OPTIMIZATION OF ELECTRICAL ENERGY THROUGH FLOATING SOLAR PANELS WITH SUN TRACKING

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Abstract*: Solar panels are the leading component in the electrical energy generation today in the category of renewable energy. However, the panels are made up of semiconductor and degrades in electrical energy production if heated beyond 25 degree C, floating panels has the advantage to keep themselves cool if floating in water, in addition vaporization of water can be minimized. Moreover, space for installation on land is saved. In addition, if the panels are able to track the sun throughout the day, radiation falling on the panels will be always perpendicular, hence electrical energy generated will be maximized. In addition, the project is a DC standalone system, it avoids conversion of DC into AC and undoubtedly DC loads are far more energy efficient & low power consumer than their AC counterparts. This research project includes all the above advantages. The energy stored in the battery throughout the day with all the advantages mentioned above is used to glow the RGB LEDs automatically at night, in fact they are representing the load we ultimately need to run from the energy stored.*

Key Words*: Floating Solar PV, Microcontroller, LEDs, LDR and Battery*

RESEARCH METHODOLOGY

The standalone PV system is used in such a way to run LEDs as loads. With floating panels and sun tracking the optimization of electrical energy generation is achieved. The aim was to keep the panels' cool, to avoid the loss of space on land and to track the sun throughout the day for the radiation to fall always perpendicular to the panels. LDR is used as sensor to sense the darkness for the LEDs to glow. LM 35 is used as temperature sensor to sense the temperature of the panels throughout. DC loads entirely managed by solar electricity using a microcontroller. Temperature, current, voltage & power can be displayed on mobile through Bluetooth mode of communication.

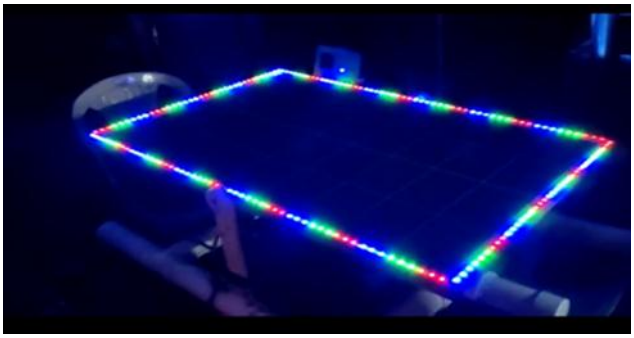
EXPERIMENTATION:

A planned energy analysis and sizing was done in detail for PV system. Based on the panel wattage the battery was designed and hence the charge controller.

REQUIREMENTS

1. Solar Panel: Single Panel of 100 W (12V/ 8.33A)
2. Charge Controller(12V/10A)
3. Storage: Lead Acid Battery (12V/7AH)
4. Intelligence: Microcontroller
5. ADC
6. LDR
7. Temperature sensor LM 35
8. Sensors: LDR & LM35.
9. Series of RGB LEDs a representative of load (more loads can be added if necessary)
10. Hydraulic system for the purpose of tracking.

DESIGN



WORKING

To begin with the tracing arrangement will be at relax mode ,After the the congregation of every apparatuses including sun sheets and the vessels are occupied with liquid .As soon as the stopcocks open to eject the liquid, the tracing scheme will begin to travel as per the location of sun with the help of certain link(including bearing).

The movement of the tracing scheme can be easily adjusted according to the requirement by controlling the discharge. This results in the sun waves at right angles to the sun sheets accounting in exploration of more energy. As the tracing scheme touch its concluding location it can be again brought back reset to its original place either physically or by by means of computerization such as devices. This can be used be in micro as well as mega level sun based sheets PV system.

The various steps required for the working of MSTS are following:

In the beginning, fill the inner container with working fluid. The working fluid may be water or an oil. This can be done using sensors/timers and pumps on a large-scale purpose or can be done manually on small scale for household purposes.

By doing this, the tracking system will come in its initial position. After this, the liquid begins to release from the interior vessel via discharge tube and will be collected in the external vessel or the pump. The liberation can be simply limited by using the liberation stopcocks. The time taken by system is inversely proportional to the volume of liquid liberated.

Due to discharge of fluid, the water level inside the inner container will start to reduce. The rate of reducing the water level depends on the discharge of fluid.

The plunger within the interior vessel will also begin to shift downwards with the water level along with the condition that the plunger should be floating on the working fluid.

As the plunger moves downwards, the joining rod attached to the plunger will also move downwards. This accounts for the angular motion to the base plate having the solar panel.

The motion of the solar panel can be adjusted in a way that it can be move along with the motion of the sun. The expected movement of the sun sheet will depend on the discharge of fluid and the linkages provided. The degree of angular movement of the base plate will be determined by on release and the degree of turning of the base plate will be governed by on the linkages provided.
Due to this motion of solar panel, more sun rays will fall on it resulting in large utilization of the solar energy and hence more electricity will be obtained. Thus, efficiency of solar panel can be easily increased by using this technique.
As soon as the water hits its minimum level the panel will come to its final position. Now on the next day sunrise the vessel is filled by pump with help of timer or by using sensor.
The fluid pump will take about 5 to 15 minutes to fill the inner container and after it, it switches off automatically with the help of water level indicator. For the household purposes it can be done manually.

COMPONENTS

1. 100W Solar Panel: It is a high-efficiency solar module. The solar panel comes with built-in by - pass diodes. This is to stabilize system performance during partial shading conditions.
2. Hydraulic Cylinder: We have manufactured this hydraulic cylinder by using an acrylic pipe. In this pipe there is nylon piston.
3. Circuit: The main use of circuit is to take the power from solar panel and transmit it to the hydraulic cylinder and achieve the required tilt of the solar panel.

ADVANTAGES

- Sun following system produces more power compare to their still equivalents due to increasedcoverage to sun waves. This surge can range from 40 to 45% depending on the geographical position of the tracing scheme.
- The installation of dual axis is cost effective as return on investment is significant.
- These sun followers provide a realistic solution in cases of the limited power capacity of the connection to the grid.

CONCLUSION

Finally, the project is dual axis solar tracker. The prerequisite to understand the insights of the project are familiarity of circuit system, power electronics, microcontrollers, electric machines, solar energy, and mechanical design to design and implement the system. The primary objective of this task needs the investigator to examine and discourse a wide range of multifaceted problems and uncover to recent green energy technologies. So there is no one size-fits-all approach to the difficulty and a negotiation must be made based on total price vs. dependability. After having worked rigorously on this project the following are the key learnings are software design, indulgent the use of a sun based sheets to charge a battery, and the workings of tracing scheme. Future scope for this project may involve implementation of control algorithms such as PID control and fuzzy logic control as well as IT based automations

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