Design and Manufacturing of Solar Air Conditioning.

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Abstract

In the home and industries air-conditioning is a major consumers of electricity and already today air conditioning causes energy shortage. The demand can be expected to increase because of changing working times, increased comfort expectations and global warming. Because of this heat is continuously increasing. Air-conditioning systems in use are most often built around vapour compression systems driven by grid-electricity. However, most ways of generating the electricity today, as well as the refrigerants being used in traditional vapour compression systems.

Solar air-conditioning might be a way to reduce the demand for electricity. An aim of the report is to describe and explain the working principles of the components and subsystem in such general terms that the report is usable not only to those specifically interested in solar air conditioning, but to anyone interested in air conditioning. In this project we are going to use Peltier module and solar system for conditioning.

Keywords *- Air conditioning, solar energy, battery, PCB, Heat sink.*

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1. Introduction –

An environmental control system utilizing solar energy would generally be more cost effective if it were used to provide both heating and cooling requirements in the building it serves. Various solar powered heating and cooling systems have been tested extensively, but solar powered air-conditioners have received little more than short-term demonstration attention. Solar cooling technologies collect the thermal energy from the sun and use this heat to provide cold air for residential, commercial, institutional and manufacturing buildings.

These technologies displace the need to use electricity or natural gas. Today, Countries across the globe are at work manufacturing and installing solar heating and cooling systems that significantly reduce our dependence on imported fuels. We need smart policies to expand this fast growing, job producing sector. It uses solar energy to produce cold or hot air. This technology can be used to reduce the energy consumption environmental impact of mechanical cooling system. A significant advantage of this system is, it has no moving parts consequently they are noiseless, non- corrosive, cheap to maintain, long lasting in addition to being environmentally friendly with zero ozone depletion as well as global warming potentials. The use of solar energy for cooling can be either to provide refrigeration for food preservation or to provide comfort cooling. There is less experience with solar cooling than solar heating. Several solar heated buildings have been designed, built, operated for extended periods but only a few short time experiments have been reported on solar cooling. However, research work is expected to close the gap between the two within few years. Solar air conditioning systems have used two basic approaches in an attempt to capture the sun's energy for cooling thermal and photovoltaic.

The photovoltaic systems use photovoltaic panels to convert solar radiation directly into DC electricity. Photovoltaic systems have two major advantageous attributes. First, they can use conventional electrically driven air-conditioning equipment, which is widely available and inexpensive. Second, they can use the utility grid for backup power during dark or cloudy periods. Unfortunately other attributes: the high cost of manufacturing, the low conversion efficiencies, and the need for a continual stream of photons to produce power, create three major disadvantages. First electricity from solar cells is very expensive because of the high cost of the solar panels. Second the space needed for powering the air conditioning units is large. And third the panels provide no energy storage, which creates a need for use of grid-based electricity at night and on cloudy days.

In fact, the peak output from the solar panels occurs around solar noon, while peak air- conditioning loads occurs several hours later, resulting in a significant mismatch between supply of needed power and demand. This mismatch greatly reduces the value of the system in reducing peak power demand to the utility. Recently deregulated markets are demonstrating that these demands are much more expensive to meet than had been previously apparent. For off-grid locations, the only viable energy storage system to match the provision of power to times when demand is high (later in afternoon and at night) is batteries. Batteries have a high first cost, require periodic replacement, and normally use toxic and/or corrosive materials. These problems have prevented the use of photovoltaic systems in other than a few high-cost demonstration systems. Thermally driven systems are another approach; they use heat from the sun to drive an air conditioner. Typical approaches from the past used a high-temperature flat-plate collector to supply heat to an absorption system. Systems with concentrating collectors and steam turbines have also been proposed.

Natural gas or other fuel is used for backup heat. While thermal systems have the advantage of eliminating the need for expensive photovoltaic panels, the existing systems have attributes that produce major disadvantages. As used in the past, thermal systems are based on single-effect absorption chillers or other cooling systems that are designed to use natural gas, steam or other high- temperature heat source. They require a very high collector temperature to drive the cooling system. The high collector temperature and relatively poor efficiency, greatly increases collector size and cost. In addition, there is no economically viable way of storing solar energy with this approach. The result of these problems is that thermal systems have been very expensive and have relied primarily on natural gas or other fuel for their thermal energy. For this reason they have seen very little use.

2. Problem Statement –

In previous condition air conditioning consumes the more electricity and it directly impact on the cost for electricity and reducing in source of electricity. So need to develop the renewable energy source as like solar energy. For this project develop the solar air conditioning system.

