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Modeling Of a Bucket Air Cooler by Using Solar Energy

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Abstract: *In a conventional energy sources day to day decreasing in their energy levels. Going green and conservation as much energy as possible has become the focal point in their eyes of the world. There are many sources of energy available to us that will conserve our natural resources and decrease on harmful emissions that are destroying our environment. Many energy sources available in world like hydro electrical, thermal, mechanical, solar, tidal, bio gas, wave, wind, geothermal, ocean thermal energy. Many incentives are now available to individuals and industries who implement the use of this ecofriendly environment through in this direction we are selected solar energy is main sources.*

Our design and construction of a bucket air cooler by using solar energy is new alternative to conventional energy sources. We set out to create an air cooler that does not create any harmful emissions in environment and provide no pollution in the surrounding. The solar power as the main energy sources to help in the project work. It is providing to cooling the enclosed space and also measured the temperature levels of before and after in absorbed enclosed space.

Keywords: *Solar panels, Bucket, CFL Inverter, DC Fan, pipes.*

I. Introduction

The global need for energy is constantly increasing and makes it inevitable to rein force the use of alternative resources. The sun is one of the richest energy sources in this context and is almost inexhaustible. Energy efficiency and solar technology are important elements to any building or community design. Also, they are important to the nation and to the Earth. The Sun is a massive reservoir of clean energy and the power from the sun's rays that reach the earth is called as solar energy. Solar energy is the most readily available source of energy.

Solar energy received in the form of radiation can be converted directly or indirectly into other forms of energy such as heat and electricity which can be utilized by the man. Since the sun is expected to radiate essentially at a constant rate for a billion years it may be regarded as an in-exhaustible source of use full energy. Solar energy has been used since prehistoric times, but in a most primitive manner. Before 1970, some research and development was carried out in a few countries to exploit solar energy more efficiently, but most of this work remained mainly academic. After the dramatic rise in oil prices in the 1970s, several countries began to formulate extensive research and development programmer to exploit solar energy.

1.1. The sun and the earth:

The sun is the largest member of the solar system with other member revolving around it. It is a sphere of intensely hot gaseous matter with a diameter of $1.39x10^9$m and on an average, at a distance of $1.5x10^{11}$m from earth. As observed from earth the Sun rotate son its axis about once every four weeks. The Sun has an effective black body temperature of 5777K with several fusion reactions staking place on it and hence acts as a continuous reactor.

The energy produced from the sun is radiated into space by Stefan-Boltzmann law which is $E= \varepsilon\sigma T^4$

Where,

ε =Emissivity of the surface,
σ =Stefan-Boltzmann constant

The earth is almost round in shape having a diameter of about $12.75x10^6$meters. It revolves around the sun once in about a year. Nearly 70% of the earth is covered by water and remaining 30% is land. Earth reflects 1/3 of the sun light that falls on it. The earth is spinning about its axis constantly. Its axis is inclined at an angle of 23.5º.

1.2. Solar spectrum and solar radiation

Solar radiation is a general term for the electromagnetic radiation emitted by the sun. The solar radiations falling on the earth's surface is categorized into ultraviolet radiations, visible light and infrared radiations according to the solar spectrum.

1.2.1. Solar Spectrum:

When the sun's energy richest he earth's orbit, the emitted solar radiation is the composite result of the several layers that emit and absorb radiation of various wave lengths. In passing through the earth's atmosphere, harmful rays (X-rays, Gamma rays) are largely filtered out along with some wave length so visible light. The maximum spectral intensity occurs at about 0.48μm wave length (λ) in the visible spectrum. About 6.4% of the total energy is contained the ultraviolet region(λ<0.38μm); another 48% is contained in the visible region (0.38μm<λ<0.78μm) and the remaining 45.6 is contained in the infrared region (λ>0.78 μm).

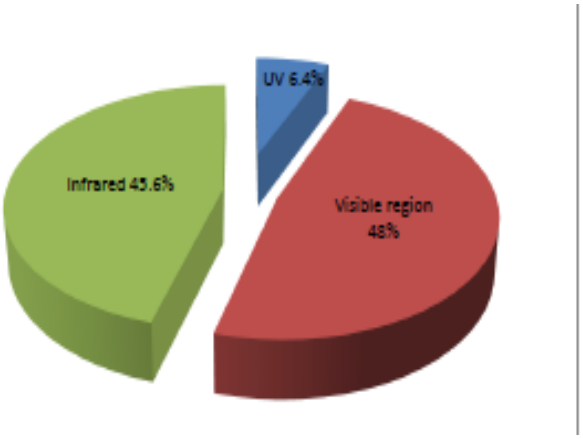

Fig1: Spectral solar radiation distribution

1.2.2. Diffuse and Direct Solar Radiation

The UV radiations are absorbed by the Ozone layer and infrared radiations are absorbed by the water vapors, and carbon dioxide. So the intensity of radiation reaches the earth decreases. Radiations reaches on the earth are of two types:

Diffuse solar radiation: As sun light passes through the atmosphere some of it is absorbed, scattered, and reflected by the air molecules, water vapours, clouds, dust, pollutants, forest fires, volcanoes etc. This is called as diffuse solar radiation.

