

## DESIGN AND FABRICATION OF SOLAR AIR COOLER

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### ABSTARCT

This paper describes current trends in solar-powered air conditioning, which has seen renewed interest in recent years due to the growing awareness of global warming and other environmental problems. Closed-cycle heat-powered cooling devices are based mainly on absorption chillers, a proven technology employing LiBr–water as the working fluid pair. Recent developments in gas-fired systems of this type make available double- and triple-effect chillers with considerably higher COP than their single-effect counterparts, which makes it possible to reduce the amount of solar heat required per kW of cooling. These systems require, however, high-temperature solar collectors. The principles of multi-staging absorption systems are described. An economic comparison is provided which shows the total system cost to be dominated by the solar part of the system. At current prices, the high COP, high temperature alternative is still more costly than the low temperature one. Open-cycle desiccant systems employing either solid or liquid sorbents are described. While the main thrust in research on novel closed-cycle absorption systems has been toward increasing the operating temperature in order to improve efficiency through multi-staging, open-cycle absorption and desiccant systems have been developed for use with low temperature heat sources such as flat plate solar collectors. A novel open-cycle (DER) system is described, which makes it possible to use the solar heat at relatively low temperatures, for producing both chilled water and cold, dehumidified air in variable quantities, as required by the load.

### INTRODUCTION

This paper reveals the comfort conditions achieved by the device for the human body. In summer (hot) and humid conditions we feel uncomfortable because of hot weather and heavy humidity. So it is necessary to maintain thermal comfort conditions. Thermal comfort is determined by the room's temperature, humidity and air speed. Radiant heat (hot surfaces) or radiant heat loss (cold surfaces) are also important factors for thermal comfort. Relative humidity (RH) is a measure of the moisture in the air, compared to the potential saturation level. Warmer air can hold more

moisture. When you approach 100% humidity, the air moisture condenses this is called the dew point. The temperature in a building is based on the outside temperature and sun loading plus whatever heating or cooling is added by the HVAC or other heating and cooling sources. Room occupants also add heat to the room since the normal body temperature is much higher than the room temperature. Need of such a source which is abundantly available in nature, which does not impose any bad effects on earth. There is only one thing which can come up with these all problems is solar energy.

### LITERATURE RIVIEW

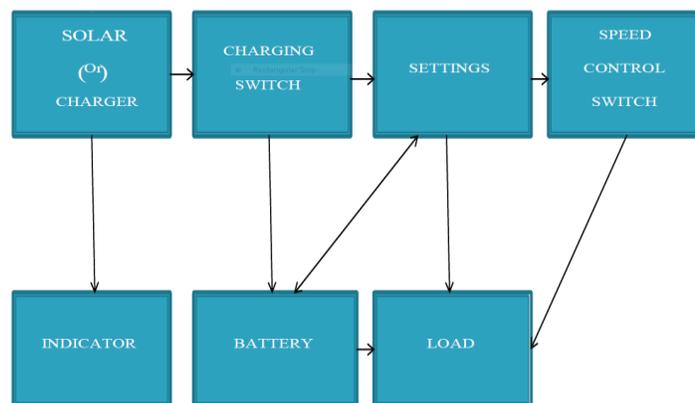
Anbarasan, Ramesh Kumar has to publish a paper on 2018. The title of the paper is “solar air cooler” the name of the journal is “design and fabrication of solar air cooler” the conclusion of the paper is “cooling air can be produced by solar power”

Wertheim has to published a paper on 1992. The title of the paper is “high pressure system” the name of the journal is “machining with minimal cutting fluid” the conclusion of the paper is “tool wear is reduced and the tool life is also increased”[2]

Senthilkumar has to publish a paper on 2002. The title of the paper is “high pressure cooling system” the name of the journal is “machining with minimal cutting fluid” the conclusion of the paper is “cutting fluid is supplied through a spindle in milling process”[3]

Ramkumar has to publish a paper on 2008. The title of the paper is “Minimal cutting fluid is passed through a two jets” the name of journal is “machining with minimal cutting fluid” the conclusion of the paper is “to reduce the temperature in between tool and job and to improve the tool life”

### BLOCK DIAGRAM



## COMPONENTS OF SYSTEM

### SOLAR PANEL



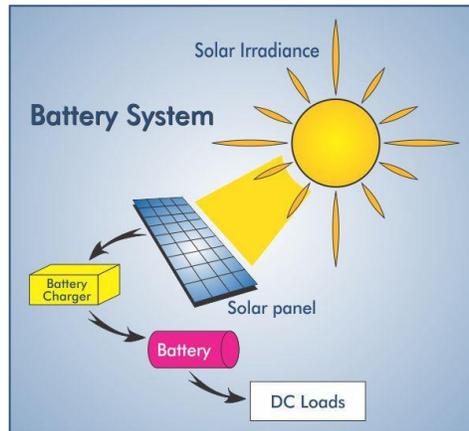
Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. The majority of modules use wafer-based crystalline silicon cells or thin-film cells. The structural (load carrying) member of a module can either be the top layer or the back layer. Cells must also be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones based on thin-film cells are also available. The cells must be connected electrically in series, one to another. Externally, most of photovoltaic modules use MC4 connector's type to facilitate easy weatherproof connections to the rest of the system.

Module electrical connections are made in series to achieve a desired output voltage or in parallel to provide a desired current capability. The conducting wires that take the current off the modules may contain silver, copper or other non-magnetic conductive transition metals. Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated.

Some special solar PV modules include concentrators in which light is focused by lenses or mirrors onto smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost-effective way.

Solar panels also use metal frames consisting of racking components, brackets, reflector shapes, and troughs to better support the panel structure.