3. General Information –

3.1. Purpose –

Solar cooling technologies collect the thermal energy from the sun and use this heat to provide cold air for residential, commercial, government institutional and manufacturing buildings. These technologies displace the need to use electricity or natural gas. Today, Countries across the globe are at work manufacturing and installing solar heating and cooling systems that significantly reduce our dependence on imported fuels. We need smart policies to expand this fast growing, job producing sector. It uses solar energy to produce cold or hot air. This technology can be used to reduce the energy consumption environmental impact of mechanical cooling system. A significant advantage of this system is, it has no moving parts consequently they are noiseless, non- corrosive, cheap to maintain, long lasting in addition to being environmentally friendly with zero ozone depletion as well as global warming potentials.

3.2 Scope –

The need for renewable energy sources is on the rise because of the acute energy crisis in the world today. Solar energy is a vital untapped resource in a tropical country like ours. The main hindrance for the penetration and reach of solar PV systems is their low efficiency and high capital cost.

a) Institutional buildings, such as schools, colleges, universities, libraries, hospitals, nursing homes, museums, indoor stadium, cinema theatres etc.
b) Commercial buildings, such as offices, stores and shopping centres, supermarkets, departmental stores, restaurants and others.
c) Residential buildings, including hotels, motels, single family and multifamily low rise buildings of three or fewer stories above grade.
d) Manufacturing buildings, which manufacture and stores products for example medicines
e) Desert Areas.
f) In remote villages where electricity is not present.

Air conditioning systems are mainly for the occupant's health and comfort. They are often called comfort air conditioning systems. The project involves the development of a suitable cooling module designed with a Solar AC to cool the surrounding air. This cooling system needed to be powered up by a DC power supply, which is designed or using a suitable off-shelf power supply.

The project scope involves the following elements:

- Sizing and Designing of the Solar AC
- Selection of the TECs
- Selection of Fans and Heat sinks
- DC power supply design with temperature control.
- Prototype Assembly and Fabrication.
- Temperature measurements for testing.
- Power supply testing and troubleshooting.

