

Fabrication of Road Washer Works on Solar

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Abstract—Science is basically "passive" observation of the universe, as it exists to generate knowledge. Engineering is making use of that knowledge to meet human needs by creating machine, systems, process and technologies that have not previously existed. Design and manufacturing are the synthetic part of engineering practice. Manufacturer has received a lot of attention recently for very good economic reasons. The use of renewable energy resources is increasing rapidly. Following this trend, the implementation of large area solar arrays is to be considered. Due to energy drivers that include uncertainty in oil prices and environmental concerns, effective management of energy system is a priority. Energy policy can focus on three areas to improve energy system like renewable energy supply, efficiency improvement and demand reduction. The road washer is a new mechanism for solving the problems of road cleaning, pipe cleaning, dust or garbage removing that really makes a life difficult. In today's date it is required that all the roads leading towards highways must be cleaned properly and not only the highways but also the roads where the traffic moves daily. The functionality of solar Road washer is dissimilar as that of the traditional road cleaner. The solar energy is harvested and stored in a battery. The battery is in turn connected to the solar cooler for the power sources. This is very innovative mechanical project on solar air cooling. Solar air conditioning has great potential. Sunlight is most plentiful in the summer when cooling loads are highest.

Keywords— Renewable Energy, Solar Road washer, Environment, Cleaner, Solar Energy .

I. INTRODUCTION

Renewable energy is rapidly gaining importance as an energy resource as fossil fuel prices fluctuate. At the educational level, it is therefore critical for engineering and technology students to have an understanding and appreciation of the technologies associated with renewable energy. One of the most popular renewable energy sources is solar energy. Many researches were conducted to develop some methods to increase the efficiency of Photo Voltaic systems (solar panels). One such method is to employ a solar panel tracking system.

A street sweeper or street cleaner may refer to either a person's occupation, or a machine that cleans streets. A street sweeper cleans the streets, usually in an urban area. Street sweepers have been employed in cities since sanitation and waste removal became a priority. A Street-sweeping person would use a broom and shovel to clean off litter, animal waste and filth that accumulated on streets. Later, water hoses were used to wash the streets. Machines were created in the 19th century to do the job more efficiently. Today, modern street sweepers are mounted on truck bodies and can vacuum debris that accumulates in streets. It don't create the overheads of maintenance or purchasing of pump neither it has to be sent for servicing every season. The concept of solar cooler sounds good and economical hence almost every class of our society can bear its expenses. This project is to control the position of a solar panel in accordance with the motion of sun. Brief Methodology: This project is designed with solar panels, LDR, ADC, Microcontroller, Stepper Motor and its driving circuit. In this project two LDRs are fixed on the solar panel at two distinct points.

LDR (Light Dependent Resistor) varies the resistance depending upon the light fall. The varied resistance is converted into an analog voltage signal. The analog voltage signal is then fed to an ADC. ADC is nothing but analog to digital Converter which receives the two LDR voltage signals and converts them to corresponding digital signal. Then the converted digital signal is given as the input of the microcontroller. Microcontroller receives the two digital signals from the ADC and compares them. The LDR signals are not equal except for normal incidence of sunlight. When there is a difference between LDR voltage levels the microcontroller program drives the stepper motor towards normal incidence of sunlight.

A. Base line condition

Renewable energy is rapidly gaining importance as an energy resource as fossil fuel prices fluctuate. At the educational level, it is therefore critical for engineering and technology students to have an understanding and appreciation of the technologies associated with renewable energy.

One of the most popular renewable energy sources is solar energy. Many researches were conducted to develop some methods to increase the efficiency of Photo Voltaic systems (solar panels). One such method is to employ a solar panel tracking system .This project deals with a micro- controller based solar panel tracking system. Solar tracking enables more energy to be generated because the solar panel is always able to maintain a perpendicular profile to the sun's rays. Development of solar panel tracking systems has been ongoing for several years now. As the sun moves

across the sky during the day, it is advantageous to have the solar panels track the location of the sun, such that the panels are always perpendicular to the solar energy radiated by the sun.

This will tend to maximize the amount of power absorbed by PV systems. It has been estimated that the use of a tracking system, over a fixed system, can increase the power output by 30% - 60%. The increase is significant enough to make tracking a viable proposition despite of the enhancement in system cost. It is possible to align the tracking heliostat normal to sun using electronic control by a microcontroller.

- The human body can be considered as thermal machine with 20% thermal efficiency. The remaining 80% heat must be disposed off from the body to the surroundings otherwise accumulation of heat results and causes discomfort.
- The human body works best at a particular body temperature like any other machine but cannot tolerate wide range of variation in environmental temperature like thermodynamic machines.

