A PROJECT ON

"HOME MADE AIR COOLER"

M.G.College ,Manmad

A Project Report

Submitted in partial fulfillment of the requirements for the award of Degree of

B.Voc Electronics

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CERTIFICATE

This is to certify that the project work embodies in this dissertation entitled "**STUDY OF HOME MADE AIR COOLER"** being submitted by Mr.Hrushikesh Vijay Avhad (TYEIM12),Mr.Sanket Garud(TYEIM15),Mr.Mrunal Ahire(TYEIM13) during the year under my guidance, this work is submitted to department of B.voc.Electronics 2023-2022 .during the course of M.G.College,Manmad

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Abstract

Homemade air cooler is one of the modern and simple type of air cooler. It is simple in construction and works on simple principle.
It mainly consists of two Buckets a Fan, PVC pipes, Ice water Thermocoal sheets and etc. In this homemade air cooler whenever supply given to fan it starts rotating then fan sucks air from atmosphere into buckets through inlet valve of the bucket with some pressure and temperature.

Then heat exchange from air to water. Then cool air comes out through outlet valves of the bucket with some pressure. Then cooling effect is produced. The cooling effect is measured with the help of temperature indicator.

It is easy in construction and works with simple principle, it is easy for maintenance and transport. It works with inverter continuously. It is low cost and power consumption is less. It is especially used for small babies in summer season.

Objectives

- It is easy to operate for anybody.
- To minimize the usage of electricity and save for future generation.
- It will produce comfort, healthy and cooling effect in any season especially in summer season.
- It is simple and less weight to carry to any place.
- It is less in cost. Low consumption of power.
- It works with inverter.
- It is easy for maintenance.

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INTRODUCTION

A Home Made Air Cooler (also swamp cooler, desert cooler and wet air cooler)is a device that cools air through the evaporation of water. Evaporative cooling differs from typical air conditioning systems which use vapor-compression or absorption refrigeration cycles. Evaporative cooling works by employing water's large enthalpy of vaporization. The temperature of dry air can be dropped significantly through the phase transition of liquid water to water vapor (evaporation), which can cool air using much less energy than refrigeration. In extremely dry climates, evaporative cooling of air has the added benefit of conditioning the air with more moisture for the comfort of building occupants.

The evaporative cooler was the subject of numerous US patents in the 20th century; many of these, starting in 1906, suggested or assumed the use of excelsior (wood wool) pads as the elements to bring a large volume of water in contact with moving air to allow evaporation to occur. A typical design, as shown in a 1945 patent, includes a water reservoir (usually with level controlled by a float valve), a pump to circulate water over the excelsior pads and a squirrel-cage fan to draw air through the pads and into the house. This design and this material remain dominant in evaporative coolers in the American Southwest, where they are also used to increase humidity. In the United States, the use of the term swamp cooler may be due to the odor of algae produced by early units. Evaporative cooling was in vogue for aircraft engines in the 1930s, for example with the Beardmore Tornado airship engine. Here the system was used to reduce, or eliminate completely, the radiator which would otherwise create considerable drag. In these systems the water in the engine was kept under pressure with pumps, allowing it to heat to temperatures above 100°C, as the actual boiling point is a function of the pressure. The superheated water was then

sprayed through a nozzle into an open tube, where it flashed into steam, releasing its heat. The tubescould be placed under the skin of the aircraft, resulting in a zero-drag cooling system.

CHAPTER 1

Methodology

The main objective of preparation of this action plan is to minimize import of room air cooler by increasing domestic production. Methodology adopted for preparing action plan is, contacted all stake holders by email and asked them information related to them. Visited room air cooler manufacturing unit, visited CIPET Raipur and taken inputs on plastic air cooler body manufacturing. Over a phone contacted Injection moulding machine manufacturer / supplier, Mould manufacturer, Raw material suppliers, HVAC sector industry associations, BIS, DGFT, FIEOetc and taken inputs. Intensive search on internet, Inspected various air cooler models available in market. Due to pandemic and lockdown situation in various state physical interaction with stake holders is not possible. After discussion with all stake holders & information gathered from internet few suggestion are given and new scheme is proposed for supporting room air cooler manufacturer

