ORIGINAL RESEARCH PAPER

Mechanical Engineering

SMART HYBRID SOLAR AIR COOLER

KEY WORDS: Solar Power, Air Conditioning, Hybrid Energy

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ABSTRACT

Mechanical Engineering without production and manufacturing is meaningless.Production and manufacturing process deals with conversion of raw materials inputs to finished products as per required dimensions, specification and efficiently using recent technology. The new developments and requirements inspired us to think of new improvements in air conditioning Engineering field. In our project, solar power is captured and stored in a battery. FAN ".

1.INTRODUCTION

This power is used to run the air cooler whenever required. Solar energy means the radiation energy that reaches the earth from the sun. It provides daylight makes the earth hot and is the source of energy for plants to grow. Solar electric systems are suitable for plenty of sun and are ideal when there is no main electricity.

Solar electricity is the technology of converting sunlight directly in to electricity. It is based on photo-voltaic or solar modules, which are very reliable and do not require any fuel. Our objective is to design and develop a solar electric system namely"HYBRID SOLAR ANDELECTRIC"[1].

2. LITREATURE REVIEW

This paper reveals the comfort conditionsachieved by the device for the human body. Insummer (hot) and humid conditions feeluncomfortable because of hot weather andheavy humidity. So it is necessary to maintainthermal comfort conditions. Thermal comfortis determined by the room's temperature,humidity and air speed. Radiant heat (hotsurfaces) or radiant heat loss (cold surfaces)are alsoimportant factors for thermal comfort.Relative Humidity (RH) is a measure of themoisture in the air, compared to the potentialsaturation level. Warmer air can holdmoremoisture. When you approach 100% humidity,the air moisture condenses—this is called thedew point.

3.OBJECTIVE OF PROJECT

To make aware of non conventional energysources to reduce environmental pollutions.This product preferably suitable for villages,because they face lot of power cutproblems in summer (around 12 to 14 hrsin day). And for offices and schools whichruns in day to which save energy.

4.NEED FOR RENEWABLE ENERGY

Renewable energyis energy generated from natural resources—such as sunlight wind, rain, tides and geothermal heat—which are renewable (naturally replenished). In 2006, about 18% of global final energy consumption came from renewable, with 13% coming from traditional biomass, such as wood-burning. Hydroelectricity was the next largest renewable source, providing 3%, followed by solar hot water/heating, which contributed 1.3%. Modern technologies, such as geothermal energy, wind power, solar power, and ocean energy together provided some 0.8% of final energy consumption.

4.1SOLAR PANEL

A solar panel is a device that collects and converts solar energy into electricity or heat. It known as Photovoltaic panels, used to generate electricity directly from sunlight Solar thermal energy collection systems, used to generate electricity through a system of mirrors and fluid-filled tubes solar thermal collector, used to generate heat solar hot water panel, used to heat water. It is energy portal. A solar power technology that uses solar cells or solar photovoltaic arrays to convert light from the sun directly into electricity. Photovoltaics, is in which light is converted into electrical power. It is best known as a method for generating solar power by using solar cells packaged in photovoltaic modules, often electrically connected in multiples as solar photovoltaic arrays to convert energy from the sun into electricity. The photovoltaic solar panel is photons from sunlight knock electrons into a higher state of energy, creating electricity. Solar cells produce direct current electricity from light, which can be used to power equipment or to recharge a battery. A less common form of the technologies is thermo photovoltaics, in which the thermal radiation from some hot body other than the sun is utilized. Photovoltaic devices are also used to produce electricity in optical wireless power transmission[2].

4.2 FAN

A standalone fan is typically powered with an electric motor. Fans are often attached directly to the motor's output, with no need for gears or belts. Smaller fans are often powered by shaded pole AC motors or brushed or brushless DC motors. In our case it is powered by dc motor having three blades

4.3. BATTERY

In our project we are using secondary type battery. It is rechargeable type. A battery is one or more electrochemical cells, which store chemical energy and make it available as electric current. There are two types of batteries, primary (disposable) and secondary (rechargeable), both of which

convert chemical energy to electrical energy. Primary batteries can only be used once because they use up their chemicals in an irreversible reaction. Secondary batteries can be recharged because the chemical reactions they use are reversible; they are recharged by running a charging current through the battery, but in the opposite direction of the discharge current. Secondary, also called rechargeable batteries can be charged and discharged many times before wearing out. After wearing out some batteries can be recycled.

