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# Solar Operated 360 Air Cooler & Heater

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**ABSTRACT:** Although solar air cooling and heating has a lot of promise, existing methods cannot use it profitably. PV cells are pricey and need a sizable area of the roof to generate enough electricity. The new solar air-conditioning system adopts a novel strategy, combining cooling from water evaporation with dehumidification from a desiccant through the use of a thermally powered system with inexpensive energy storage and a unique heat exchanger design. In contrast to traditional electrically powered systems, the study attempts to show that a solar air conditioner may be economically driven by heat. Calcium chloride, which is affordable and often used as road salt, is the salt of choice. A small pool with a black plastic liner can serve as the solar collector, allowing the sun to drain water from the salt solution. Off-peak electricity or natural gas can be utilized as a backup heat source if sunshine is insufficient. To support the overall goal, the immediate goals were to gather component test data and modelling findings.

**KEYWORDS:** pv cells, solar energy, air conditioning.

## I. INTRODUCTION

Students can examine their level of creativity competency on the self-assessment test. The student is exposed to a variety of mechanical engineering topics during their studies and given the chance to work on various equipment. The learner may design and create a gadget as they study more, which strengthens their grasp of manufacturing technique. This paper examines the project's requirement as well as different planning, design, material selection, manufacturing, erection, estimating, and testing issues. 14% of the world's primary energy consumption is met by renewable energy sources. Climate change, the depletion of fossil fuels, and the need for a reliable energy supply are all contributing to the rapid growth of renewable energies including biomass, hydro, solar, wind, tidal, geothermal, and wave energy. This assignment project explores the viability, sustainability, and potential of implementing solar air conditioning in Malaysia, taking into account thermodynamics principles, particular devices, and equipment on the market or in development, potential upgrades or alternatives available, potential to the social, economic, and geographic situation in Malaysia, as well as consideration for the successful commercial introduction of solar air conditioning.

### *Problem Definition*

The situation of a power outage nowadays is considerably worse. Therefore, we should place a higher priority on energy conservation and power savings. The focus of efforts is on locating resources or ways to conserve energy. To reduce operating and overall costs, a 360-degree evaporative cooler will be designed, produced, and manufactured in this project. Since it doesn't produce any pollutants, it is environmentally beneficial. Unlike traditional air coolers, this air conditioner (A.C.) delivers air without raising the humidity level. A 360-degree turn will allow individuals to sit wherever.

### *Objectives of Study*

- To develop and design a power saving, energy efficient, environment friendly evaporative air conditioning system having low operating cost and can be used in hot and dry regions.
- To design a cooler and heater, this allows air to flow in 360 directions
- To save the water and electricity by using the same cooler for all rooms of home
- Main important of this cooler is this air cooler gives cool air as well hot air so for all season we can use it
- Less weight with more benefits and safety for types users like industrial as well home

II. METHODOLOGY

A device that uses adiabatic contraction to condense air and water is known as a 360 air cooler and warmer. Water droplets or a water film dispersed across a wetted matrix or pad can provide the surface area needed to contract. To avoid the accumulation of salts and sediments in the water, the total amount of water provided must be greater than the rate of evaporation. The pump and the fan each have their own motor, allowing for independent operation. Water is pumped up from the bottom tank to the top tank through holes on the top tank as a result of the pump. The fans pull air in from all four directions, and as it passes past the pads, it is cooled.

III. EXPERIMENTAL SETUP

**Construction**

It is made out of a hollow box-shaped structure that is 400 x 400 x 400 mm in size. It is constructed from 1.5mm thick M.S. sheet. For simple air and water movement, the cooler's top and bottom are shaped like a dome. The cooler's top is equipped with a sprayer setup. Pumps are used to move the water to be sprayed from the cooler's sump via plastic tubing that have holes in them. Sprayed.

The cooler has a blower installed on one of the sides. The wire meshes are included to delay the flow of both water and air and to extend the duration that the two are in contact. The water spray cools the air from the blower as it passes past it. The ventilator receives this cooled air. Provide a straightforward method for altering the direction of the air flow. As a result, air direction may be changed as needed. Increase the heating coil's electric connection to provide warm air throughout the winter. The cooling system may be turned ON and OFF using an electrical switch panel board installed outside the cabin. Metal primer is applied to the entire arrangement, and ornamental metal enamel paint is used to complete it.