CHAPTER 2

Working of portable air cooler

- Evaporative cooling is an entirely natural method of cooling, using only air and water no artificial refrigerants. Hot air is drawn into the cooler and passes through water-moistened pads. Some of the water evaporates, absorbing the heat as it does so, and cools the air. A fan then blows this beautifully cooled air throughout the room and forces hot air out through open windows and doors. Because evaporative cooling is natural and the unit's don't require an enclosed space to work, they are an ideal solution for cooling open areas such as undercover patios and workshops Other types of phase-change cooling. A closely related process,sublimation cooling differs from evaporative cooling in that a phase transition from solid vapor, rather than liquid to vapor occurs.Sublimation cooling has been observed to operate on a planetary scale on the planetoid Pluto, where it has been called an anti- green house effect. Another application of a phase change to cooling is the self-refrigerating" beverage can. A separate compartment inside the cancontains a" desiccant and a liquid. Just before drinking, a tab is pulled so that the desiccant comes into contact with the liquid and dissolves. As it does so it absorbs an amount of heat energy called the latent heat of fusion. Evaporative cooling works with the phase change of liquid into vapor and the latent heat of vaporization, but the self-cooling can uses a change from .solid to liquid, and the latent heat of fusion to achieve the same result.

CHAPTER 3

Evaporative cooler designs

Most designs take advantage of the fact that water has one of the highest known enthalpy of vaporization (latent heat of vaporization)values of any common substance. Because of this, evaporative coolers use only a fraction of the energy of vapor-compression or absorption airconditioning systems. Unfortunately, except in very dry climates, the single-stage (direct) cooler can increase relative humidity (RH) to a level that makes occupants .uncomfortable. Indirect and Two-stage evaporative coolers keep the RH lower

- Direct evaporative cooling:is used to lower the temperature of air by using latent heat of evaporation, changing liquid water to water vapor. In this process, the energy in the air does not change. Warm dry air is changed to cool moist air. The heat of the outside air is used to evaporate water. The RH increases to 70 to which reduces the cooling effect of human perspiration. The moist air has to%90 be continually released to outside or else the air becomes saturated and evaporation .stops
- Indirect evaporative cooling: is similar to direct evaporative cooling but uses some type of heat exchanger. The cooled moist air never comes in direct contact with the conditioned air. Themoist air stream is released outside or used to cool other external devices such as solar cells which are more efficient if kept cool. One indirect cooler manufacturer uses the so-called Maisotsenko cycle which employs an iterative (multi-step) heat exchanger that can reduce the temperature to below the wet-bulb temperature
- Hybrid; Direct or indirect cooling has been combined with vapor-compression or absorption air conditioning to increase the overall efficiency and to reduce the .temperature below the wet-bulb limit

- Materials;Traditionally, evaporative cooler pads consist of excelsior (aspen wood fiber) inside containment net, but more modern materials, such as some plastics and melamine paper, are entering use as cooler-pad media. Wood absorbs some of the water and has a larger surface area which allows the wood fibers to cool passing air to a lower temperature than some synthetic materials, but natural fibers also can .pose a problem with harboring or supporting mildew growth

CHAPTER 4

Typical installations

Typically, residential and industrial evaporative coolers use direct evaporation, and can be described as an enclosed metal or plastic box with vented sides. Air is moved by a .centrifugal fan or blower,and a water pump is used to wet the evaporative cooling pads .The cooling units can be mounted on the roof or exterior walls or windows of buildings To cool, the fan draws ambient air through vents on the unit's sides and through the damp pads. Heat in the air evaporates water from the pads which are constantly re-dampened to continue the cooling process. Then cooled, moist air is delivered into the building via a .vent in the roof or wall

Because the cooling air originates outside the building, one or more large vents must exist to allow air to move from inside to outside.Air should only be allowed to pass once through the system, or the cooling effect will decrease. This is due to the air reaching the saturation point. Often 15 or so air changes per hour (ACHs) occur in spaces served by evaporative coolersa relatively high rate of air exchange

CHAPTER 5

Evaporative cooling towers

Large hyperboloid cooling towers made of structural steel for a power plant in Kharko (Ukraine)

