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Analysis and construction of Scheffler solar concentrator with application

Scheffler reflector is fixed focus concentrators used for medium temperature applications in different parts of the world. This focus remains on the path of the radiation beam incident during the year. This paper reports the design, development and performance analysis of Scheffler reflector of 2.7 m^2. The Scheffler reflector studied with typical experimental plan for simultaneous variation of the independent variables. Experimental response data analyzed by formulating dimensional by formulating dimensional equations. The tests were conducted in Feb 2017, 20 liters water were kept on focus. The experimental data were recorded during the fixed time interval. The analysis reveled performance of the average power and efficiency in terms of boiling tests.

Keywords: Scheffler reflector, solar radiations, boiling test, fixed focus.

I. Intrduction

The Scheffler reflector is a parabolic reflector fixed focus, mainly used for cooking, baking, water hearing. Recently, other applications in thermal power delivered by the reflectors have come up, most people use reflecting steam boilers. The reflector is a small part of a much larger lateral paraboloid. This section paraboloid of revolution, which is used as a reflector, remote from the axis of the parabola, as shown in Fig.1. Scheffler reflector inclined cut produces the typical elliptical shape. Inclined axis of the incisions on either side of the axis paraboloid reflector produces two resources by focusing on a single focus. Scheffler's axis of rotation to form a system for the road through a paraboloid axis and perpendicular to the attention. The earth's axis of rotation is placed parallel axis. Therefore, the angle of inclination equal to the angle of the axis of rotation of the installation site latitude with the horizontal. The scope of the research is to establish design data for Scheffler reflector with the help of the most affecting design parameters of function Scheffler reflector. In the present work experimental study of Scheffler reflector water heater consisting single storage tank as an absorber mounting side curved reflector trough is performed. This improvement will increase by technology sector solar energy and Scheffler reflector can better understand from the design point of view. The paper is expected to process analysis Scheffler reflector water heater for average and power capacity according endure boiling water Deorukh held in Ratnagiri.

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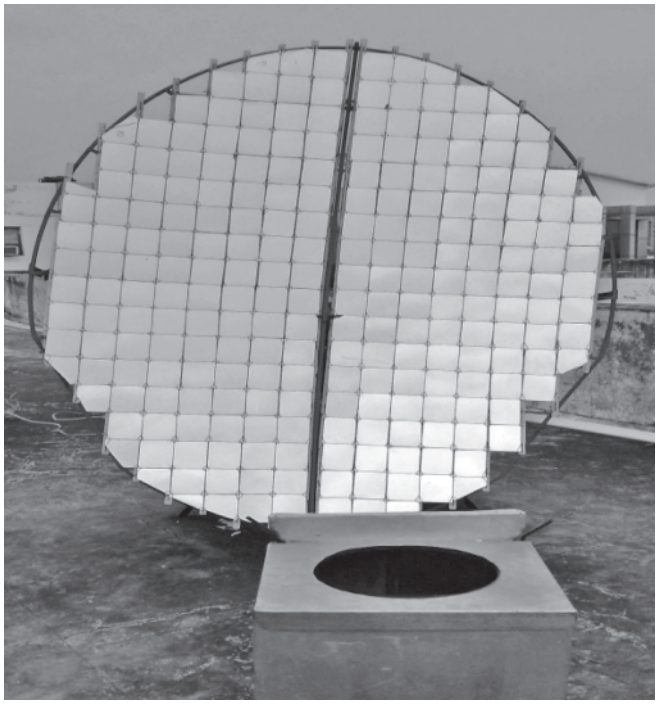

Fig.1 Parabolic solar concentrator

II. Manufacture Scheffler reflector

The solar system consists of a primary reflector 2.7m^2 area and a secondary reflector. Main components of the primary reflector elliptical reflector frame, rotating support, tracking channels reflector stand, and daily and seasonal tracking device. The primary reflector is designed by considering the lateral part specific paraboloid. Seven reflectors have been designed and crossbars used, and the elliptical frame to form the required section of the paraboloid. These crossbars were evenly along the minor axis with one bar in the center and