Direct (beam) solar radiation: The solar radiation that reaches the earth's surface without being diffused is called as direct solar radiation. It is also referred to as the solar radiation propagating along the line joining the receiving surface and the sun. Atmospheric conditions can reduce direct beam radiation by 10% on clear, dry days and by 100% during thick, cloudy days. The radiant energy flux received per second by a surface of unit area held normal to the direction of sun's rays at the mean earth- sun distance outside the atmosphere is called as **solar constant.** It is practical constant throughout the year and its adopted value is 1367 W/m^2.

1.3. Sun and earth angles:

The following are the important sun-earth angles:

a) **Zenith angle (θ*):*** It is the angle between sun's ray and perpendicular line to the Horizontal plane. It is shown in figure2.
b) **Altitude angle (α):** It is defined as the angle between sunrays and a horizontal plane. It is shown in figure2.
c) **Surface Azimuth angle (γ):** It is the angle in a horizontal plane, between the line due south and the projection of normal to the surface on the horizontal plane. It is also shown in figure2.
d) **Latitude (ϕ):** The latitude of a location is the angle made by the radial line joining the given location to the centre of the earth with its projection on the equatorial plane.

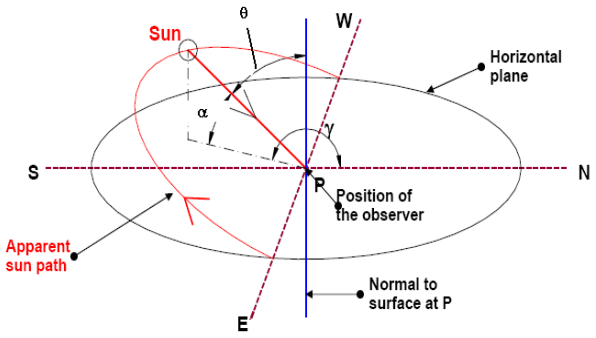

Fig2: Sun and Earth angles

e) **Declination (δ):** The angle between the line joining the centers of the sun and the earth and its projection on the equatorial plane is called as declination angle. Declination is due to the rotation of earth about an axis which makes an angle $66^{1}/_{2}^{o}$ with the plane of its rotation around the sun.

f) **Hour angle (ω):** The angle through which the earth must be rotated to bring the meridian of the plane directly under the sun is called as hour angle.

g) **Angle of incidence (θ_i):** It is the angle between beam radiation on a surface and the normal to that surface. The angle of incidence is calculated by the following formula:

2.4. Solar energy in India:

India is one of the few countries with long days and plenty of sunshine, especially in the Desert region. On average, the country has 300 sunny days per year and receives an average hourly radiation of 200MW/km^2. The India Energy Portal estimates that around 12.5% of India's land mass, or 413,000km^2, could be used for harnessing solar energy [6]. This zone, having a abundant solar energy available, is suitable for harnessing solar energy for a number of applications. In areas with similar intensity of solar radiation, solar energy could be easily harnessed. Solar thermal energy is being used in India for heating water for both industrial and domestic purposes. A 140MW integrated solar power plant is to be set up in Jodhpur but the initial expense in curried is still very high. India receives solar energy equivalent to over 5000trillionkWh/year [7], which is for more than the total energy consumption of the country. In India the energy problem is very serious. In spite of discoveries of oil and gas off the west coast, the import of crude oil continues to increase and the price paid for it now dominates all other expenditure. As for as India is concerned there are 33 solar photo voltaic(PV) power plant switch total 425.9(MW) DC peak power and the total of 979.4MW power production throughout the country. The maximum power production from the solar energy is from the state of Gujarat with 654.8MW i.e.66.4% contribution [7]. The second best power producing state is Rajasthan with 197.5 MW with 20.5% contribution [7].

