

Enhancement of Cooling in Solar Air Conditioner using Peltier Module

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Abstract

In all over the world, the rise on temperature of land is a significant issue, as per the source the temperature rise is twice the global average increase. Controlling nature and weather over environment is impossible, but inside a four wall is possible. As we already know air conditioners functions by a natural scientific process of heat transfer. In recent years, need for comfort has been in demand due to change in climate. Therefore, the usage and productivity of air conditioners is increased which leads to consumption of large amount of energy and cost too. To keep away from this sort of circumstances, the power required for the air conditioning system which must be a renewable energy that is solar energy. This solar energy powers up the AC system, which controls and maintains the temperature of a conditioned area. If we need a good comfort inside our living area, air conditioning is most necessity in recent years. Therefore this paper focuses on enhancement of cooling on a Direct Current (DC) Air conditioning system integrated with peltier module. This air conditioning can be run on solar panel which stores charges to battery and thus will be supplied to our air conditioning system. As we all knew this will reduce the cost, renewable and environmentally friendly.

Keywords: solar panel, renewable energy, peltier module, cooling.

1. Introduction

The air conditioning system has becomes most necessity these days. This shows that there is increase in mass production of air conditioning systems which leads to increase in cost and consumption of energy. On the other hand there is 40% of energy consumption and 36% of CO₂ emission are caused by the building according to United Nations Environment Programme (UNEP). So here we come up with enhancement of cooling on solar air condition using peltier module. In this technique, the solar panel absorbs thermal energy from sun and uses this heat for further process on this system. Thus heat is used to supply a conditioned air. This will definitely displace the use of electric in large consumption. For human comfort air should have the properties regarding temperature, humidity and velocity. This air conditioner cool/heat and humidity/dehumidify the air to above human comfort conditions depending on the temperature and humidity the outside atmospheric air. Outside air is slightly to be differing from what we expect as a comfort air. Note that also other factors taken into account importantly cleanliness. In order to bring it with in the human comfort condition we need to do one or more of the following, heat it, cool it, dehumidify it,

humidify it or mix it. This system can solve lot of energy consumption and reduce the emission of greenhouse gas

2. Literature Survey

As we probably are aware the saving electricity is our main role so saving electricity is done when solar energy plays a role here. At the point when our air conditioning uses electricity power, at that point there are more problem which increase the cost for electricity. So we have developed a solar air conditioning system which uses solar panel in which takes thermal energy from sun and use this heat for storage of power in battery. Thus we came up with enhancement of cooling in solar air conditioning system using peltier module

D. Loveday (1998) [1] presented Designing for thermal comfort in combined chilled ceiling/displacement ventilations environment. S. Mumma (2001) [2] presented Overview of integrating dedicated outdoor air systems with parallel terminal systems. H. Xing (2002) [3] presented Measurement and calculations of neutral height in a room with displacement ventilation. E. K. Pedersen (2003) [4] presented a screening assessment of emissions of volatile organic compounds and particle from heated indoor dust samples. D. Shu (2004) [5] presented Improvement of indoor air quality and application of contamination control. K. Tham (2005) presented size relationship between airborne viable bacteria in controlled indoor environment study. G. Sarwar (2007) [7] presented the ozone/limonene effect reactions on indoor secondary organic aerosols. E. Bryce (2009) [8] presented Refinement of SRR sensor for application with air tight buildings. Ying Han (2010) [9] presented the sources and health impacts of Indoor air pollution. J Wang (2011) [10] presented Method to access quality and quantity of outdoor ventilation airflow received by occupants. Tsang-Chu Yu (2012) [11] Presented wireless sensing system for prediction indoor air quality. Muhamad Damanhuri (2013) [12] presented Monitoring of air ducting using mechanical robot for indoor air quality (IAQ) improvement. I Daniel Lawrence (2014) [13] presented the Study and analysis of indoor air quality characteristics on air conditioned application. S Shipa B (2015) [14] presented the Fuel emission correlation assessment of indoor pollutants from different households. A Szczurek (2016) [15] presented CO₂ and volatile organic compounds as indicators of IAQ. Paulina Lewkowka (2017) [16] presented the use of sensory analysis techniques to assess the quality of indoor air. R. Boukhanouf (2018) [17] presented experimental analysis of regenerative evaporative cooler for cooling of buildings and arid climates. J. Saining (2020) [18] presented Comprehensive review on indoor air quality monitoring systems for enhanced public health.

