BASED ON A PHOTOVOLTAIC GENERATION HEATING SYSTEM DOUBLE PARABOLIC RE-FLECTOR FOCUSING AND HYBRID TRACKING TECHNOLOGY

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***Abstract* - A photovoltaic generation based heating system Double Parabolic Reflector on Focus and Hybrid Tracking Technology has been proposed in this paper. It has adopted Strategy centered on the basis of Double Parabolic Uniform Reflection in this system, which can not only improve Focusing ratios, but also ensure that the combined sunlight Reflect photovoltaic panel equally and long service Battery life. Automatic tracking technology can combine calendar method with hill climbing method Accelerate tracking and increase stability and immunity. The ability of the system to track the sun we can get Better cool performance using extensive Infrared combination heat dissipation and cooling method Filter with water cooling technology. And this cooling Method can increase conversion efficiency and longer Service life of the photovoltaic panel. In addition, man-machine Interactive modules can be easily created in this system for real time monitoring and debugging for operators by testing the prototype of the device, it is a system High performance, good tracking performance and reduced cost.**

Keywords-Photovoltaic Generation; Double parabolic; Hybrid to keep track.

I. INTRODUCTION

Since the photovoltaic generation system is no noise and Pollution, it's safe and dependable. This is acting as an important role In economic development However, the Sun is radiation Scattered and photovoltaic battery is expensive, which is As a result, the high cost of the photovoltaic generation system occurred. Therefore, currently, focusing on developing photovoltaic Generation Tools to Reduce and Improve Cost There is an important research direction in the field of efficiency.Focusing is a kind of technology, photovoltaic generation. The photovoltaic panel focuses on the sunlight to generate. However, most of the existing solar photovoltaic generation Instruments focus light directly through convex, frictional lens or light Reflection mirror [2] and reflects the sunlight collected Photovoltaic panel unevenly, which will harm the solar Photovoltaic panel due to partial heating. Currently, there are some new focusing technologies, for example, Dr. Yang Solar energy photovoltaic system was built in multi-mirror Focusing on solar radiation [3] Solar concentrations are a reflector With multi-mirror, which can strengthen the solar Improve efficiency of radiation and photovoltaic batteries Dr. Zu prepared a kind of total reflection concentration, which The butterfly type is arranged by diagonals in type [4] and this Concentrating concentrations centered on solar can create sunlight The photovoltaic panels feel equally and again many times Focus Function and Improvement of Generation Efficiency Area of solar battery. But the focus ratio of this method the number of diagonals is related, so this is limited by quantity And the cost of the device Focused photovoltaic generation system, in the sun Tracking technique is always a difficult problem and hot topic In the world [5]. There are several ways to track the sun, and can mainly divided into two types, there is a photoelectric Tracking and second tracking after the sun's launch. At present, domestic common photoelectric tracking method Gravity type, electromagnetic type and power operated Type [6]. But they are easy to get affected weather. According to the number of shaft tracking system, tracking method after sun launch can be divided into two types: single axis and double axis. American biologist Professor Biacus developed a single axis Sun tracker in 1997, which has ended automatic tracking should be east-west direction, but north-south direction manually adjust. Professor Khalifa made a passive Double axis tracking system using a parabolic focus Compared to control and comparative light intensity control Law [7] The results of the test show that a parabolic tracking

The method can get more than 75% energy from a certain one. In China, some researchers such as Dr. Zhang have an active design Butterfly Focus Dual Pivot Tracker, Calculation of Height Angle of the angle and direction of the sun through the programs [8].And then the angle that might need to turn on the concentration Calculated. Control precision is 0.1 degrees. Dr. Sun and Dr. Bao The sun's automatic tracking device is searched for Well [9] .They analyse the advantages and disadvantages Four Tracking Devices with Inter Solar Power Tracker, controlled release type tracker, clock type tracker and Comparative control type tracker,

and then keep ahead Design proposal of a new automatic tracking device, in which promoted the development of tracking technology. Sun. Currently, most tracking methods are not ideal bad stability due to their shortcomings, less tracking accuracy and weakened immunity.