1.4 Applications of solar energy:

The application areas of solar energy can be categorized as follows:

- Architecture and urban planning
- Agriculture and horticulture
- Solar thermal energy can be used for:
  - Cooking/heating
  - Drying/Timber seasoning
  - Electricity/Power Generation
  - Cooling and Refrigeration

Solar energy can also be used to meet our electricity requirements. Through Solar Photo voltaic (SPV) cells, solar radiation gets converted into DC electricity directly. This electricity can either be used as it is or can be stored in the battery. This stored electrical energy then can be used at night. SPV can be used for a number of applications such as:

- Domestic lighting
- Street lighting

- Village Electrification
- Water pumping

Powering of remote telecommunication repeater stations and Railway signals. If the means to make efficient use of solar energy could be found, it would reduce our dependence on non-renewable sources of energy and make our environment cleaner.

II. Specification Of The Problem

Our design is "construction of a bucket air cooler by using solar energy" is new alternative to conventional energy sources. We set out to create an air cooler that does not create any harmful emissions in environment and provide no pollution in the surrounding. The solar power as the main energy sources to help in the project work. It is providing to cooling the enclosed space and also measured the temperature levels of before and after in absorbed enclosed space.

There are many sources of energy available to us that will conserve our natural resources and decrease on harmful emissions that are destroying our environment. Many incentives are now available to individuals and industries who implement the use of this ecofriendly environment through in this direction we are selected solar energy is main sources. The cost of this project is also less so, we can provide air cooler to the poor people also.

III. Solar Energy Collectors

A solar collector is a device used for collecting solar radiation and transfers the energy to a fluid passing in contact with it. Utilization of solar energy requires solar collectors. These are general of two types:

- Non-concentrating type
- Concentrating type

The solar energy collector with its associated absorber is the essential component of any system for the conversion of solar radiation energy into more usable form e.g. heat or electricity. In the non-concentrating type the collector are as same as the absorber area. On the other hand in concentrating collectors the area intercepting the solar radiations is greater, sometimes hundred times greater than the absorber area.

3.1.Non-concentrating:

3.1.1 Flat plate type solar collector:

The main components of a flat plate solar collector (Fig.1) are:

- Absorber plate made of any material, which will rapidly absorb heat from sun's rays and quickly transfer that heat to the tubes or fins attached in some manner, which produces a good thermal bond.
- Tubes or fins for conducting or directing the heat transfer fluid from the inlet header or duct to the outlet.
- Glazing, this may be one or more sheets of glass or a diathermanous (radiation transmitting) plastic film or sheet.
- Thermal Insulation which minimizes downward heat loss from the plate.
- Covers trip to hold the other components in position and make it all Watertight.
- Container or Casing which surrounds the foregoing components and keeps them free from dust, moisture, etc.

The generally Flat plate solar collectors are classified into two types:

- Water-type collectors, using water as the heat-transfer fluid, and
- Air-type collectors, using air as the heat-transfer fluid.

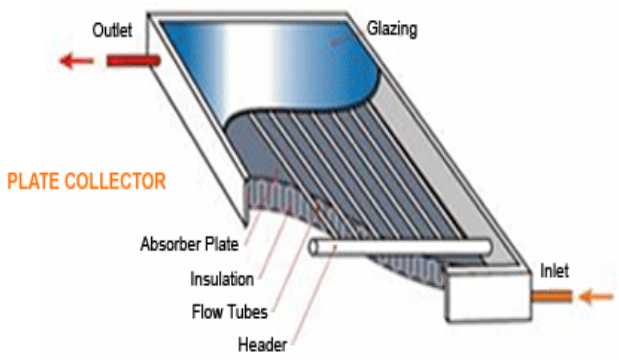

Fig3: Flat plate collector for water

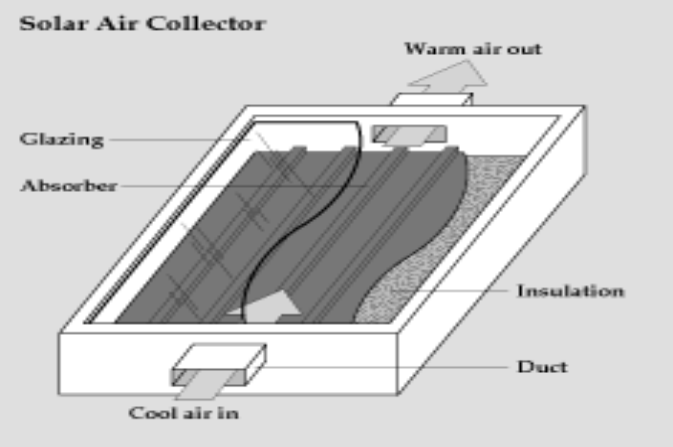

Fig4: Flat plate collector for air heating

3.1.2. Evacuated-tube collectors:

These collectors are usually made of parallel rows of transparent glass tubes. Each tube contains a glass outer tube and metal absorber tube attached to a fin. The fin is covered with a coating that absorbs solar energy well, but which in habits radioactive heat loss. Air is removed, or evacuated, from the space between the two glass tubes to form a vacuum, which eliminates conductive and convective heat loss.