TABLE 1: REFLECTOR SCHEFFLER PERFORMANCE

Time of the day	Max receiver temp ^{0}C	Min receiver temp ^{0}C	Inlet water tank temp ^{0}C	Outlet water tank temp ^{0}C	Concentration ratio
10:00 am	160	150	17	60	20.6 m
10:30 am	176	162	18	62	20.6 m
11:00 am	200	265	18.22	63	20.6 m
11:30 am	300	280	18.33	64	20.6 m
12:00 pm	343	320	19.55	66	20.6 m
12:30 pm	360	340	27.5	67	20.6 m
1:00 pm	365	345	28.5	70	20.6 m

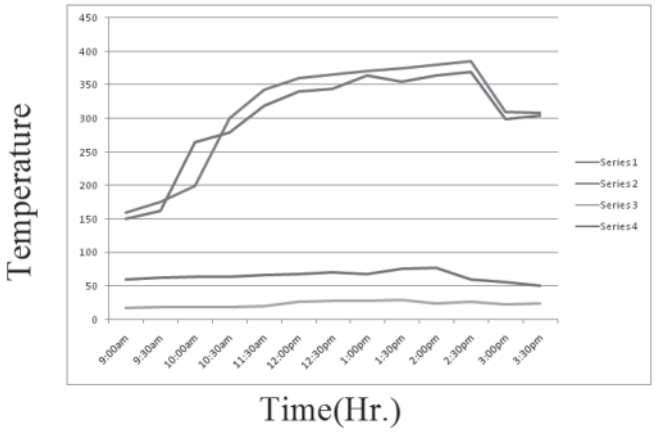

Fig.2 Variation of receiver and water temp ^{0}C

others. They were located at a distance of previous on sides. These transverse rods were checked using a jig specially designed profiles checks of Scheffler reflector. The rotating support was fabricated as an integral part of the primary reflector consists of a rotation axis (constructed of a steel pipe), a tracking channel (channel bent in semi-circular shape and welded around the rotation axis with carriers). The reflector is placed vertically on the site with his or her state of grouted to the foundation, the plates of the die, and to reinforce the firmly bolted and welded. Journal of gestures associated with the council reflector in a straight line parallel to the polar axis through the west into the north and to the south direction. At the end of the axis the world (iron pipe) reflector in the church then was: gestures reflect the journals of two.

III. Testing procedure

Scheffler reflector used has an area of 2.7 square meters. on the a water container 10 liter hold focus. Measurement of the parameters are the temperature of water, solar Radiation. RTD is used for measuring the temperature of the water to the extent of from 0 to 100°C 400°C. The same anemometer had tool shows ambient temperature. Solar power meter is used to measure radiation. and experiment was carried out in May and June. Readings were collected in different time zones from 10 hours to 3 hours for various days of all deductions They were taken at 30 minutes. More than 300 observations were recorded.

IV. Performance assessment

On the concentration ratio of the basic energy efficiency h cooker energy output ratio (the increase of energy results in rise in temperature) energy input (energy due to water solar radiation). TUS, instantaneous energy has provided benefits. M mass with water, we measured the time interval of the maximum water receiver temperatures min Δt and is a reflection area. Average energy equation is given, Where the MV is used for temporary power inlet. In particular heat CPIs constant pressure and ΔT [K] is the temperature change certain period of time. Average energy, test is given in where the total process TP is the time.

Results

The Scheffler solar concentrator is used having an area 2.7 m^2; it has 10 litre container water. The parameter is measured by water and receiver temperature. We measured tempraure inlet temparture and outlet temperature of water tank.The readings were taken at diffrent time zone between 10 AM to 1 PM for various days. All readings taken were at interval of 30 minutes

This Fig.2 shows the tank to keep the water recipient that a point of emphasis that should be 400. We observe the inlet temperature and the outlet temperature of the car receiver.

VI. Conclusion

This study also concludes that these innovative solar concentrators can open solar systems. In addition, other benefits such as reduction of fossil fuels consumption and global warming cannot be ignored. The study also suggests that the types of similar systems should be equipped with necessary fixings and instrumentations to monitor and control the desired thermal parameters. During industrial temperature-sensitive processing. In order to non-polluting and non-polluting uses the source of reversible nature i.e. solar energy, the intensity must be maximum. The efficiency of Schefffler reflected is observed at 23.2% and the average power is 466 W. This system was very nicely found its application in domestic cooking.

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