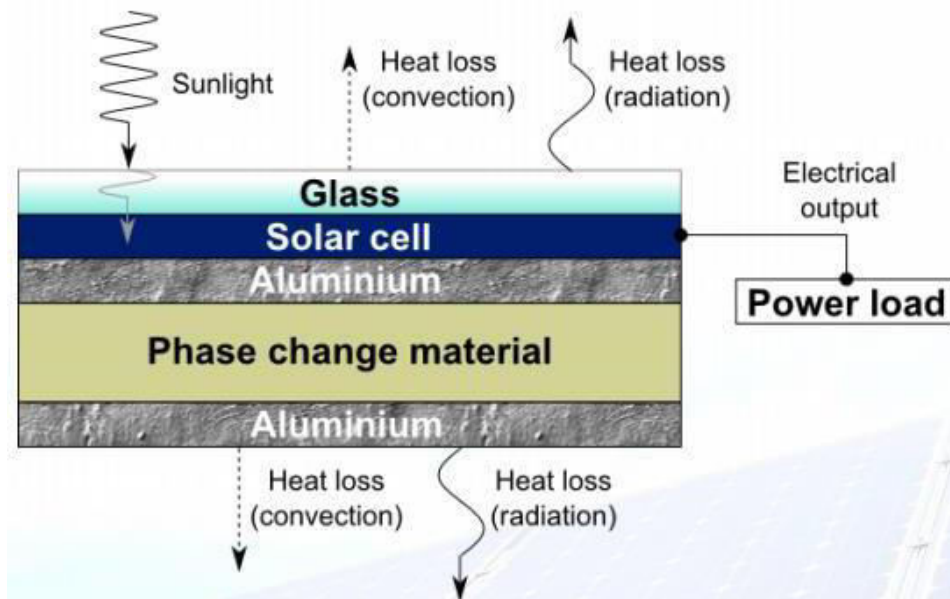


Figure 1: Working of Solar Panel

Calculations are made of the energy fluxes into and out of each stratum. The temperature of each layer of the solar panel may be calculated using this. The electrical efficiency of the panel is determined by the temperature of the solar cell layer; for every °C rise, efficiency falls by 0.45%. Electrical output is then calculated by

$$Power\ Output = Efficiency \times Sunlight\ Intensity$$

Using information from climate models on sunshine intensity, air temperature, and wind speed, this performance is averaged over a year. To calculate the % output improvement for a solar panel without phase change material connected, the same formula is conducted. In a guidebook by Henning and an essay by Grossman, solar cooling



systems are covered. On the absorption cycle, which involves a heat engine powering a heat pump, closed-cycle systems are built. There are two types of open cycles: closed and open. On the absorption cycle, which involves a heat engine powering a heat pump, closed-cycle systems are built.

#### ***Fabrication of Solar Collector***

Solar collector is used to evaporate the moisture contained in the CaCl<sub>2</sub> brine solution. It is in the shape of cuboids that is open at the top and made of steel sheet. Solar collector is also work as a CaCl<sub>2</sub> storage tank. To increase the effectiveness of flat plat solar collector, whole body is being painted black colour and covered by the glass plate from the top. The heat energy coming from sun is trapped inside the solar collector and the rays are not able to get back due to glass plate covered at the top. Hence the temperature of inside the collector is sufficient to evaporate the moisture. The size of solar collector is (3\*1\*1) feet.

#### ***Fabrication of Pumping Device, Fan/ Exhaust System***

In this project two pumps are used, one of which is used to circulate CaCl<sub>2</sub> brine solution from the storage tank. And other is used to circulate water from water storage tank to liquid- liquid heat exchanger. The pump used in the project has 5.6 ft. discharge head. Fan is used to supply dehumidified and cooled air from liquid-air heat exchanger to the space to be cooled.

#### ***Water Storage Tank***



**Figure 2: Water Tank**

It is used to collect the water coming out from the heat exchanger. It has certain amount of capacity to store water that is used for liquid-liquid indirect type of heat exchanger.

#### ***Interconnection between Components***

The different components are arranged as per the working principle of the project. These connections are as follows

- The solar collector, which also works as desiccant storage tank, is connected to the inlet pipe of the pump and the outlet of pump is connected with the inlet of liquid-liquid heat exchanger with the help of connectors.
- The outlet pipe of liquid-liquid heat exchanger is connected with the inlet of liquid- air heat exchanger, inside which the desiccant falls in the form of droplet and hence collected at the base of heat exchanger
- The collected desiccant at the base again supplied to the solar collector by using the phenomenon of gravity with the help of pipes
- The water storage tank supplies the water inside the liquid-liquid heat exchanger. The water from heat exchanger again transferred to the storage tank by using pump.
- The exhaust fan is provided on the face of the liquid-air heat exchanger, which suck the dehumidified air from heat exchanger and supply it to the region to be cooled.

#### **IV. CONCLUSION**

This paper undertook a review based study on 360 degree air cooler and heater. Majority of affordable air coolers in market gives air supply in one direction at a time. This paper is based on innovation and moderation to those typical desert air coolers. This cooler is designed in such a way that it can give cold as well as hot air in all 360 degree directions. Main idea of this project is to make an affordable air cooler as well as heater that can be used in villages or other small regions as well. The recent researches and results have shown that a considerable saving in power consumed and at the same time the cooling and considerable heating effectiveness can be enhanced. 360 degree air



cooler and heater also has an advantage of saving the natural resources as it works on natural phenomenon and it is pollution free.

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