Batteries have gained popularity as they became portable and useful for many purposes. The use of batteries has created many environmental concerns, such as toxic metal pollution. A battery is a device that converts chemical energy directly to electrical energy it consists of one or more voltaic cells. Each voltaic cell consists of two half cells connected in series by a conductive electrolyte. One half-cell is the positive electrode, and the other is the negative electrode. The electrodes do not touch each other but are electrically connected by the electrolyte, which can be either solid or liquid. A battery can be simply modelled as a perfect voltage source which has its own resistance, the resulting voltage across the load depends on the ratio of the battery's internal resistance to the resistance of the load. When the battery is fresh, its internal resistance is low, so the voltage across the load is almost equal to that of the battery's internal voltage source. As the battery runs down and its internal resistance increases, the voltage drop across its internal resistance increases, so the voltage at its terminals decreases, and the battery's ability to deliver power to the load decreases.

5. WORKING PRINCIPLE

Solar panel consists of number of silicon cells, when sun light falls on this panel it generate the voltage signals then these voltage signals are given to charging circuit. Depending on the panel board size the generated voltage amount is increased. In charging circuit the voltage signal from the board is gathered together and stored in the battery[3].

6. ANALYSIS OF SOLAR AND ELECTRIC FAN

We conducted an analysis on the solar and electric fan by placing the experimental setup under three conditions

1. Inside a well lit room.
2. Outside the room exposed to direct sunlight.
3. Outside the room under the shade.

6.1 METHODS OF UTILIZATION OF SOLAR ENERGY

6.1.1. DIRECT METHOD

a. Photo Voltaic Method
b. Thermal Method

6.1.2. INDIRECT METHOD

a. Water Power Method
b. Wind Power Method
c. Bio Mass Method
d. Wave Energy Method
e. Ocean Power Method

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[4].

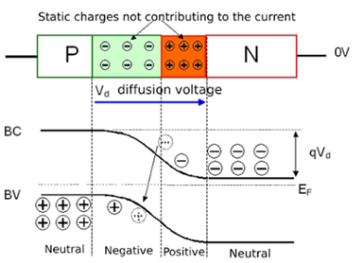


Fig. 1 P-N Junction BIAS

7. COMPONENTS AND DESCRIPTION

The physical setup of this project are given below and it is been explained as follows

1. Solar Panel
2. Battery
3. Dc motor
4. LED light

7.1 SOLAR PANEL

A solar cell works on the principle of photo-voltaic principle, the photo-voltaic solar energy conversion is one of the most attractive non-conventional energy sources of proven reliability from the micro to the Megawatt level.

ITS ADVANTAGES ARE:

1. Direct room temperature conversion of light to electricity through a simple solid state device.
2. Absence of moving parts,
3. Ability to function unattended for long periods as evidence,
4. Modular nature in which desired currents, voltages and power levels can be achieved by mere integration,
5. Maintenance cost is low as they are easy to operate,

DISADVANTAGES ARE:

1. Distributed nature of solar energy,
2. Absence of energy storage.

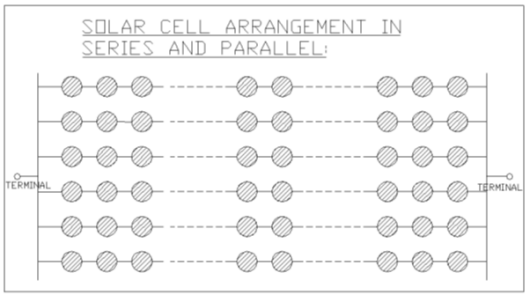


Fig.2 Solar Cell Arrangement in series and Parallel

7.2 BATTERIES

In isolated systems away from the grid, batteries are used for storage of solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact, for small units with output less than 1KW. Batteries seem to be the only technically and economically available storage means. Since both the photo voltaic system and batteries are high in capital costs, it is necessary that the overall system be optimized with respect to available energy and local demand pattern. To be economically attractive the storage of solar electricity requires a battery with a particular combination of properties:

