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Nano Sized Air Cooler

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Abstract: ***The performance of heat transfer is one of the most important research areas in the field of thermal engineering. There are a large number of refrigerants, which are used to transfer heat from low temperature reservoir to high temperature reservoir by using vapor compression refrigeration system. There are various obstacles faced in working of different refrigerants due to their environmental impact, toxicity, flammability and high pressure; which makes them more hazardous than other working fluids according to safety and environmental issues. Researchers observed the performance of different environmental friendly refrigerants and their mixtures in different proportions. They also observed the effect of working parameters like dimensions of capillary tube, working pressures and working temperatures, which affect the coefficient of performance of vapor compression refrigeration system. From the literature there seems to be need of new efficient, minimum global warming potential, minimum ozone depletion potential and environmental friendly refrigerants. The air conditioner and air cooler are widely used in the world. These electrical devices consumed more electrical power and it is not benefit for the poor people. In practice power shortage is also occurred. These problems are rectified by modification of ordinary table fan. In summer season, the ordinary table fan gives small amount of cold air in the room. So the table fan is modified by using copper tube with fins and special design Cooling Chamber. In this project the cooling of air by using cold water or any other refrigerant which is circulated in the copper tube for the purpose of reducing the heat in the surrounding environment, where it is of great importance in widely distributed villages with little or no rural electrification and also in the urban areas where power shortage is often in practice. Air cooling is a method of dissipating heat. It works by expanding the surface area of or increasing the flow of air over the object to be cooled, or both. An example of the former is to add cooling fins to the surface of the object, either by making them integral or by attaching them tightly to the object's surface. In the case of the latter, it is done by using a fan blowing air into or onto the object one wants to cool. The addition of fins to a heat sink increases its total surface area, resulting in greater cooling effectiveness.***

Keywords: Compression Refrigeration, Evaporative Cooling, Electrification, Heat Transfer, Refrigerant.

I. INTORDUCTION

Vapour compression system is a system which is used to transfer heat from low temperature reservoir to high temperature reservoir with the help of working fluid, called refrigerant. There are different types of refrigerant, which were used as the working medium in vapour compression refrigeration system in the last few decades, but they cause of ozone layer depletion and greenhouse effect Refrigeration system is based upon the Clausius statement of second law of thermodynamics. This statement shows, "It is impossible to construct a device which, operating in a cycle, will produce no affect other than the transfer of heat from a cooler to a hotter body. The construction of vapour compression refrigeration system is illustrated in figure below.

This system consists of four basic components, i.e. a compressor, an evaporator, a condenser and capillary tubes. Here the compressor delivery head, discharge line, condenser and liquid line form the high pressure side of the system. The expansion line, evaporator, suction line and compressor suction head form the low pressure side of the system. In plants with a large amount of

refrigerant charge, a receiver is installed in the liquid line. A drier is also installed in the liquid line. The drier contains silica gel and absorb traces of moisture presented in the liquid refrigerants so that it does not enter the narrow cross section of the expansion device causing moisture chocking by freezing.