This letter holds a photovoltaic generation heating ahead the system is based on double parabolic reflector focus and Hybrid Tracking technology, which can increase service life Photovoltaic panel, improve the efficiency of the system and reduce the Cost of Photovoltaic Generation.

II. THE MACHINERY STRUCTURE OF THE SYSTEM

Structure of photovoltaic generation heating system Double parabolic reflector is shown on the basis of concentration Fig. 1. This is mainly a big reflective reflector, a small bit parabolic reflectors, infrared filters and solar photovoltaic panels.

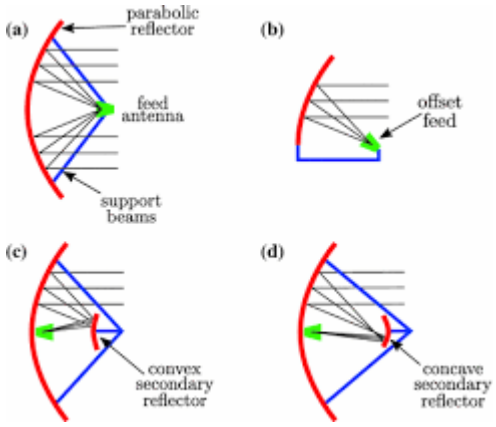

Figure 1. The machinery structure of the system

2.1 Double Parabolic Reflector Focusing Institution

Double parabolic reflector configurations are commonly known as imaging reflector systems [14]. They are constituted by a feeding phased array properly magnified by two reflector antennas. Such systems efficiently combine the advantages of reflector and array antennas. They are commonly used to generate reconfigurable beams over a small angular scan range. Some sort of beam compression is realized to increase the illuminated region of the array significantly and, as a consequence, the number of simultaneously active elements.

As shown in Fig. 1 in photovoltaic generation heating. The system based on double parabolic reflector concentrations, Concave sides of two reflective reflectors are the opposite. Both the surfaces of them are reflecting, and their focus is overlap. When the normal parallel axis of two parabolic targets Sun is centered on the focal line of sunlight parallel to the axis after reflecting by the large parabolic reflector.

2.2 Photovoltaic Panel Cooling Institution

The combined sunlight makes the temperature of the solar Photovoltaic panel gets high, which directly affects Conversion efficiency and service life in this paper, A Comprehensive heat extraction and cooling method combination Infrared filters are used with water cooling techniques. Infrared filter is placed at or near the focus of two Parabolic, which can filter the most infrared rays, respectively reduce severe fever due to solar photovoltaic panel this.
Solar photovoltaic panel is connected to hydroxide Metal heat conduct, and cold metal conduct Tubal heat is posted on the insert operation. Top of Cold metal tubal float is connected to water tank Cold water is the end of the inlet pipe and cool metal tubule Hot water is connected to hot water storage pond by outlet pipe.

When cold water flows through the cold metal tubule, it. The heat of the solar photovoltaic panel will take off, and then flow in hot

water storage pond. This method can do Reduce the heat of the solar photovoltaic panel, and warm Water can be used in life and production in the storage pond.

III. ELECTRICAL CONTROL DESIGN OF THE SYSTEM

Mainly photovoltaic generation heating system tracking control system, man-machine interactive modules, photovoltaic panel cooling control modules and defective and adaptive modules. Control theory diagram. The system is shown in Fig.2.

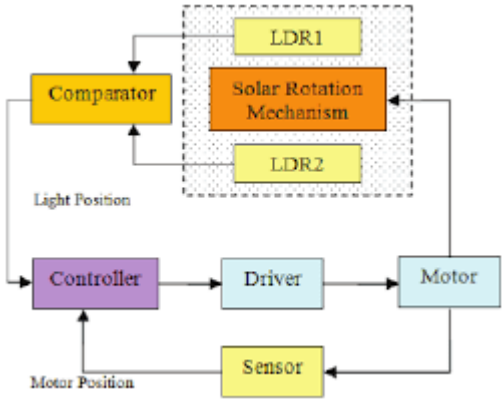

Figure 2. Control principle diagram of the system

3.1 Tracking Control System

As shown in Figure 2, mainly tracking control system Controller, driver, stepping motor, mechanical included Servo Institute and Solar Power Circuit Detecting Photovoltaic panel, etc. It uses tracking control system Freescale MCU as the main control unit. Controller PWM produces waves and steering according to the control signal. The operating conditions of the system And then the driver Drive stepping motors by following the control signal That meeting can be light height angle and east-west angle The purpose of adjusting and tracking the sun will reach.