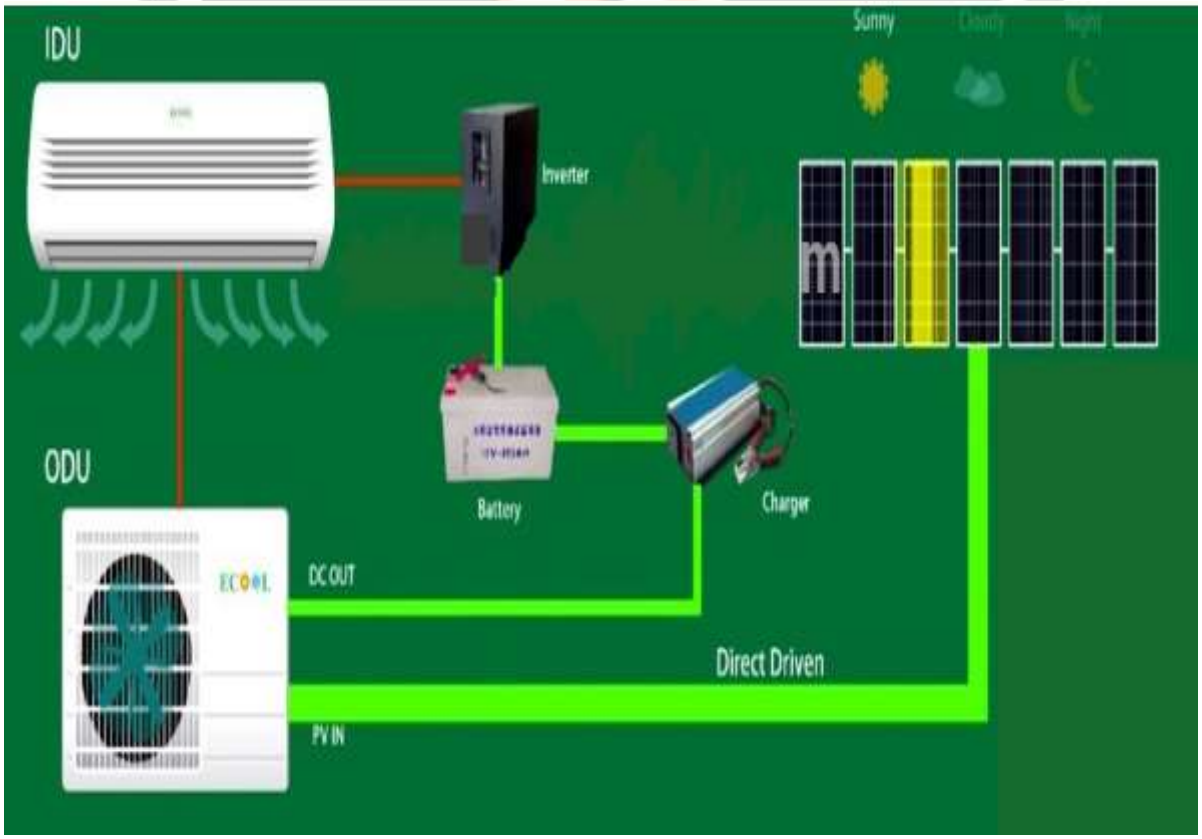

Fig - Solar Air Conditioning

4. Working –

Solar ac is powered by dual power supply of solar and utility grid or UPS. This is driven directly by solar energy with high efficiency in day time and which adopts most advance automatic controlling technology of seamless complementation and transfer between or supply in the world.

1. 100% solar modes –

In sunny day air conditioner is mainly powered by solar energy and assisted by ups soar energy directly drives dc inverter Air compressor inside and offers more than 901% electricity consumed by air conditioner for normal run. Meanwhile solar energy charges battery pack or UPS backup for evening operations.

1.2 cloudy days –

Solar air conditioner is powered by both solar energy and ups. Solar energy directly drives dc inverter air compressor inside and offers more than 70% consumed by air conditioner for the normal run. Meanwhile solar energy charges the battery pack and ups back up for evening operations.

1.3 nights –

In the evening solar air conditioner is powered by UPS alone and solar PV system takes break.

5. Methodology –

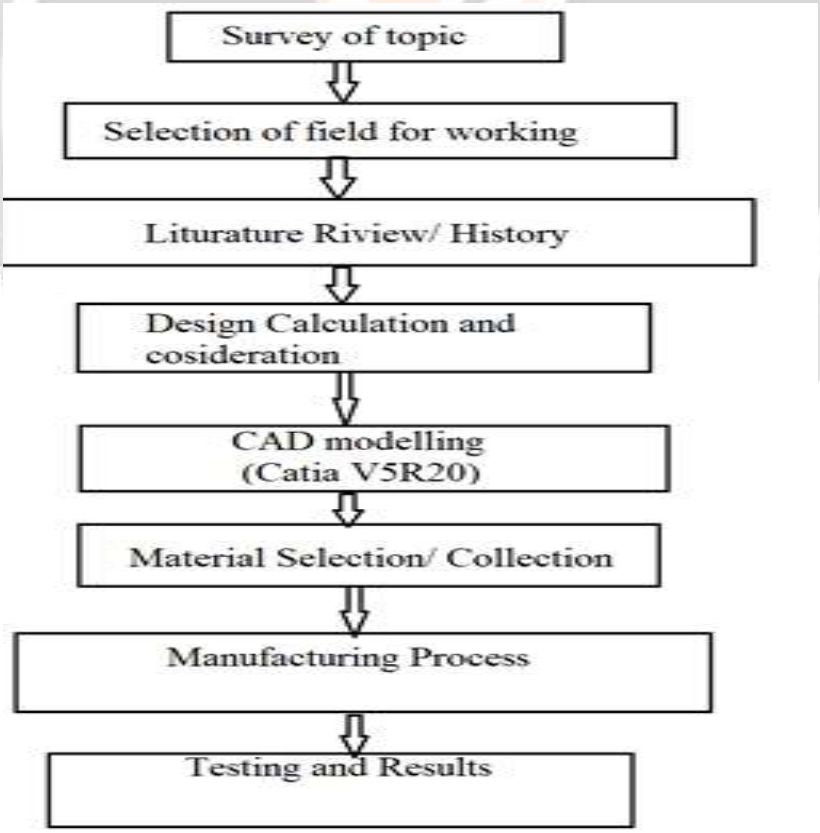

Fig- Methodology

6. Application –

1. This system applicable for home, offices, industries, colleges for air conditioning the rooms, halls.
2. Solar energy is very useful for the use in different type of appliances.
3. As same as air conditioning solar energy use for solar car, solar street light

7. Advantages-

1. Solar air conditioning saves the electricity consuming
2. Provide the night time energy when its charge in day condition.
3. It reduces the billing cost by using the solar energy.

8. Disadvantages –

1. High initial investment cost.
2. System is bulky

9. Conclusion –

Solar air-conditioning has the attractiveness of using a free and a clean energy source to insure the cooling needs in the hottest periods, since cooling demand coincides most the time with the availability of solar radiation. Furthermore, solar technologies can employ environmentally safe refrigerants like water.

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