3. Solar Air Conditioner

3.1. Selection of material

The material used for the construction of the Solar Air Conditioner is mild steel. The reason to use mild steel is as following properties

Based on the mechanical properties of the mild steel, it is known that mild steel has higher tensile strength, highly ductility, machinability and weldability than choosing other materials.

Mild steel is available at low cost and is recyclable. So it is concluded that choosing mild steel as material for fabricating the product will be appropriate.

3.2.Peltier Module

Here we use a peltier module for main application of cooling. It is the effect which creates a temperature difference by transferring heat between electrical junctions. It creates an electric current when voltage is applied across conductors. When current pass through the number of P-N junctions of two conductors, heat is removed from one junction and cooling occurs. Heat is deposited at another junction.

The main application of peltier module is cooling. Therefore, it can be also used for heating or controlling temperature.

When current is passed through the number of P-N junctions, there is a decrease in temperature at the junction which is cold side. Here cooling occurs, which lead to heat absorption from environment. Heat is carried along the elements by electrons and released on the opposite side. Here electrons move from high energy state to low energy state. Here we use peltier module for enhancement of cooling in solar air conditioner.

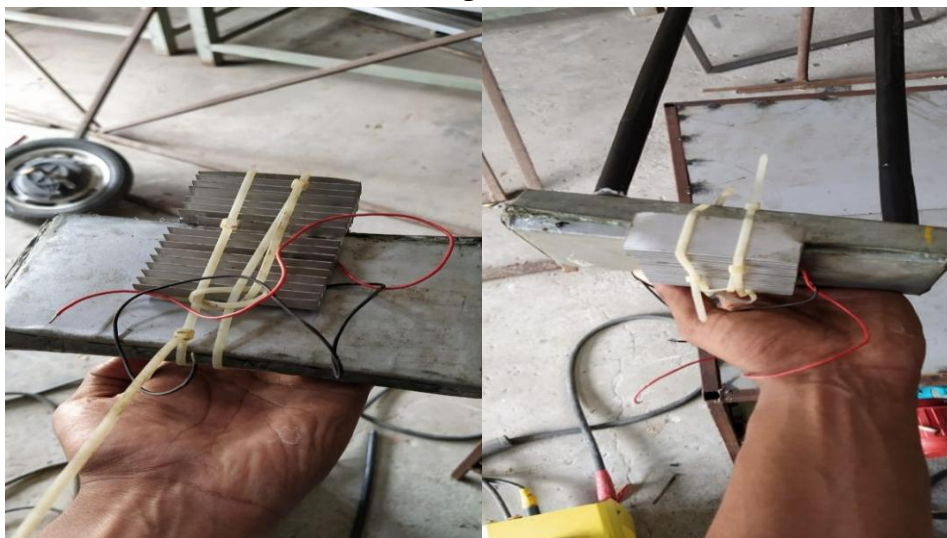


Fig.1 Peltier module used

4. Working mechanism

In this system, the solar panel charges the battery and supplies power to the unit. The atmospheric air is sucked inside by using blower. The sucked air is then allowed to pass through electrostatic precipitator, though the dust and smokes air is eliminated. Then the air is passed through the air filter capable of removing escaped dirt and dust from the electrostatic precipitator.



Fig.2Experimental Setup of solar air conditioner using peltier module



(a) Side View



(b) Front View



(c) Top View

The cleaned air is then sprayed using a water jet to humidify the air. The humidified air is then passed through peltier module. Cooling occurs when current is passed through n-p type pair of elements, there is decrease in temperature, resulting in absorption of heat from the environment. Which is usually moisture makes the air humidified naturally. The humidified air is then allowed to pass along the cooling coil which carries coolant inside. Here we use a coolant which is capable of ecologically friendly coolant which improves the quality of air. By passing the air along the cooling coil, we can able to obtain a cool air. The cooled air is then sent out through a water eliminator, though we can eliminate water in case it comes out. Finally we can provide a conditioned air.

5. Conclusion

This paper has introduced the energy saving measures that have been in perspective of enhancement of cooling in solar air conditioner using peltier module. As a conclusion here we conclude with a low cost and solar powered air conditioner is achievable and marketable in reality.

- Using solar energy as the power source it is proved to be feasible.
- It is efficient to use solar energy as a renewable source of energy.
- Improves the quality of air.

Lastly we would like to add that it would have possible to provide a conditioned air with solar source of energy and also enhance cooling in this system.

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