A new evacuated-tube design with a cavity to transfer the heat to the storage tank and also there are no glass-to-metal seals. This type of evacuated tube has the potential to become cost-competitive with flat plate collectors.

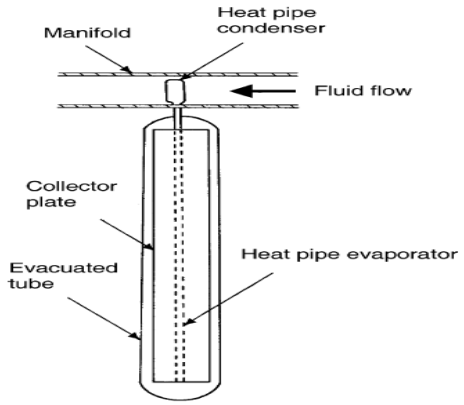

Fig5: Evacuated tube collector

3.2. Concentrating type solar collectors:

3.2.1. Parabolic through solar collector:

A parabolic trough solar collector uses are lecturing the shape of a parabola which is mostly a mirror, or an anodized aluminum sheet depending on the required applications to reflect and concentrate the solar radiations towards a receiver tube located at the focus line of the parabola. The absorber tube may be made of mild steel or copper and is coated with a heat resistant black paint for the better performance. The receiver absorbs the incoming radiations and transforms them in to thermal energy, which is being transported and collected by a fluid medium circulating within the receiver tube. The heat transfer fluid flows through the absorber tube, gets heated and thus carries heat. The temperature of the fluid reaches up to 400ºC. Depending on the heat transfer requirement different heat transfer fluids may be used.

Working Principle:

The Solar radiations coming parallel to the focal line of the parabola (reflector) collects at the surface of reflector and concentrate it to the focal point F as shown in figure.7. If the reflector is in the form of trough with parabolic cross section, the solar radiation focuses along a line. In concentrating collectors the term concentration ratio(C) is a very important parameter.

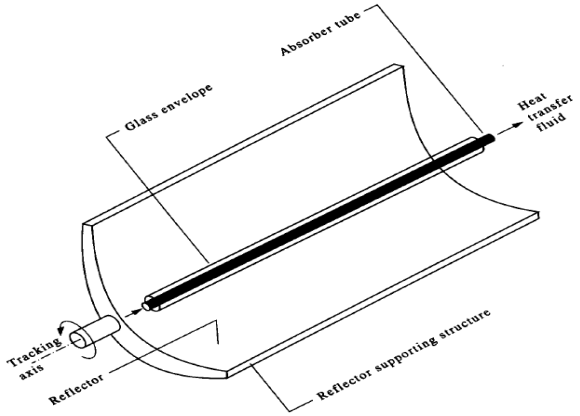

Fig6: Parabolic Trough Solar Collector System

3.2.2 Linear Fresnel reflector:

It is an array of linear mirror strips which concentrate light on to a fixed receiver mounted on a linear tower. The LFR field can be imagined as a broken-up parabolic trough reflector, but unlike parabolic troughs, it does not have to be of parabolic shape, large absorbers can be constructed and the absorber does not have to move.

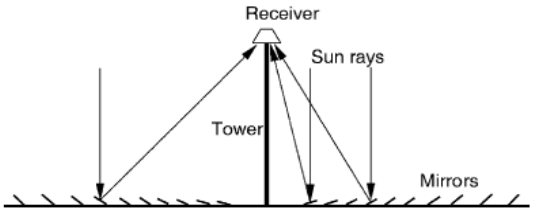

Fig7: Linear Fresnel reflector

3.2.3 Parabolic dish collector:

A parabolic dish reflector is a point-focus collector that tracks the sun in two axes, concentrating solar energy on to a receiver located at the focal point of the dish. The dish structure must track fully the sun to reflect the beam in to the thermal receiver. The receiver absorbs the radiant solar energy, converting it in to thermal energy in a circulating fluid. The thermal energy can then either be converted into electricity or it can be transported to the pipes to central power conversion system. Parabolic dish can attain temperature of about 1500ºC.