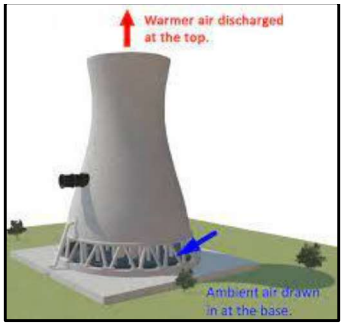


Fig. No.-: Cooling tower

Cooling towers are structures for cooling water or other heat transfer media to near-ambient wet-bulb temperature. Wet cooling towers operate on the evaporative cooling principle, but are optimized to cool the water rather than the air. Cooling towers can often be found on large buildings or on industrial sites. They transfer heat to the environment ,from chillers, industrial processes, or the Rankin power cycle

for example Mist spraying system with water pump beneath. Misting systems work by forcing water via a high pressure pump and tubing through a brass and stainless steel mist nozzle that has an orifice of about 5 micrometers, thereby

producing a micro-fine mist. The water droplets that create the mist are so small that they instantly flash evaporates. Flash evaporation can reduce the surrounding air temperature by as much as 35 °F (20 °C) in just seconds. For patio systems, it is ideal to mount the .mist line approximately 8 to 10 feet (2.4 to 3.0 m)above the ground for optimum cooling ,Misting is used for applications such as flowerbeds, pets, livestock, kennels, insect control .odor control,zoos, veterinary clinics, cooling of produce, and greenhouses

CHAPTER 6

Misting fans

A misting fan is similar to a humidifier. A fan blows a fine mist of water into the air. If the air is not too humid, the water evaporates,absorbing heat from the air, allowing the misting fan to also work as an air cooler. A misting fan may be used outdoors, especially in a dry climate.Small portable battery-powered misting fans, consisting of an electric fan and a hand-operated water spray pump, are sold as novelty items. Their effectiveness in everyday use is unclear**.**

CHAPTER 7

Advantages

Less expensive to install

- Estimated cost for installation is about half that of central refrigerated air conditioning

Less expensive to operate

- Estimated cost of operation is 1/8 that of refrigerated air

- Power consumption is limited to the fan and water pump. Because the water vapor is not recycled, there is no compressor that consumes most of the power in closed-.cycle refrigeration
- The refrigerant is water. No special refrigerants, such as ammonia, sulfur dioxide or CFCs, are used that could be toxic, expensive to replace, contribute to ozone depletion and/or be subject to stringent licensing and environmental regulations

Ease of maintenance

- The only two mechanical parts in most basic evaporative coolers are the fan motor and the water pump, both of which can be repaired at low cost and often by a mechanically inclined homeowner

Ventilation air

- The constant and high volumetric "flow rate of air through the building reduces the age-of-air in the building dramatically"

- aporative cooling increases humidity. In dry climates, this may improve comfort .and decrease static electricity problems

- The pad itself acts as a rather effective air filter when properly maintained; it is capable of removing a variety of contaminants in air, including urban ozone caused by pollution, regardless of very dry weather. Refrigeration-based cooling systems lose this ability

Disadvantages

Performance

- High dew point (humidity) conditions decrease the cooling capability of the evaporative cooler
- ,No dehumidification. Traditional air conditioners remove moisture from the air .except in very dry locations where recirculation can lead to a buildup of humidity .Evaporative cooling adds moisture

Comfort

- The air supplied by the evaporative cooler is typically 80-90% relative humidity very humid air reduces the evaporation rate of moisture from the skin, nose, lungs and eyes
- High humidity in air accelerates corrosion, particularly in the presence of dustThis can considerably shorten the life of electronic and other equipment
- High humidity in air may cause condensation of water. This can be a problem for some situations

Water

- Evaporative coolers require a constant supply of water to wet the pads
- Water high in mineral content will leave mineral deposits on the pads and interior of the cooler. Depending on the type and concentration of minerals, possible safety

hazards during the replacement and waste removal of the pads could be present

- The water supply line may need protection against freeze bursting during off-season, winter temperatures. The cooler it needs to be drained too, as well as cleaned periodically and the pads replaced

Mosquitoes

- An evaporative cooler is a common place for mosquito breeding. Various authorities consider a poorly maintained cooler to be a big threat to public health

Miscellaneous

- Evaporative cooling towers are the most common sources of Legionella and Legionnaires' disease
- Odors and other outdoor contaminants may be blown into the building unless sufficient filtering is in place
- Mold and bacteria may be dispersed into interior air from poorly maintained or defective systems, causing Sick Building Syndrome