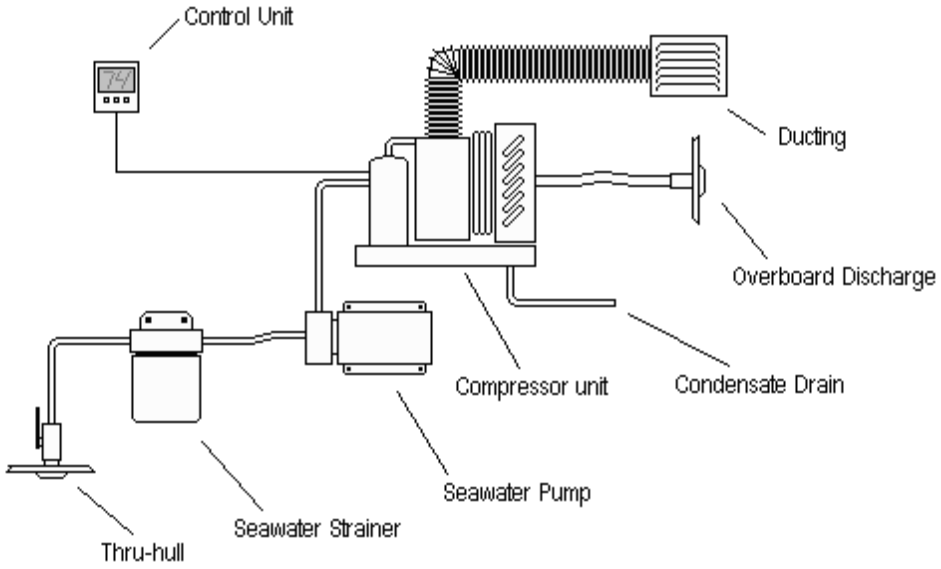

Fig. 1. Air Conditioning

Air conditioning can also be provided by a process called free cooling which uses pumps to circulate a coolant from a cold source, which in turn acts as a heat sink for the energy that is removed from the cooled space. Common storage media are deep aquifers or a natural underground rock mass accessed via a cluster of small-diameter boreholes, equipped with heat exchanger. Some systems with small storage capacity are hybrid systems, using free cooling early in the cooling season, and later employing a heat pump to chill the circulation coming from the storage. The heat pump is added because the temperature of the storage gradually increases during the cooling season, thereby declining its effectiveness.

For residential homes, some countries set minimum requirements for energy efficiency. In the United States, the efficiency of air conditioners is often rated by the seasonal energy efficiency ratio. The higher the Seasonal energy efficiency ratio rating, the more energy efficient is the air conditioner. The Seasonal energy efficiency ratio rating is the BTU of cooling output during its normal annual usage divided by the total electric energy input in watt hours during the same period.

The basic concept behind air conditioning is said to have been applied in ancient Egypt, where reeds were hung in windows and were moistened with trickling water. The evaporation of water cooled the air blowing through the window. This process also made the air more humid, which can be beneficial in a dry desert climate. This practice was replaced by mechanical ice-making machines.

II. THEORITICAL ANALYSIS

In the study of heat transfer, fins are surfaces that extend from an object to increase the rate of heat transfer to or from the environment by increasing convection. The amount of conduction, convection, or radiation of an object determines the amount of heat it transfers. Increasing the temperature gradient between the object and the environment, increasing the convection heat transfer coefficient, or increasing the surface area of the object increases the heat transfer. Sometimes it is not feasible or economical to change the first two options. Thus, adding a fin to an object, increases the surface area and can sometimes be an economical solution to heat transfer problems

III. DESIGN ANALYSIS

The components are placed at their positions. When the pump is switched ON, thus the water circulates in copper tube, which is mounted at front face of table fan. The table fan is switched on. The air coming from the exhaust fan passes on the surface of copper coil and aluminium fin. The heat transfer takes place from low temperature to high temperature that is copper coil absorb the heat from air and given to the refrigerant liquid or water which is flowing in the coil. Since, fins are used in order to increase the heat transfer rate & surface area. Thus, heat transfer and effectiveness is calculated. The copper tube is inserted into the hollow aluminium rod, where the water is to flown inside the copper tube which is placed inside the aluminium rod. The fabricated fin is placed in the front panel of the table fan. This is fitted with table fan by using tag. Connected is to be fitted with copper tube and hose pipe to avoid the leakage of cold eater which is circulated in copper tube. Fin is placed in order to improve the heat transfer rate and effectiveness of table fan. Grinding is done at each end of copper tube and aluminium rod in order to get the fine finishing is done for required dimensions. After grinding process, copper tube is inserted inside the aluminium rod and fitted by means of glue. Then it is placed at the form panel of the table fan. The design should be as usual to be utilised by the residences and working more and more when in requirement. The below will be the figure of evaporative type of cooler where the heat is sinker and cooling is done.