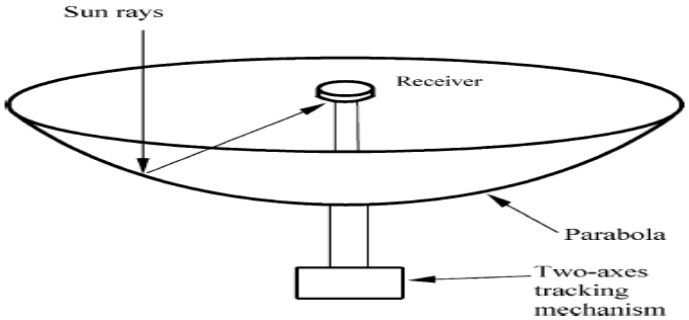

Fig7: Parabolic dish

3.2.4. Power tower:

A power tower is a large tower surrounded by tracking mirrors called heliostats. These mirrors align themselves and focus sunlight on the receiver at the top of tower, collected heat is transferred to a power station. The average solar flux impinging on the receiver has values between 200 and 1000kW/m2. This high flux allows working at relatively high temperatures of more than 1500ºC.

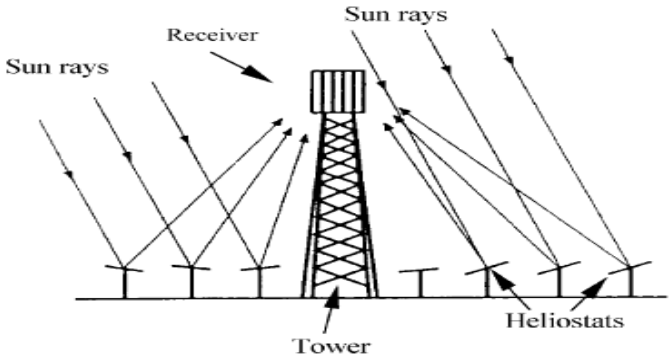

Fig8: Power tower

IV. Air Cooler And Air Conditioner

4.1. Air cooler

The air cooler is a cools the air by operating the air. Today in the 20th century, the world is facing a major problem of global warming due rapid industrialization. In India, during summer the average temperature is about 40^0C to 45^0C. It even reaches up to 48^0C to 50^0C in the month of June. TO maintain comfortable condition in (i.e. temperature & humidity) in the summer season various types of application are used such as "Air Conditioner", "Coolers", etc… These applications are easily available in the market.

In India, the average income of common man is not so high, common man cannot afford this application because of their high cost. Another problem is scarcity of electricity, especially in villages; the load shading is 14 to 16 hours a day. Air Cooler is portable units which can be easily moved around the house as required. They work by using water, stored in an internal water tank, to supply a filter that the hot air is drawn through subsequently cooled before being returned to the room.They perform at their best when the air temperature is heart and the humidity level is low.The humidity level will influence the level the air cooler can cool the room. Typically they will lower the room temperature by 2^0C to 3^0C.

Fig9: Air cooler

4.1.1. Working principle

Air coolers work on the principle of cooling by the evaporation of water which is present in them. These coolers are also called desert cooler are swamp cooler and they require water, which is filled in this coolers. The cooling is effect is produced due to the transition in phase from liquid state to vapor state.

Various parts that are needed to make an evaporative cooler or a simple air cooler are:

- Fan and vents- a fan is needed to direct the cool air towards the room. These fans continuously flow cool air in the rooms.
- Water source – evaporative cooler uses water so it is necessary to fill the cooler with water so that the cooling can take place.
- Cooling pads- the purpose of cooling pads is to absorb water and to pass air through them.
- Distributor – water needs to be distributed properly to these cooling pads. This is done by cooling pumps and various pipes that interconnect the cooling pads. These cooling pads should always be in saturated state otherwise the water will evaporate away from this pads.

4.2. Air conditioner

An air conditioner is a system designed to change the air temperature and humidity with in an area. It can either be cold or hot.

The air conditioning is that branch of engineering science which deals with the study of conditioning of air i.e. supplying and maintaining desirable internal atmospheric condition for human comfort, irrespective of external conditions. This subject, in it's brought hence, also deals with the conditioning of air for industrial purposes, food processing, storage of food and other materials. Air conditioning units are used to stabilize the air temperature in a room by extracting warm air from the room and recycling it back as cold air. All our air conditioner expels heat through a hose which must be vented through a window or wall.

Fig10: Air conditioner

4.2.1. Working principle

Warm air is run over refrigerant- filled coils, which absorbs heat and changes it from liquid to a gaseous state. The air is then converted back to liquid state and evacuated outside.