## PERFORMANCE OF SOLAR



Module performance is generally rated under standard test conditions (STC): irradiance of 1,000 W/m<sup>2</sup>, solar spectrum of AM 1.5 and module temperature at 25°C.

Electrical characteristics include nominal power ( $P_{MAX}$ , measured in W), open circuit voltage (VOC), short circuit current (ISC, measured in amperes), maximum power voltage (VMPP), maximum power current (IMPP), peak power, (watt-peak,  $W_p$ ), and module efficiency (%).

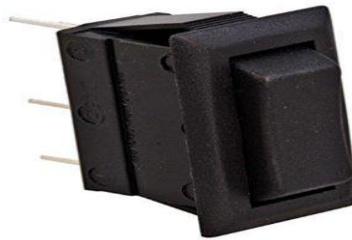
Nominal voltage refers to the voltage of the battery that the module is best suited to charge; this is a leftover term from the days when solar modules were only used to charge batteries. The actual voltage output of the module changes as lighting, temperature and load conditions change, so there is never one specific voltage at which the module operates. Nominal voltage allows users, at a glance, to make sure the module is compatible with a given system.

Open circuit voltage or VOC is the maximum voltage that the module can produce when not connected to an electrical circuit or system. VOC can be measured with a voltmeter directly on an illuminated module's terminals or on its disconnected cable.

**The different types of thin-film solar cells can be categorized by which photovoltaic material is deposited onto the substrate:**

- Amorphous silicon (a-Si)
- Cadmium telluride (CdTe)
- Copper indium gallium selenide (CIS/CIGS)
- Organic photovoltaic cells (OPC)

## SINGLE POLE SINGLE THROUGH SWITCH



## SWITCHES ARE CLASSIFIED

### Types of Switches

- Single Pole Single Throw Switch (SPST)
- Single Pole Double Throw Switch (SPDT)
- Double Pole Single Throw Switch (DPST)
- Double Pole Double Throw Switch (DPDT)
- Push Button Switch.
- Toggle Switch.
- Limit Switch.
- Float

## COOLER TANK



The capacity of the water tank is 1.5 liters.

- It is connected to a DC motor drive.
- The DC motor is operated in 6 volt power.
- The fluid is forced to escape through the nozzle with a high velocity.

## DC MOTOR

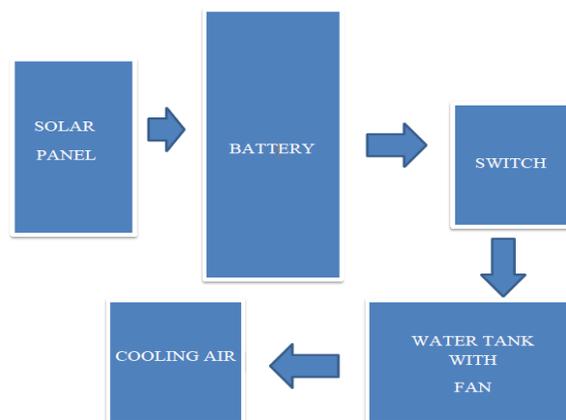


Motor is single phase induction motor same as ceiling fan motors. Difference occurs in the mechanical modelling of FAN structure. Exhaust fan structure is made in such a way, it blows air inside out. A ceiling fan is structured such a way that it provides air directly below.

### METHODOLOGY TO SOLVE A PROBLEM

- The elements of the projects are assembled in a correct way.
- First the power supply is taken from a solar panel and stored in a battery. Then the battery is used to convert the power in AC-DC. Then the switch is to control the pulse setting. The air cooler will run according to power supply.
- The water is stored in a water tank. The fan used to convert the cooling water to cooling air.

### FLOW CHART FOR THE EXPERIMENT



## **FABRICATION PROCESS**

In the fabrication process of solar air cooler application process having various operations like

1. Cutting
2. Drilling
3. Welding
4. Grinding

### **CUTTING**

Cutting is a collection of processes where in material is brought to a specified geometry by removing excess material using various kinds of tooling to leave a finished part that meets specifications.

The net result cutting is two products the waste or excess material, and the finished part. In material working, the waste would be sawdust and excess material .In cutting metals the waste is chip or swarf and excess metal.

### **GRINDING**

Grinding uses an abrasive process to remove material from the work piece.

A grinding machine is a machine tool used for producing very fine finishes, making very light, or high precision forms using an abrasive wheel as the cutting device. This wheel can be made up of various sizes and types of stones, diamonds or inorganic materials.

### **WELDING**

Welding is a fabrication process that joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melding the work pieces and adding a filler material to form a pool of molten material That cools to become a strong joint ,but sometimes pressure is used in conjunction with heat or by itself, of produced the weld.

### **DRILLING**

Drilling is a cutting process that uses a drill bit to cut a hole of a circular cross-section in solid materials.

The drill bit is rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at from hundreds to thousands of revolutions per minute.

<b>COST OF THE MATERIALS</b>	<b>Cost(Rupees)</b>
Dc Motor	2300
SPSTS switch	25
Solar panel	2000
Battery	1150
Lithium	1500

### **SPECIFICATIONS**

No of solar panel

Type of fluid : water

Power supply : AC Battery Type

Amount of fluid used : 15ml/min

Battery : 2

Motor type : dc motor

### **Electrical Characteristics:**

Open circuit voltage - 21.6v

Short circuit current - 1.94A

Maximum power - 20wp

### **CONCLUSION**

The output of the project is Comfort thermal conditions achieved in the living room. That is room temperature up to 25C and relative humidity of 60%. Comparing the cost of this product with the existing products in the market is solar product appeals better and affordable by common people. This solar product perfectly suits for villages, schools and offices and thus an alternate to the power cut problems. It comprises of many attractive.

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