

MIRROR BASED POWER GENERATION

Pranav Kedare¹, Hemant Kulkarni²

¹Electrical Engineering , Sandip Institute of Engineering & Management mahiravani, Nashik

Abstract - The solar power plant technology using solar concentrators like parabolic trough, enclosed trough, Fresnel reflector, dish sterling, solar power tower are generating adequate power but efficiency of this plants is quietly less, Due to this the utilization of sun energy is minimum and less energy is generated. In the mirror based power generation system the focus is on the technology of parabolic dish power plants, a proven technology for solar power generation. The large scale in parabolic dish power plant through parabolic shape mirror concentrates the solar radiation onto pipe in the focal line of the receiver. Thus the thermal energy generated is used for electricity generation using prime mover as green steam engine. Due to use of this power plant there is vast savings of fuel. Approximately in year the plant can continuous on up-to 288 days. It does not create any sort of pollution. There is no use of any fossil fuel which is the best features of this power plant. This plant should be installed as per local areas like village at the higher position of the village. As we know very well that from last two centuries we use 60% of non-conventional energy. Hence, mirror based power generation plant can be much preferable and useful to us. Solar thermal power plants are ideal for covering peak and medium load in power off grid policy in hybrid operation they also work as base load. When we use mirror based power generation system then we can also prove the Moto of 24 hours of electricity

Key Words: Scheffler reflector, axis tracking mechanism. Green technology

1. INTRODUCTION

In the solar power plant technology the opportunity it present and the development in the market are the outlined. The focus is on the technology of parabolic dish in power plants a proven technology for solar power generation. The large scale in parabolic through power plant through shape mirror concentrated the solar irradiation onto pipe in the focal line of the receiver. The thermal energy thus generates it use for electricity generation in a steam engine parabolic through we can combined with wind energy system when sun is not shining. Due to use of this power plant there is vast savings of fuel. Approximately in year plant can continuous on up-to 288 days. It does not create any pollution. There is no use of any fuel as the best features of this power plant. This plant should be installed as per local areas like village at the higher position of the village. As we know that very well from last two centuries we use 60% of non-conventional energy Hence, solar power plant can be much preferable and useful to us. Solar thermal power plant

is ideal for covering peak and medium load in power grid in hybrid operation they also work as base load.

1.1 CONSTRUCTION

A. Scheffler dish:

i) The size of the Scheffler dish is of two type i.e

A) 10 sq.m

B) 16 sq.m

ii) The shape of this Scheffler dish is parabolic. One parabolic dish consist of 380 mirrors

iii) The main working of this dish is to concentrate the run rays towards the receiver.

iv) The basic model description Scheffler is concentrating heat on reflector

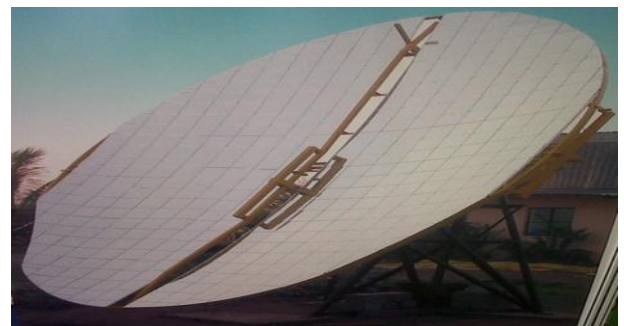


Fig 1.Scheffler dish

MODULE DESCRIPTION	RATING
surface area of collector	16 sq.m.
Dimensions and shape	parabolic
Reflectivity	92%

Table 1: Scheffler specification

B. Green steam engine:

It's a machine that burns fuel to make heat energy from water. A steam engine is a heat engine that performs

mechanical works using steam. Steam works as working fluid. Steam engine is external combustion engine where the working fluid is separates from the combustion products. To rotate steam engine solar power is used. The ideal thermodynamic cycle used to analyze this is called Rankine cycle. In simple steam engine the steam works only once in a cylinder and then it get exhaust directly into the atmosphere. Hence green steam engine is the improved design as that of old steam engine. Benefits of green steam engine are as follows

- 1) Noiseless operation
- 2) Simple conversion from rotary to reciprocal movement and vice-versa.
- 3) Multiple outputs from a single rotary source.
- 4) Multiple outputs with separate timing, amplitude and duration.
- 5) Input and output in same linear direction.
- 6) Extremely simple structure.
- 7) Few and easily constructed parts
- 8) Little or no lubrication requirements
- 9) Applications include generators, distillers, boat propulsion, pumps, toy models, to suggest only a few.
- 10) Engine may be operated on any fuel including solar, bio-mass, dung, corn and barley, wood, waste heat and unrefined fuels.