The four important factors which affect the human comfort. The system which effectively controls these conditions to produce the desired effects upon the occupants of the space is known as air conditioning systems.

The main parts of air conditioning system:

- Circulation fan- the main function of this fan is to move air to and from the room.
- Air conditioning unit- It is a unit, which consist of cooling and dehumidifying processes for summer air conditioning or heating and humidification processes for winter air conditioning.
- Supply duct- It directs the conditioned air from the circulating fan to the space to be air conditioned at proper point.
- Supply outlets- These are grills, which distributes the conditioned air evenly in the room.
- Return outlets- These are the openings in a room surface which allow the room air to enter the return duct.
- Filters- The main function of the filters is to remove dust, dirt and other harmful bacteria's from the air.

4.3 Difference between air cooler and air conditioner:

Coolers and air conditioners are two types of appliances that a person can use in order to make the air cooler. Though electrical fan it the most economical, in high temperature it does not cool efficiently. These two machines are completely different from each other, though they share the fact that both can produce cool air. An air conditioner goes a step further and even produces heat, in addition to cool air. Let's look at both of these machines separately.

The American society of Refrigerating engineers defines refrigeration as the science of providing and maintains temperature below that of surrounding atmosphere.

A cooler, also known as, evaporative cooler, swamp cooler and wet air cooler, uses the hot air in the room and water in order to produce cooler air. It uses the evaporating technique in order to produce the cool air, earning the name evaporative cooler. Evaporative cooling employs waters enthalpy of vaporization, where the temperature of dry air can be dropped by putting it through transition of liquid water to water vapor. The system uses water in to wet absorptive on the sides of the cooler. A fan is used to send the water through the absorptive pads which cools the air by making it more humid and then blows it out to the room. A cooler uses less energy as it only has two major components which need powering; a water pump and a fan. It also needs a constant supply of water; between 3-10 gallons of water in order to keep the pads wet and cool the air.

Air conditioning involves the control of the temperature, humidity (moisture content of air) and motion of the air in an enclosed space. The air conditioning load is the amount of heat that must be added to or removed form a structure to maintain desired conditions.

Compared to cooler, an air conditioner or AC uses refrigerants in order to cool the temperature. AC's can also reduce the humidity of the air in area. The term air conditioning means altering the properties of air,

temperature and humidity, to more favorable condition. The term can also refer to any form of technological cooling, heating, ventilation, or disinfection that modifies the condition of air. Air conditions can work no matter where you reside or whatever the humidity level. The cooling is typical done using a simple refrigeration cycle, but sometimes evaporation can also be used. The first modern air conditioner was invented by Willis Havilland carrier in 1911. By 1920s, AC's had become popular among households.

The air conditioner cools the air using coils, which are filled with refrigerants, which have the ability to change state at relatively low temperature. Air conditioners also have airs and ducts in order to transport air from one place to another in the system. Hot air is sent over the low-pressure refrigerant-filled evaporator coils. Which then absorb heat and changes form liquid state to gaseous state and is then converted back liquid state when the evacuated back to liquid state when the gas is compressed. The extra heat that is produced from compressing the gas is then evacuated through the back, while the cool air sent into the room.

V. Experimental Setup

5.1. Experimental setup

5.1.1. Inverter:

The inverter is the simplest of all digital logic gates. However, building understanding for its properties and operation is crucial for the design and analysis of larger/complexes logic gates. Inverter implementation issues in MOS and bipolar technologies.

5.1.1.1. Working principle

The inverter working principle as shown figure below. The main device is a transformer. Which have 12V-0-12V, a common iron core. But instead we use the power input as 220 volts. The power output as 12 volts. The way the switch differential is power AC input as 12 volts and out to AC 220 volts.

The 12 volts input power sources is a battery be supply into the center tap of the coil 12 volts. This is now considered a power pack or coil primary. The ends of the wire on both sides (points A and B) And it will be connected via a 2-way switch to ground. Which if the switch connected at A point, will cause an electric current number one, flows from the positive terminal of the battery, into the center tab point. Then flows up to the top, through the contacts A of the switch to ground. If the switch is moved from points A to the points B, would make the an electric current No. 1 has stopped. Because currents will redirect the flow an electric current is number 2. From the center tap down below. Through contact B of the switch to ground.

The 2 way switch will be controlled on-0ff with the oscillator circuit that as the frequency generator of 50Hz as a result, switch off – on back and forth between points of A and B with the speed of 50 times per second. Makes an electric current No. 1 and No. 2 alternating flow rate of 50 times second as well. Which current flowing through the switch all the time like this.