(1) Low cost
(2) Long life
(3) High reliability
(4) High overall efficiency
(5) Low discharge
(6) Minimum maintenance

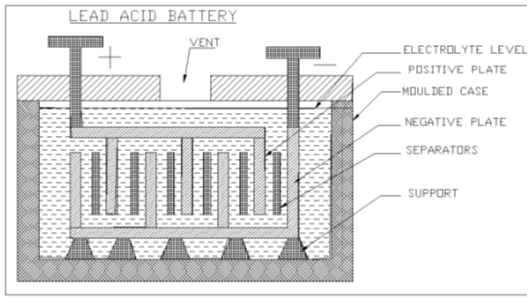


Fig. 3 Lead Acid Battery

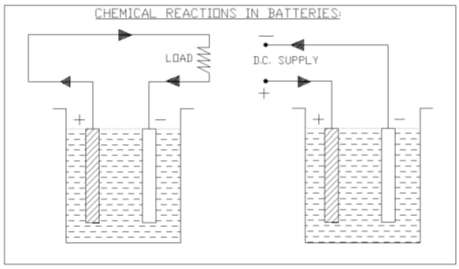


Fig. 4 Chemical Reactions in Batteries.

8. PRINCIPLE OF OPERATION:

The basic principle of motor action lies in a simple sketch. The working principle explains that, when a current carrying conductor is placed in a magnetic field, a force is produced to move the conductor away from the magnetic field[5,6].

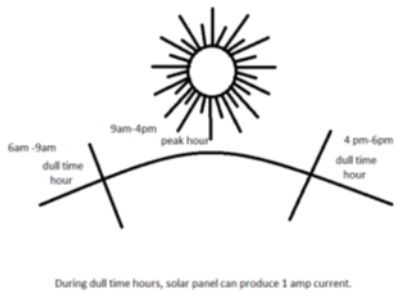
F = B I L Newton's
Where,
B = Flux density in WB/sq.m
I = Current passing through the conductor
L = Length of the conductor

Let us consider a single turn coil. The coil side A will be forced to move downward, whereas the coil side "B" will be forced to move upward. Due to this movement, the coil is made to rotate.

8.1 LED LIGHT

Light Emitting Diodes (LED) have recently become available that are white and bright, so bright that they seriously compete with incandescent lamps in lighting applications. They are still pretty expensive as compared to a GOW lamp but draw much less current and project a fairly well focused beam. The diode in the photo came with a neat little reflector that tends to sharpen the beam a little but doesn't seem to add much to the overall intensity. When run within their ratings, they are more reliable than lamps as well. Red LEDSare now being used in automotive and truck tail lights and in red traffic signal lights. You will be able to detect them because they look like an array of point sources and they go on and off instantly as compared to conventional incandescent lamps.

Fig. 5 LED light



- Power produced from solar panel = 20 watts
- Battery storing capacity = 7 amps
- Motor capacity =1.4 amps
- Average working time =5 hrs per day
- Voltmeter shows 16 volts in stationary condition. =20watts /16volts

1.25amps/hr.
Formula :

P=V X I
Where P=power
V=volts
I=current
P=16volts X1.25amps =20Watts per hour.

9. ADVANTAGES

- This system is ecofriendly in operation.
- It is portable, so it can be transferred easily from one place to other place.
- Non conversional source as fuel.
- Maintenance cost is low.
- More amount of energy is capture by auto tracking.

10. DISADVANTAGES

- It does not purify air.
- Initial cost is high.
- Solar panel saves the energy during day only.

11. APPLICATIONS

The Hybrid solar and electric fan is used in

- Home
- Industries
- Meeting halls
- Seminar halls
- By adding control circuit, we can maintain the room temperature at required level.

11. EXPECTED OUTCOME

By completing this project, we have achieved clear knowledge of comfort cooling system for humans by using non-conventional energy. This project would be fruitful in both domestic and industrial backgrounds.

We also learned about non-conventional energy sources and utilization.

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