CHAPTER 8

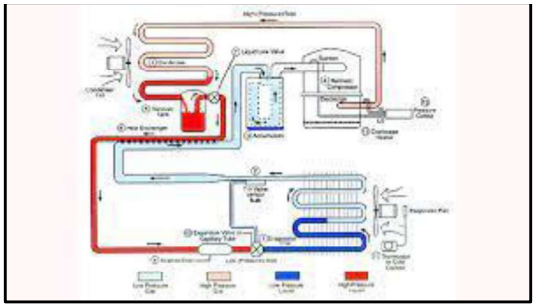
PARTS OF AIR COOLER

Condenser

Condenser, device for reducing a gas or vapour to a liquid. Condensers are employed in power plants to condense exhaust steam from turbines and in refrigeration plants to condense refrigerant vapors". such as ammonia and fluorinated hydrocarbons. The petroleum and chemical industries employ condensers for the condensation of hydrocarbons and other chemical vapors. In distilling operations, the device in which the .vapour is transformed to a liquid state is called a condenser

Expander cycle

The expander cycle is a power cycle of a bipropellant rocket engine. In this cycle, the .fuel is used to cool the engine's combustion chamber. picking up heat and changing phase The heated gaseous fuel then powers the engine's pumps and turbine before being injected .into the combustion chamber and burned

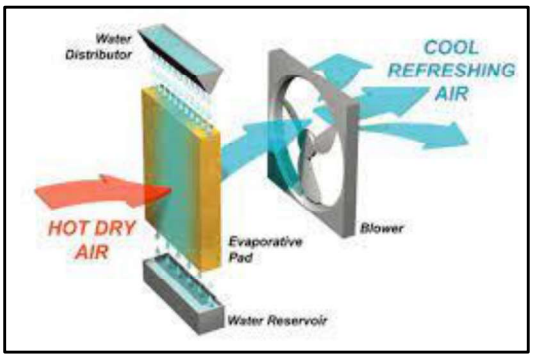


Compressor

Compressor, device for increasing the pressure of a gas by mechanically decreasing its volume. Air is the most frequently compressed gas but natural gas, oxygen, nitrogen, and other industrially important gases are also compressed. The three general types of compressors are positive displacement, centrifugal, and axial. Positive displacement compressors are usually of the reciprocating piston type, in which the gas is drawn in during the suction stroke of the piston. compressed by decreasing the volume of the gas by moving the piston in the opposite direction, and, lastly, discharged when the gas pressure exceeds the pressure acting on the outlet valve. Reciprocating compressors are .useful for supplying small amounts of a gas at relatively high pressures

Evaporator

Evaporator, industrial apparatus for converting liquid into vapour. The single-effect evaporator consists of a container or surface and a heating unit, the multiple-effect evaporator uses the vapor produced in one unit to heat a succeeding unit. Double, tripleor quadruple-effect evaporators may be required in industrial and steam heating plants



CHAPTER 9

Homemade air cooler

Homemade air cooler is one of the modern and easier types of portable & simple air coolerIt works on the principle of normal air coolers. It is used to produce comfort, healthy .and cool in any seasons especially in summer

CONCLUSION

BY CONSIDERING ALL THE FACTORS; THAT WE THINK OUR HOME MADE AIR COOLER IS VERY USEFUL THEN OTHER COOLERS; BECAUSE IT IS

- EASY CONSTRUCTION
- LOW COST
- LESS POWER CONSUMPTION
- ALTERNATE SOURCE (BATTERY ALSO WORKS)
- The total market size for Air Coolers in India only (excluding exports) for all applications, both in the organised and small scale sectors together is estimated at Rs 2,300 crores. Since no reliable industry statistics are available, this estimate has .been culled from information provided by some players spread over the country Of this total, approximately Rs 1900 croorganisedres is for the Residential sector which includes the organised and small-scale and its 400 crores for the Industrial and Commercial sectors, which is allorganized
- Air cooler is a seasonal product and India is having infrastructure, raw material and technical knowhow to manufacture air cooler. Indian large scale company Symphony is having presence in more than sixty countries and producing more than 20 lakh coolers annually, apart from it there are many companies who are producing branded air coolers in India.

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