Climbing Calendar Method with a Tracking Strategy Mountaineering method is adopted in this tracking control system. Track the Sun roughly by using the calendar way. Then make some minor adjustments from mountain climbing way.

3.1.1 Calendar Method

The calendar method, also called clock method. to establish A sun position calendar for one year with a fixed time interval Meeting light height angle and east-west angle, and by track The sun roughly by the table look-up method Its speed The tracking method is fast and its cost is low.

3.1.2 Hill Climbing Method

Due to simple structure and some parameters Can be measured, mountain climbing method is widely used maximum Power Point Tracking of Photovoltaic cells. Is here Its Working Principle: First, measure current output power, add a small voltage disturbance to the original output voltage, Measure the original after the change, and compare it Original power, so that we can know the changing direction of power.

If the power increases, continue to use the original Unrest Conversely, if the power is low, change it Direction of unrest. There are tracking plans for Fig.3 Mountain climbing method From the graph we can see when Electricity does not reach the maximum point, the voltage is changing The direction shown in Figure 3. Hill Climbing Method is a self-adaptation process get Current output power by measuring current output voltage and compare it with the current, power of the first moment, Save bigger Broadcast this process until power Maximum value reaches. Fig.4

is the flow chart of the hill climbing method Vmax, Output power is the maximum power PMX, and when Voltage maximum value is more than changing direction. This is the opposite, V5 is turning to V4.

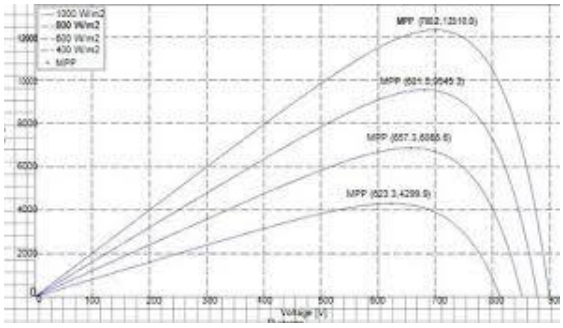

Figure 3. The tracking schemes of the hill climbing method

Hill climbing method is a self-optimization process. Obtain the current output power by measuring current output voltage and current, compare it with the power of the before moment, and save the bigger one. Circulate this process until the power reaches the maximum value. Fig.4 is the flow chart of hill climbing method.

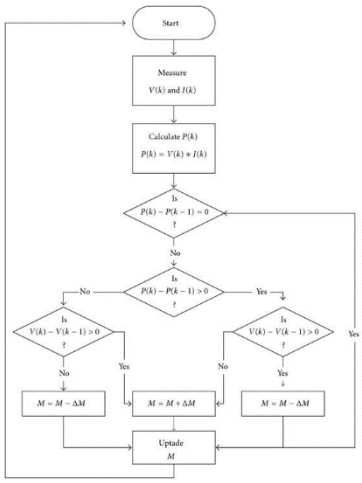

Figure 4. The flow chart of hill climbing method

3.2 Photovoltaic Panel Cooling Control Module

A comprehensive heat extraction and cooling method Combined infrared filter with water cooling technology. In the photovoltaic panel cooling control module. In water the cooling module is connected with the solar photovoltaic panel Operation of water-cooled metal heat insulation, and cooling Metal tubal heat is posted on the insert operation when Cold water flows through the cold metal tubule, it will take removing the heat from the solar photovoltaic panel. And when the temperature of the water increases in a certain value, temperature Relay works, then the temperature control valve will open automatically and water will be flowing in hot water storage pond. At the same time, the cold water of the float water tank flow in the metal tube again by cooling water inlet pipe. And When the temperature of water falls to a certain value, then Temperature relay reset, then the temperature control valve will be Automatically shut down and stop the water from flowing. The solar Photovoltaic panels can be cooled in this process, and hot Water can be used in life and production in the storage pond.