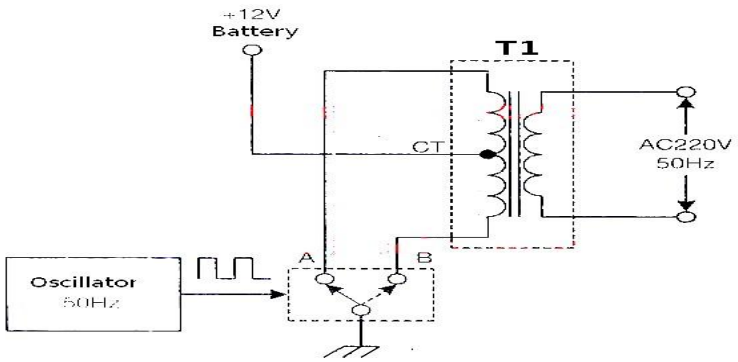

Fig11: circuit diagram of inverter

Makes magnetic field resulting in swelling and shrinkage. And induced across to the 220 volts coil. Which is now considered to be a output power or secondary coil. The resulting voltage 220V AC 50HZ frequency winding up this series. The voltage available to be supplied to the various types of electrical voltage to 220 volts AC to operate.

A PV system is comprised of two main components; the solar panels themselves and an inverter. The inverter changes DC power from the panels to AC power like what comes out of your plug socket.A typical PV system will use a 'central inverter which is a large unit that is connected to all your solar panels. Usually this is mounted at eye level in a garage or on the side of a house under cover

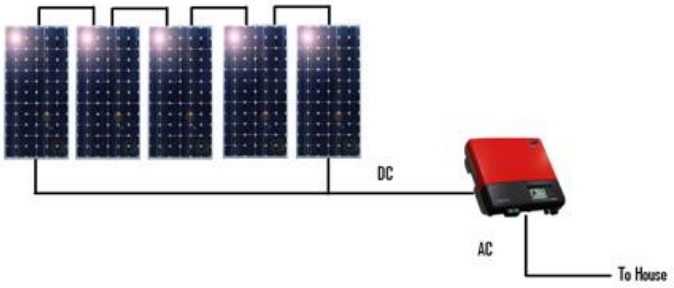

Fig12: central inverter system

In the case of a micro inverter system each panel or pair of panels has its own much smaller inverter mounted underneath the panel on the roof. The outputs of these are then combined together and fed down to the house's main switchboard, the same as a central inverter system.

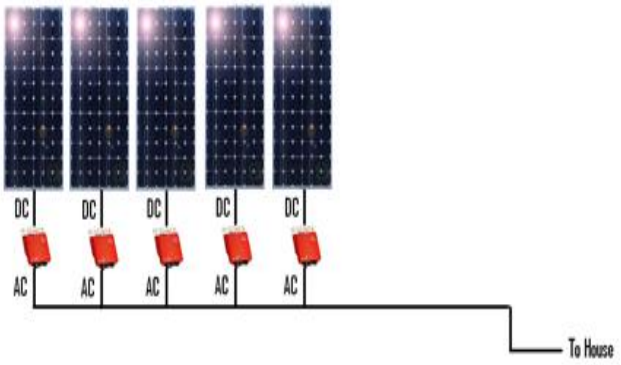

Fig13: Micro Inverter System

This type of configuration has advantages over a central inverter configuration mainly in efficiency because each panel is operated individually rather than as a group but is more expensive for the same size system.

5.1.2. Batteries

Most of the batteries we use in our hobby today are the rechargeable type. There are several kinds of rechargeable batteries and these include Ni-Cad (Nickel Cadmium), Ni-MH (nickel metal hydrate), Li-Po (Lithium Polymers), lead acid, sealed lead–acid, and gel–cell, among others. Ni-Cad are used to run our radio systems as well as power our model cars, boats, and planes. Generally they are weird together in packs of four or more cells, depending on the application. Ni-MH is relatively new and is being widely accepted for the same applications as Ni-Cad. Li-Po cells are new technology and are quickly finding their way into modal applications. The other types of batters mentioned are usually 6 or 12 volt and used to power flight boxes and large scale boats.

