / generator and produce electric power. Three generic solar thermal power systems, trough, power tower, and dish/engine systems, are being employed for power production [1, 2]. Trough systems use linear parabolic concentrators to focus sunlight along the focal lines of the collectors. In a power tower system, a field of two-axis tracking mirrors, called heliostats, reflects the solar energy onto a receiver that is mounted on top of a centrally-located tower. Dish/engine systems, the third type of solar thermal power system, comprise a parabolic dish concentrator, a thermal receiver, and a heat engine/generator located at the focus of the dish to generate power. Of the three solar thermal power technologies, trough electric systems are the most mature [3]. In India, Dish Technology to harness solar energy for generating electricity is yet to get established. However, pioneering work on use of Scheffler Dish for SOLAR COOKING was done by Shree Deepak Gadhia of Gadhia Solar, Valsad, Gujarat to overcome the shortcomings of box type solar cooker (could only boil and roast the food) and mini concentrating dish type solar cookers (cumbersome outdoor usage). It was introduced for community cooking about two decades back and was successfully used for other applications like desalination, food processing, etc [4].

In this we measure the intensity of sun during the whole day & find the steam generation ratio during two hours of interval, for that we make solar concentrator for concentrating the sun ray on a single focal point then measure the sun intensity & steam generation during the day. The Concave surface used for the solar heating furnace is made from mild steel, Which has thickness of 2mm, diameter of 914mm. this is also known as “Solar Concentrator”. The main aim of the solar heating furnace is the curve surface which is covered by the mirror, when the sun rays are comes on the mirror at that time this rays reflected by the mirror. The mirror concentrates the sun rays on the single focal point. The focal point contains very high degree of temperature. This high temperature used for metallic receivers producing hot air for the next generation solar towers, solar power plants produces very high amount of steam to generate electricity.

The solar heating furnace principle is being used to make inexpensive solar cookers and solar water pasteurization.

2. LITERATURE STUDY

Solar energy strikes our planet a mere 8 min 20 s after leaving the sun which is 1.5 x 1011 m away. The sun’s total energy output is 3.8 x1020 MW which is equal to 63MW/m2 of the sun’s surface [5]. The world’s overall solar energy resource potential is around 5.6 gigajoules (GJ) (1.6 megawatt-hours (MWh) per square meter per year. The highest solar resource potential is in the red sea area, including Egypt and Saudi Arabia [6]. Solar energy is the most favourable alternative energy which can serve as a substitute for fossil fuel; it is non-polluting source of energy which if properly harness and utilized can help to curtail the amount of CO2 emitted to the atmosphere due to the combustion of fossil fuel [7]. Widespread use of solar energy for domestic, agricultural and agro-industrial activities has been practice almost since the development of civilization, the increasing threat of acute shortage of the commercial sources of energy coupled with serious environmental pollution problems has accelerated interest in the scientific exploration of renewable sources of energy. It is estimated that the small fraction of solar radiation falling on the earth is equal to the world energy demand for one year [1]
3. MATERIALS AND METHOD
A parabolic dish of 2 mm thickness and of 914mm diameter was used for the construction of the solar parabolic concentrating collector. A reflective mirror was cut using a glass cutter into small square pieces of size 4 cm, x 4 cm, these reflective mirrors was used to cover the interior of the concave surface of the Parabolic dish By using glue. As the rays of the sun falls on the surface of the dish the focus of the reflected rays was concentrate on thealuminium black surfaced POT which was filled with the water. The ambient temperature and the temperature of the collector were recorded between the hours of 9:00 am-2:00 pm local time. Care was taken to locate the position of focus accurately.

4. EXPERIMENTAL SETUP
The examination setup is as appeared in figure. The parabolic dish concentrator was set to move freely toward any path by turning dish physically. A counter stand was set in specific heading where the point of focus was found during any time of the day. The distance from the central point to the counter stand is recorded and also the height of the retort stand from the ground is also measured using a meter rule.

Figure 1. Experimental setup
5. RESULTS AND DISCUSSION
The results from the various experiments performed using parabolic dish solar concentrator was presented from figure. Figure 2 shows the plot of temperature of the boiling water from 9 am to 12 noon. From the figure it was observed that the highest temperature obtained was 94°C and the temperature of water was 18°C at the starting of experiment. The amount of water was 1 litter and at the end of experiment the amount of water remains 900 ml.

Figure 3. shows the plot of temperature of the boiling water from 12 noon to 2 pm. From the figure it as observed that the highest temperature obtained was 95°C and the temperature of water was 18°C at the starting of experiment. So, the sun intensity was higher between 12 noon to 2 pm.

6. CONCLUSION
The outline and development of a parabolic dish application is displayed in this paper. The execution of the dish as far as efficiency is higher than expected. While no detailed execution investigation is exhibited here. The main research fields for this work are solar -collector physics, components design and development, material economy, energy cost savings, and
reduction of carbon dioxide emission into the atmosphere. All the components were made from locally available materials. This promotes local content utilization of manufactured goods and services. Further updates are possible in the model according to the requirements, specifications or constraints applicable to a specific system. Also, only preliminary testing of the analysis model has been done. It can be useful and be improved by subjecting it to detailed experiments on systems working on a regular basis.

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