B. Direct Method Of Utilization Of Solarenergy

- The most useful way of harnessing solar energy is by directly converting it into electricity by means of solar photo-voltaic cells.
- Sunshine is incident on Solar cells, in this system of energy Conversion that is direct conversion of solar radiation into electricity.
- In the stage of conversion into thermodynamic from is absent. The photo-voltaic effect is defined as the generation of an electromotive force as a result of the absorption of ionizing radiation.
- Energy conversion devices, which are used to convert sunlight to electricity by use of the photo-voltaic effect, are called solar cells.

C. Photovoltaic\Principles For Solar Energy

The photo-voltaic effect can be observed in nature in a variety of materials that have shown that the best performance in sunlight is the semiconductors as stated above.

When photons from the sun are absorbed in a semiconductor, that create free electrons with higher energies than the created there must be an electric field to induce these higher energy electrons to flow out of the semi-conductor to do useful work. A junction of materials, which have different electrical properties, provides the electric field in most solar cells.

D. Need For Solar C

Human beings give off heat, around an average of 100 kcal per hour per person, due to what is known as 'metabolism'. The temperature mechanism within the human body maintains a body temperature of around 36.9 degree C (98.4degree F). But the skin temperature varies according to the surrounding temperature and relative humidity.

E. Aims and Objectives

- Here will a solar panel which will give the output to the battery but sometimes there might be an increase in the intensity of the sunlight so there is a possibility of having damage to the battery.
- So here controller circuit will be used to provide constant voltage to the battery even when the intensity of the sunlight is high because when the intensity is high the solar panel will give double the voltage than it is required by the battery.
- If the oil is spitted on the there are more chances of accidents but it can be avoid by using the road washer function.
- The dust can be cleaned by using the high speed blowers.
- The pipe can be cleaned without get choked.
- Battery charging problem but it can be overcome by using solar technology
- This circuit will run pump and there will be filters attached to the pump.
- A charge controller, charge regulator or battery regulator limits the rate at which currents added to or drawn from electric batteries. It prevents overcharging and may prevent against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk.
- It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life.
- The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery recharger.

- The dc gear based mechanism will be used for moving the solar panel.
- This will give effective solar energy on the panel and it will boost the charging the battery.
- Pump controller circuit will be used for automatic on and off of the pump as it will save human effort as there is no effort will be required for starting the pump on and off.
- The dc fan will also run on the rechargeable battery.
- The sensor attached on the solar will move the solar panel according to the sun direction.

II. LITERATURE REVIEW

Mechanical sweepers in the United States The very first street sweeping machine was patented in 1849 by its inventor, C.S. Bishop. For a long time, street sweepers were just rotating disks covered with wire bristles. These rotating disks served as mechanical brooms that swept the dirt on the streets. John M. Murphy called at the offices of American Tower and Tank Company in Elgin, Illinois, in the fall of 1911. He had a plan of a motor driven pickup street sweeper.

They called in a recently acquired silent partner, Daniel M. Todd, and it was decided to hire Mr. Murphy and begin the development of his idea. That started what has become the Elgin Sweeper Company.

After two years of trial, development, experimentation, and research, a sweeper was achieved which Murphy was satisfied performed all of the sweeping functions in the manner he had envisioned – one which partners James and Daniel M. Todd and Charles A. Whiting were willing to risk a reputation gained from 30 years manufacturing experience.

In the fall of 1913, the City of Boise, Idaho, purchased the first Elgin Sweeper, following a demonstration. Boise Street Commissioner, Thomas Finnegan, made a comparison showing a savings of \$2,716.77 from the Elgin motorized sweeper when used rather than a horse-drawn sweeper.

Following its introduction and initial sales, John M. Murphy continued the perfection of his sweeper. In 1917, US patents were filed and issued for J. M. Murphy, Street Sweeping machine #1,239,293.