5.1.2.2. Working principle on batteries:

A Battery, which is actually an electric cell, is a device that produces electricity from a chemical reaction. STR cells in series or parallel, but the term generally used for a single cell. A cell consists of a negation; a separator, also an ion conductor; and a positive electrode. The electrolyte may be aqueous, in liquid, paste, or solid form. When the cell is connected to on external load, or device to be powered electrons that flow through the load and are accepted by the positive electrode. A primary batteries is one that can convert its chemicals in to electricity only once and then must be discarded reconstituted by passing electricity back through it; also called a storage are rechargeable battery, it can be batteries come In several styles; the most familiarly are single- use alkaline batteries.

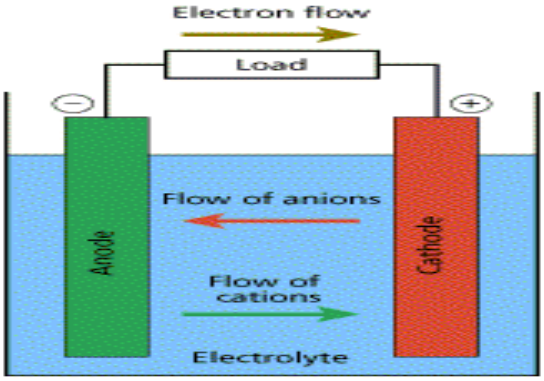

Fig14: Parts of a battery

5.1.3 Table fan

Fan is a device for agitating air or gases or moving them from one location to another. Mechanical fans with revolving blades are used for ventilation, in manufacturing, in winnowing grain, to remove dust, cuttings, or other waste, or to provide draft for a fire. They are also used to move air for cooling purposes, as in automotive engines and air-conditioning systems, and are driven by belts or by direct motor.

The axial-flow fan (e.g., an electric table fan) has blades that force air to move parallel to the shaft about which the blades rotate. The centrifugal fan has a moving component, called an impeller that consists of a central shaft about which a set of blades form a spiral pattern. When the impeller rotates, air that enters the fan near the shaft is moved away perpendicularly from the shaft and out of an opening in the scroll shaped fan casing.

Fig15: Table Fan

The speed of rotation together with the static pressure determines the air flow for a given fan. Where noise is an issue larger, slower-turning fans are quieter than smaller, faster, fans that can move the same airflow. Fan noise has been found to be roughly proportional to the fifth power of fan speed; halving speed reduces noise by about 15dB.

As a light, flat instrument manipulated by hand to cool the body or ward off insects, the fan is of tropical origin and probably stems from the primitive use of palm or other leaves.

VI. Specifications

6.1. Bucket and pipes

Fig16: Bucket

Fig17: pipes

Table: 1 Specifications of Bucket and pipes

S.No	Parameters	Value
1	Height of the bucket	380mm
2	Outer diameter of the bucket at the top	296mm
3	Inner diameter of the bucket at top	290mm
4	Outer diameter of the bucket at bottom	260mm
5	Inner diameter of the bucket at bottom	254mm
6	Thickness of the bucket	3mm
7	Pipe outer diameter inserted in the hole	50mm
8	Pipe inner diameter	46m
9	Thickness of pipe	2mm
10	Length of the pipe	150mm

6.2. Solar panel

Fig18: Solar panel

Table: 2 Solar panel technical Specifications

S.No	Parameters	Value
1	Size of the panel	530mm*340mm
2	Maximum power (P max)	20WP
3	Voltage at maximum power (V)	17.5V
4	Current at maximum power	1.14A hr
5	Open circuit voltage	21.5V
6	Short circuit current	+/- 3 %

6.3.Fan

Fig19: DC fan

Table: 3 Fan technical Specifications

S.No	Parameters	Value
1	Type of fan	DC
2	Fan capacity	12V
3	Fan diameter	290mm

6.4. Inverter:

Fig: CFL Inverter

Table: 4 CFL Inverter technical Specifications

S.No	Parameters	Value
1	Voltage	12V
2	Current	7.2amps
3	Circuit	31C

VII. Conclusion

In conventional energy sources day to day decreasing in their energy levels. Going green and conservation as much energy as possibilities become the vital role in their cycle of the world. There are many sources of energy available to us that will conserve our natural resources.

The Government of India will provide much incentive to individual and industries to implement the solar energy. The use of this Eco friendly environment and no pollution in surrounding. Air cooler providing to optimum cooling the enclosed space (12x12feats) in all the regions. The testing of the entire system showed a maximum temperature drop of 3.5^{o} Celsius.

VIII. Future Scope

Where power energy is not available in that area solar energy is adapted to meet the needs. Solar energy is the alternative to conventional energy due to more advantages like Eco friendly, reduce the green house effect, no pollution and low cost.

However more further scope to air cooler by using solar energy in remote areas, we recommend to society to use solar energy.

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