

Solar Powered Cold Storage, For Domestic & Horticulture Preservation

Afreen Taj .B¹, Asma Parveen .S², Syed MD Muddassir³, Aijaz Ahamed⁴

^{1, 2, 3, 4} Dept of Electrical and Electronics Engineering,

^{1, 2, 3, 4} Rao Bahadur Y Mahabaleswarappa Engineering College, Ballari, Karnataka, India.

Abstract- Solar cooling refers to any cooling system that uses solar power. and development program, which should develop and demonstrate multiple new technology innovations and mass production economies of scale. Solar air conditioning will play an increasing role in zero energy and energy-plus buildings design. Solar energy, radiant light and heat from the sun, has been harnessed by humans since ancient times using a range of everevolving technologies. Solar radiation, along with secondary solar-powered resources such as wind and wave power, hydroelectricity and biomass, account for most of the available renewable energy on earth. Only a minuscule fraction of the available solar energy is used. Solar powered electrical generation relies on heat engines and photovoltaic. Solar energy's uses are limited only by human ingenuity. A partial list of solar applications includes space heating and cooling through solar architecture, potable water via distillation and disinfection, day lighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes. To harvest the solar energy, the most common way is to use solar panels. Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.

I. INTRODUCTION

The core idea is to use the solar energy directly to produce chilled water, crops, vegetables, fruits, medicines. The high temperature required by absorption chillers is provided by solar troughs. The system doesn't require "strategic" materials (like in PV systems) and has peak production in the moment of peak demand.

II. COMPONENTS & SUPPLIES



Solar Photovoltaic



Battery



Solar Charge Controller



Heat Sink With Fan



Connecting Wires



Peltiermodule



Thermal grease



600 Size:19MM*32.9M Clear

scotch tape



Thermacolsheet

III. WORKING

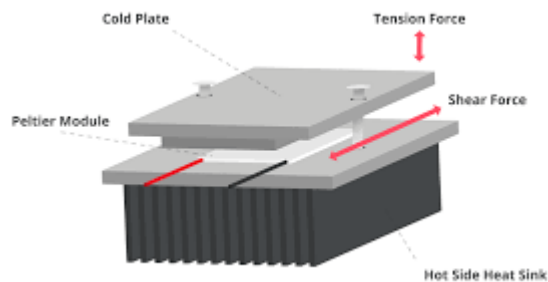
When the Sun light hits the Solar panel with the help of photovoltaic action the heat is passed to the generator were it converts. Where it converts heat energy into electrical energy and then condenser starts conducting. Were heat is converted into water in condenser this water is pumped to the evaporator were all the hot air is feed here. Again it is given to the absorber with the help of pump again it is given to the heat exchanger were it is been heated this hot air is given to the generator and the cycle repeat...

IV. PELTIER MODEL

A thermoelectric (TE) cooler, sometimes called a thermoelectric module or Peltier cooler, is a semiconductor-based electronic component that functions as a small heat pump [1]. By applying a low voltage DC power source to a TE module; heat will be moved through the module from one side to the other. One module face, therefore, will be cooled while the opposite face simultaneously is heated. It is important to note that this phenomenon may be reversed whereby a change in the polarity (plus and minus) of the applied DC voltage will cause heat to be moved in the opposite direction. Consequently, a thermoelectric module may be used for both heating and cooling thereby making it highly suitable for precise temperature control applications.

A. Features of Peltier Module

1. Peltier module can convert thermal energy into electricity, or when electricity is provided to the peltier module then absorption of heat (cool side) on one side and rejection of heat (hot side) on other side.
2. Conventional systems can use or generate harmful gasses like Chloro Fluoro Carbons (CFCs) and Hydro Chlorofluorocarbons (HCFCs). The peltier module can't use or generate these harmful gasses.
3. The conventional refrigeration system can generate some noise during operation. The peltier module can't generate any noise during operation. It is quite in operation.
4. Peltier module can operate on DC power source.
5. By using proper closed loop circuit, the peltier module can control precise temperature.



Solar Energy

Advantages of Solar Energy :-

- Renewable Energy Source
- Reduces Electricity Bills
- Diverse Applications
- Low Maintenance Costs
- Technology Development

This process of cooling (chillers) units is 50% less expensive compare to regular cooling (chillers) units.

Here 40% to 50% of electric energy is also been saved (minimized).

It is easy to assemble.

Comparing to the process of chiller units it doesn't require any high maintenance. Which interns reduce (or) save the Money.

This process doesn't require any special maintenance, this process can be mentioned in similar manner same as that of regular home maintenance.

It can work on Single Phase.

This process can also be done by a small generator.

Disadvantages of Solar Energy :-

Cost

- Weather Dependent

- Solar Energy Storage is Expensive

Uses a Lot of Space

Associated with Pollution

V. HOW IT WORKS



The off-grid solar system means you are not connected in any way to the utility grid. The system utilizes batteries to store energy produced from solar panels.

VI. SOLAR PANEL

The solar panel converts sunlight into electricity. Photovoltaic cells on the solar panel absorb the sun's energy and convert it to DC electricity.

7. CHARGE CONTROLLER:

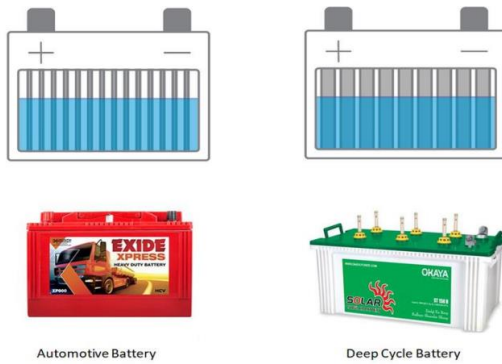
The current from the solar panel feeds into a charge controller, which controls how much current goes to a battery. Charge controllers prevent batteries from being over-charged and over discharged.