Comparing the cost of this product with the existing products in the market is solar product appeals better and affordable by common people. This solar product perfectly suits for villages, schools and offices and thus an alternate to the power cut problems. It comprises of many attractive features such as usage of solar energy, cooler and cooling cabin at lower cost. It is eco-friendly and natural, electricity savers. Durability of the product is more thus minimizing the cost. No electricity is used so this product saves the energy and saves environment from getting polluted.[3]

Energy has become the utmost necessity of our life. It is required from dawn to dusk to fuel the world. Energy is scattered everywhere around the Earth. Man has always desired to capture it and use it for mankind. One of the most important sources of energy is solar energy. Several methods of capturing solar energy and its usage are practised. The intensity of solar rays is immense and ways are still being discovered to harness the full potential of the rays. Focussing the rays to a point will cause generation of heat. Transferring the energy towards cooking is one such method. Usually a solar cooker is a device that is placed in the open ground under direct sunlight. This causes inconvenience to the users. Recent developments are in progress to make it possible to cook under shelter harnessing energy from the solar rays. [4]

There is extensive potential in the solar rays yet to be harnessed. The existing methods, apart from being inefficient in transferring energy, it fails to store the heat effectively. Introduction of Phase Change Materials (PCM) has done the trick of harnessing sun's energy to cook. By doing so the heat energy storing efficiency is increased and thereby effectively increases the process of cooking. With prices of LPG elevating, using this method proves to be cost effective and energy conserving. Unlike induction stoves, the residential solar cooker uses energy from the solar rays and is cost effective. In the absence of sunlight, the PCM setup still increases the efficiency of heating the utensils. By implementing this system, it eradicates cooking in night time. the overall system will work only during the daytime then it will not be compact and there will be cooker in each and every house will replace LPG and electric stove. Installation of this system in India reduces more than millions of temperature can be greatly reduced in the future. to this hectic world. The effects of thermo physical properties of PCM, installation methodology, location of pcm are scope of future work.[4]

A new hybrid system design for cold storage has been proposed. This paper describes the working principle of new hybrid solar refrigeration cycle with its different components of the machine and the test procedure. This paper is going to provide researchers a fundamental knowledge on integration of solar and conventional refrigeration systems. Furthermore, selective information of the past efforts in the field of solar hybrid refrigeration techniques has also been described. This knowledge will help them to start the parametric study in order to investigate the influence of key parameters on the overall system performance. The aim of the work described below is to combine the solar panel

powered and refrigeration machine, to meet different requirement of household in different season, and to improve the efficiency of utilization of solar energy.[5]

Thus the design of hybrid systems for cold storage becomes more important due to limitations of fossil fuels and the environmental impact during their use. Hybrid system is complex as they involve in economic, technical and environmental factors. It shows that solar hybrid refrigeration technologies are attractive alternatives that not only can serve the needs for air-conditioning and refrigeration, and ice making purposes, but also can meet demand for energy conservation and environment protection. However, a lot of research work still needs to be done for large-scale applications in industry and for the replacement of conventional refrigeration machines. [6]

In hot and humid conditions the need to feel relaxed and comfortable has become one of few needs and for this purpose utilization of systems like air-conditioning and refrigeration has increased rapidly. These systems are most of the time not suitable for villages due to longer power cut durations and high cost of products. Solar power systems being considered as one of the path towards more sustainable energy systems, considering solar-cooling systems in villages would comprise of many attractive features. This technology can efficiently serve large latent loads and greatly improve indoor air quality by allowing more ventilation while tightly controlling humidity. Despite increasing performance and mandatory energy efficiency requirements, peak electricity demand is growing and there is currently no prevalent solar air cooling technology suited to residential application especially for villages, schools and offices.[7]

This project reviews solar powered road washer with cooling cabin for household food items hence their viability for residential application. So as comparing the cost of this product with the existing products in the market is, solar product appeals better and affordable by common people. This solar product perfectly suits for villages, schools and offices and thus prevention from the power cut problems. It comprises of many attractive features such as usage of solar energy, cooler and cooling cabin at lower cost. The above method is eco-friendly and natural, electricity savers. Durability of our product is more thus minimizing the cost. No electricity is spent so this product saves the energy and saves environment from getting polluted.[7]

III. CONSTRUCTION & WORKING

A. Component Used

Bars size 1.5 feet aluminum material
Coupling round 6mm width.
Motor 1800rpm without gear box
With gear box 24 rpm
Input voltage 14 volt.
Power 60 watt.