3.3 Man-Machine Interactive Module

The man-machine interactive module has an LCD display, Independent operating keyboard and wireless communication LCD display is used to make important data and work System status, such as output voltage, load Current, real-time production capacity, interior time, light meet Height angle, east-west angle, temperature and wind speed, etc. Operator is used for operator

Related measures according to the working conditions of system. The main functions include power switch, water valve Control, working pattern switching, emergency prevention Automatic status, system resetting and currency adjustment etc. This makes it possible for wireless communication operators

Send operation parameters and controls for this device the parameters of the controller by the remote computer, so it becomes convenient to monitor real time for operators and debugging on device.

3.4 Fault-Tolerant and Adaptive Modules

To increase self-protection function and increase longer System life, fault-tolerant and adaptive The module is used in this system. While encountering something special Conditions, such as rainy, airy, plugging turn, on voltage, At present, solar photo-voltaic panels are overheating, etc., System will automatically move into security situation, give more Alarms through wireless communication or choose to stop Automatically, waiting for operators to solve problems.

IV. EXPERIMENTAL TESTING

In this test, 4 single crystalline silicon solar cells of size All 110 mm × 200 mm has been adopted on the photovoltaic panel, While the rated power of each tablet is 3W (intensity Direct solar radiation: 1000W / m2). Light intensity Single Features and Light Focus Ratio Curve Crystalline silicon solar cells are fitted using MATLAB. Fig.5 Is the controller of the system.

Figure 5. The controller of the system

4.1 Light Intensity Characteristics of the Photovoltaic Panel

As shown in Figure 6, the open circuit voltage will increase rapidly, while the light intensity will increase in light intensity after 100W / m2. When the light intensity exceeds 100W / M2, the light intensity does not have any effect on the open circuit voltage, but Fig.7 shows that the short-circuit current grows almost linearly, Therefore, light intensity is mainly done to improve the power of photovoltaic panels, because the short circuit increases linearly in the current.

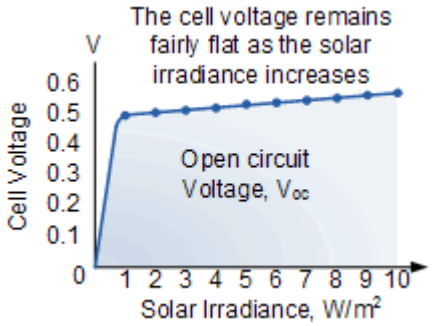

Figure 6. Open circuit voltage - Light intensity curve

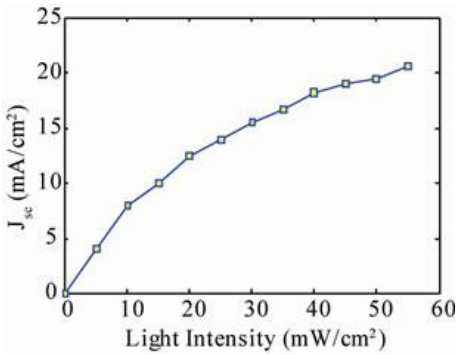

Figure 7. Short circuit current - Light intensity curve

Fig.8 shows that when the temperature is certain, the light intensity increases and the electricity is approximately linearly increased. Fig.9 shows that when the temperature is 25 C through better cooling measures and the light intensity increases to 800W / m2, the conversion efficiency of the photovoltaic panel will reach approximately 15% at its peak, when the light intensity will continue to increase, the conversion efficiency of the photovoltaic panels will reach the horizontal line after a slight decrease, ü will remain more than 10%.