8. BATTERY:

It stores energy generated from the solar panel during the day.

9. INVERTER:

It converts the DC (Direct Current) power from the battery bank or solar panels to AC (Alternating Current) so that you can run your AC appliances, such as TV, Fan, Fridge, Water Pump, etc.



Automotive Battery

Deep Cycle Battery

The battery is used to store the energy produce by the Solar Panel during the day. It is an essential part of an off-grid solar system, and provide a constant source of stable and reliable power that allows to power devices when the sun is down.

The cost of the battery is contributing a large portion of the entire project cost. here we will discuss in detail so that you can select the right battery for your off-grid solar installation.

Batteries are categorized according to 1. Application &Construction 2. Chemistry

1. Applications: Automotive and Deep-Cycle
2. Chemistry: Lead Acid, Lithium, and NiCd

X. AUTOMOTIVE BATTERY

This type of battery is designed to provide a very large amount of current for a short period of time. This surge of current is needed to turn the engine over during starting. Therefore lots of thin plates are employed to achieve maximum surface area and as a result higher starting current in starting batteries.

XI. APPLICATION: AUTOMOBILES (CAR & BIKE)

Deep-Cycle Battery:

A deep cycle battery is designed to provide a steady amount of current over a long period of time. This type of battery is also designed to be deeply discharged over and over again. To accomplish this, a deep cycle battery uses thicker plates. This will lead to lower surfaces and accordingly less instant power, unlike the starting batteries.

XII. APPLICATION:RENEWABLE ENERGY

Lead-Acid Battery V/s Lithium-Ion Battery:



Lead Acid Battery

Lithium Battery

Two of the most common battery chemistry types are lithium-ion and lead-acid. Apart from these NiCd is also used for the renewable application, but here I will discuss only the first two Lead-acid batteries are made with lead, while Lithium batteries are made with the metal lithium. Lithium and lead-acid batteries can both store energy effectively, but each has unique advantages and drawbacks.

1. Lead-acid Battery:

The lead-acid battery is a tried-and-true technology that costs less, but requires regular maintenance and doesn't last as long.

Flooded Lead-Acid (FLA) :

These types of batteries are submerged in water. These must be checked regularly and refilled every 1-3 months to keep them working properly. It also needs to be installed in a ventilated place to allow battery gases to escape.

Sealed Lead-Acid (SLA):

SLA batteries come in two types, AGM (Absorbent Glass Mat) and Gel, which have many similar properties. They

require little to no maintenance and are spill-proof. The key difference in AGM vs. gel batteries is that gel batteries tend to have lower charge rates and output. Gel batteries generally can't handle as much charge current, which means they take longer to recharge and output less power.

2. Lithium Battery:

Lithium is a premium battery technology with a longer lifespan and higher efficiency, but you'll pay more money for the boost in performance. The Lithium batteries that are employed in solar systems are Lithium Iron Phosphate (LiFePO4) which have great thermal stability, high current ratings, and a long life cycle. This new technology lasts longer and can be put through deeper cycles. They also require no maintenance or venting, unlike lead-acid batteries. The main downside for lithium batteries is their higher price compared to lead-acid batteries at the moment.

XIII. WHICH BATTERY SHOULD YOU CHOOSE?

If you need a battery backup system, both lead-acid and lithium-ion batteries can be effective options. However, it's usually the right decision to install a lithium-ion battery given the many advantages of the technology – longer lifetime, higher efficiencies, and higher energy density.

If you are planning to live off the grid full-time, you should go with Flooded Lead Acid (if you don't mind regular maintenance) or the premium Lithium option for heavy use. If you want to install the solar in a small cabin or a vacation home, you'll only be there a few times a year. In this case, you won't be able to provide the regular maintenance which is required for Flooded Lead-acid batteries. Then, I will recommend spending some extra amount to buy a Sealed Lead Acid battery instead.

XIV. CONCLUSION

In current, the refrigeration system is extensively used as a cooling agent but it consumes lots of electricity and releases various types of gases like CO₂, CO which is harmful for the atmosphere and produce global warming and climate change. This paper covers all the relevant concerns for the design of refrigeration system using peltier device based on solar energy. The solar energy is renewable energy source which will never be end. The existing system was designed using nonrenewable sources and its produces excessive amount of harmful gases which create energy crisis and depletion the ozone layer also.

REFERENCES

- [1] Shaikh Khalil Rashid, Singar Tushar Machhindra, Dokhale Bipin Ashok, Khandizod Sumit Suresh, Bhane A. B, Savant S. G, (2016). "Experimental Model On Solar Operated Air Conditioning System Using Peltier Module", International Journal of Emerging Technology and Advanced Engineering, Volume 6, Issue 5, May 2016.
- [2] Pushkarny B.H., Divyesh Patel, Akshay Parulkar, Hitesh Rai, Nadeem Khan (2016). "Solar Refrigeration Using Peltier Effect", International Journal Of Research In Aeronautical And Mechanical Engineering, ISSN (ONLINE): 2321-3051 Vol. 4 Issue 2, Pgs: 67-74.
- [3] Tillmann Steinbrecher, (2014). "The Heatsink Guide – Peltier Guide" collected 2014-01-12
- [4] Katherine M. Blundell "Concepts in Thermal Physics," Weblink through Google books.