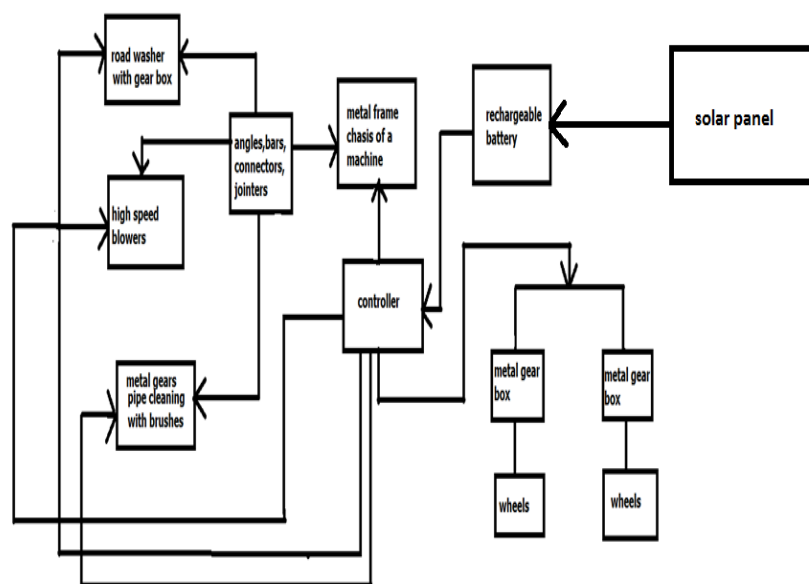


Figure No.1: Proposed layout of Road Washer

B. Construction

Solar modules use light energy (photons) from the sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells based on cadmium telluride or silicon. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most solar modules are rigid, but semi-flexible ones are available, based on thin-film cells. These early solar modules were first used in space in 1958. Electrical connections are made in series to achieve a desired output voltage and/or in parallel to provide a desired current capability. The conducting wires that take the current off the modules may contain silver, copper or other non-magnetic conductive transition metals. The cells must be connected electrically to one another and to the rest of the system. Externally, popular terrestrial usage photovoltaic modules use MC3 (older) or MC4 connectors to facilitate easy weatherproof connections to the rest of the system.

Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated. Some recent solar module designs include concentrators in which light is focused by lenses or mirrors onto an array of smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost-effective way

Then the motor will be placed to the bars using the Type design clamps and the clamps will hold the motor. Here the low rpm and high torque concept will be used.

Then the motor will be placed into the coupling attached to the solar panels. Here solar will be used the electricity will be converted from solar energy. The solar energy will be stored in the battery. The sunlight intensity changes anytime so this process will lead to battery damage. Saving the battery from damage the controller circuit is required. The brushless dc fan of high rpm will be used.

The fan will run on battery and after that the pump section will run on the battery for saving the water. There will be sensor wires attached on the bottom of the cooler water tank and another sensor will be attached at the upper portion of the net of the cooler. The upper sensor will detect that the net of the cooler is dry then the pump will automatically on and it will be in the same position till the net is filled with water or wet and it will soon switch off the pump.

C. Working

- Microcontroller circuit will work on power supply as well on battery
- Microcontroller circuit will move the solar panel through the gear based moving mechanism.
- The sensor that will be installed on the solar panel will detect the sun movement and accordingly give the signal to the microcontroller about the movement and the microcontroller will drive the motor the solar panel will move towards the sun direction.
- Through the solar panel battery will be charged.
- The pump controller circuit will run on battery and the sensors attached will sense the level of water in the tank and the motor pump will be on as the level of water goes down and the pump will be off when the tank level is full.
- The dc fan will continuously run on battery.
- The sensors attached on the solar panel that is ldr will give changes in the resistance as received due to changes in the sun light will send the data to the microcontroller attached to the circuit.
- The regulator ic of 12vdc will give supply to the microcontroller.
- The capacitor will do the charging and discharging work and its value is 1000mfd 16 volts.

The DC motor works over a fair range of voltage. The higher the input voltage more is the RPM (rotations per minute) of the motor. For example, if the motor works in the range of 6-14V, it will have the least RPM at 6V and maximum at 14 V.

In terms of voltage, we can put the equation as:

$RPM = K1 * V$, where,

$K1$ = induced voltage constant V = voltage applied

CONCLUSION

Newer mechanical street sweeper Modern street sweepers are equipped with water tanks and sprayers used to loosen particles and reduce dust. The brooms gather debris into a main collection area from which it is vacuumed and pumped into a collection bin or hopper. A regenerative air street sweeper uses forced air to create a swirling effect inside a contained sweeping head and then uses the negative pressure on the suction side to place the road debris inside a hopper. Debris is removed from the air by centrifugal separation and reused, keeping particulate matter inside the hopper.

Many regenerative air sweepers are AQMD certified by the company who manufactures them and can pick up particles as small as 10 micrometers or less (PM-10), a leading cause of storm water pollution. However a modern regenerative air street sweeper faces the challenge of noise level due to the fact that regenerative air street sweeper requires an extra engine to power the vacuum required to create the negative pressure for placing debris into a hopper.

And more important the whole machine runs on solar energy so there will not be any cost related to the diesel or the petrol use. The battery will work as a fuel system for the machine as the solar energy is free of cost.

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