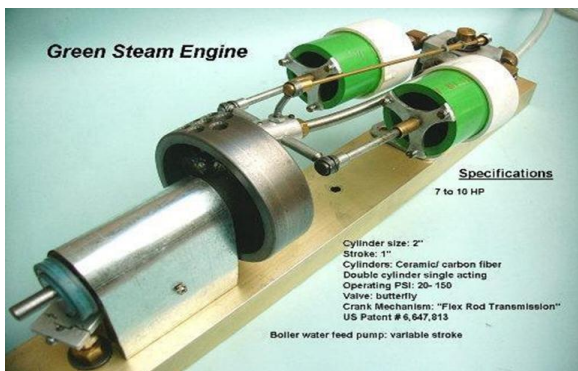


Fig 2. Green Steam Engine

C. Alternator:

An alternator is an electrical generator that converts mechanical energy to electrical energy in the form of alternating current

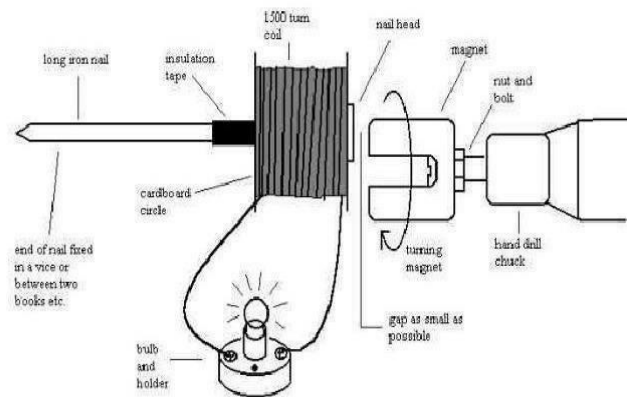
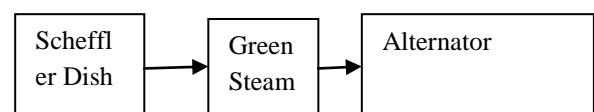


fig.3 Construction of Alternator

2. WORKING OF MIRROR BASED POWER GENERATION

Sun rays concentrated on Scheffler dish are reflected to receiver. Receiver contains header pipe which stores water in half portion of pipe. Remaining Half portion is used for store steam. When sun rays are reflected on Scheffler dish and concentrated on receiver on basic principal which state that when sun rays are concentrated on magnifying glass it burns piece of paper. Steam which is produced is store in upper side of header pipe due low density of steam. And cool water goes downward for heating and it gets converts into steam. This cycle is continuously going on and steam is produce. Steam is produced at temperature 180°C to 350°C pressure 10 bars. This steam goes into input of green steam engine. Green steam engine has property of crank mechanism which has a unique feature of FRT flex rod transmission which produces an intermittent movement whereby the valve movement is stopped and it is opened and closed during the power and exhaust strokes. These give prolonged, fully opened valve timing. In compliment, the pistons are held stationery while the valve moves between phases. The output shaft continues rotation while the pistons stand still. As the result efficiency of engine increases as well as power produce at shaft. Due to pump in front of flywheel it recycle condensed exhaust steam. Due to this efficiency is increased. At shaft of engine generator is coupled. Basic principal of generator is that, alternating voltage may be generated by rotating coil in magnetic field within a stationery coil. The value of the voltage generated depends on the number of turns in the coil, strength of the field and the speed at which the coil or magnetic field rotates Shaft of steam engine rotate and generator generate electricity due to coupling of shaft.



Block diagram 1: -MBPG

3. TECHNO COMMERCIAL VIABILITY

The techno commercial viability of MBPG follows

1) MARKET:

The MBPG generates electricity at low cost and generates AC power. There is only one-time installation and no additional maintenance cost.

2) RAW MATERIAL & FUELS:

The MBPG requires primary requirement sunlight and secondary requirement is water there is no intake of coal, oil, wood, etc.

3) PROJECT TECHNICAL CONCEPT:

The MBPG works on principle of magnifying glass that concentrating sunlight technology. It covers all types engineering like electrical and automation engineering. For controlling the MBPG recovers waste heat recovery due to this efficiency is increases.

4) ENVIRONMENT:

The MBPG does not hazard the environment it is totally green system. There is no any type of pollution and no impact on environment it works on sunlight and utilizes energy.

5) HUMAN RESOURCE:

There is fewer requirements for human resource. Human resource requires for maintenances the maintenances is clean the mirrors of scheffler dish.

6) INVESTMENT COST:

There is only one-time investment cost and no operating and running cost.

[3] Green steam engine

(www.greensteamengine.com) "parabolic solar concentrators for cooking, food processing and other applications"- Deepak Gadhia

4. CONCLUSIONS

Though we are generating sufficient power but the demand is increasing day by day. Due to this the load shedding problem is very vast. Hence by using mirror based power generation plant we can overcome the load shedding problem.

Anyone can install this own generation plant as space required for mirror based power generation is quite less than other.

This is completely Eco-friendly as the mirror based power generation does not take any type of conventional fuel like coal, oil, etc. hence, it does not emit smoke and fume and hence is totally pollution free.

Need of smart city is currently the demand of developing country and hence mirror based power generation will play an important role in achieving smart city goal.

REFERENCE

[1] "Sun focus manual" published by MNRE Delhi.

[2] "Scheffler dish based solar system operation & maintenance manual", MNRE(NOV2014)