Therefore, in the high cost of photovoltaic batteries under the current situation, there is a positive meaning of concentration in increasing the electricity per unit area of photovoltaic panel and reducing the cost of electricity generation. In this paper, we use a unique double-parabolic concentration method to achieve high focusing ratio with focusing light, and high parallelism.

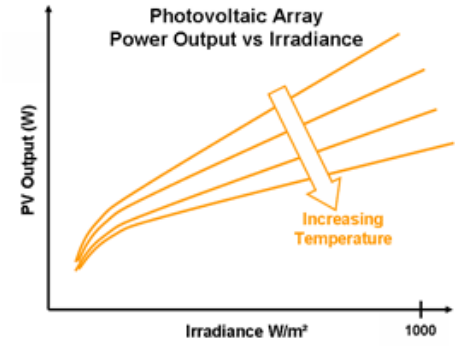

Figure 8. Power-light intensity curve

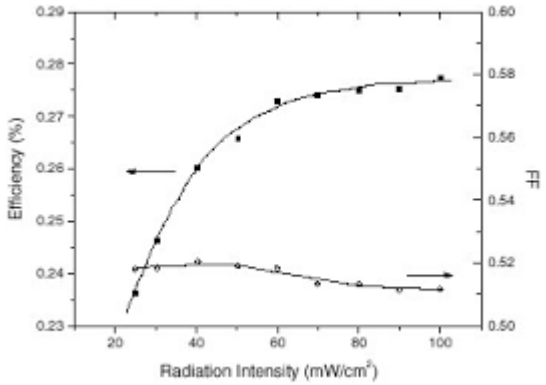

Figure 9. Efficiency - Light intensity curve

4.2 In Focusing Features

Fig 10, during different times on the same day, we obtain a fit focused light intensity and environmental light intensity curve using prototype condenser, Design Focusing Ratio 5, and the curve in Fig.10 shows that the actual focus .The ratio is about 4, so it reaches the basic design requirements. The main difference between them is that the reflected reflective reflector is not 100 percent, in other words sunlight is energy loss in the process of dissemination and reflection.

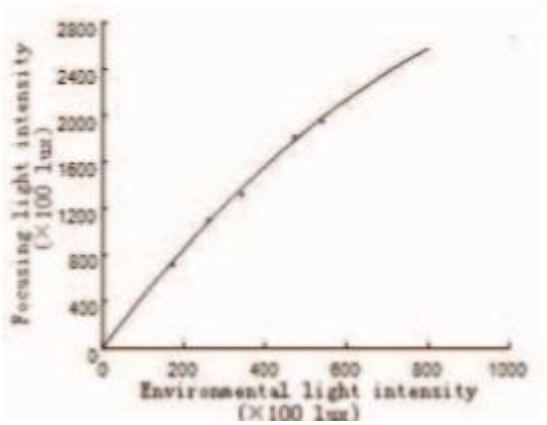

Figure 10. Condensation features

In this paper the prototype reaches the basic design requirements, the prototype test once again proves that innovation in the new double-parabolic focusing method, and the method of adding infrared filter with water cooling techniques is scientific, logical and Practical.

V. CONCLUSION

Condenser structure, cooling theory, tracking strategy, mechanical servo mechanism and control methods of the existing photovoltaic generation system were verified in this paper as bold innovation and experimental. Theoretical analysis and prototype tests show that there are three important advantages in the work are as follow:

1) The new light sensor portfolio tracking strategy adopt the calendar method which can track the orbit of the sun combined with photovoltaic panels, mountain climbing power disturbance method, we can reduce the investment on the hardware of lighting identification devices, tracking speed And improve the system's stability and hassle rejection ability while tracking the sun.

2) The new theory of concentrations in which a large parabolic concentration combined with a small parabolic reflector uniform can improve not only the accumulated degree but also ensures that the concentrated sunlight can hit Photovoltaic Panel Batteries Equally And Longer Service Life

3) By combining infrared filter with water cooling technology by using extensive cooling wastage and cooling method, we can achieve better cooling performance, which can not only improve conversion efficiency of photovoltaic panels but also their service life. May increase.

VI. ACKNOWLEDGMENT

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