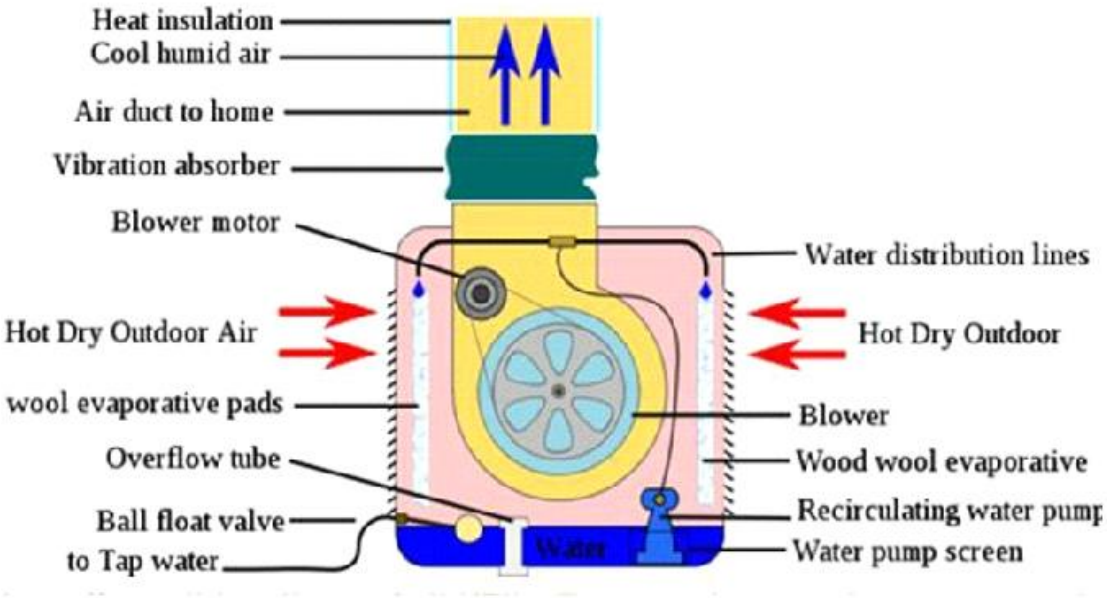

Fig. 2. Evaporative Cooler

A. Vibration Absorber

The paper presents the basic features of the steady-state performance of a two-degree of freedom system consisting of a main linear spring mass system under periodic forcing, the motion of which acts parametrically on the motion of an attached absorber system. Terms, nonlinear in the absorber motion, act back on the main mass and with appropriate choice of tuning parameters, "absorption" of the main mass response can be obtained. Experimental results for this type of device are compared with a theoretical solution obtained from a first order asymptotic approximation. Comparison is also made with the performance of a linear tuned and damped absorber.

B. Blower Motor

Blowers are specified on the basis of pressure and flow rate. As mentioned, the ratio of system inlet pressure and outlet pressure determines whether a fan or blower should be picked according to strict definition, although the terms are sometimes used synonymously. Where higher pressures are needed, a designer may have to select a positive displacement machine over a centrifugal type. Manufacturers often publish fan performance curves or similar charts which help the designer to narrow his choice to one or several models that match requirements.

C. Over Flow Tube

Air conditioner, heat pump & condensing boiler or furnace condensate handling & drainage defects. This air conditioning repair article discusses the inspection, diagnosis, and repair of air conditioning condensate drainage systems, including condensate leaks, condensate piping, traps, drains, condensate pumps, and the detection and hazards of air conditioning, heat pump, or condensing boiler or furnace condensate piping, drains, & condensate leaks in buildings. The over cooled water can be flown from the outdoor tube to save the water and providing the cooling at the same time.

IV. EXPERIMENTATION

The copper tube is inserted into the hollow aluminium rod, where the water is to flown inside the copper tube which is placed inside the aluminium rod. The fabricated fin is placed in the front panel of the table fan. This is fitted with table fan by using tag. Connected is to be fitted with copper tube and hose pipe to avoid the leakage of cold eater which is circulated in copper tube. Fin is placed in order to improve the heat transfer rate and effectiveness of table fan. Grinding is done at each end of copper tube and aluminium rod in order to get the fine finishing is done for required dimensions. After grinding process, copper tube is inserted inside the aluminium rod and fitted by means of glue. Then it is placed at the form panel of the table fan. Reservoir setup is fabricated by means of welding process. Initially, the Steel material is chosen and it is assembled by means of welding process according to required dimensions. Steel opener is placed at the top of the reservoir tank. At the four end the thermoplastic is fitted, in order to maintain the reservoir water temperature. And also thermoplastic is placed at back side of the reservoir opener also. The two holes are drilled in reservoir opener, where the hose pipe is inserted through the holes. The clamp is placed at the opener in order for easy opening and closing of the tan. Initially, material has been chosen for high thermal conductivity. Then, copper and aluminium has been chosen for better thermal conductivity. As, copper has higher thermal conductivity, the tube has been chosen as copper. And, also copper costs more. Then, fin which is to be used is then choose and consider as aluminium. As aluminium has more thermal conductivity than other materials except copper, it is choosing. First, copper tube is bought and checked whether it satisfy our result or not. In the below figure the experiment done in the box red in colour gives clear view of power supply to the motor from the battery.


Fig. 3. Nano Sized Cooler

A. Motor

Air conditioner motors are some of the crucial components that are required in the operation of the air conditioning in your house. We will discuss the various types of single-phase motors that are used in your equipment at home. Here are four types of electric motors that are commonly being used.

B. Battery

The battery can be charged time to time as required and used, the battery used of lead acid battery with 42 amps and 48 volts current supply is given to run the cooler.

V. RESULTS AND DISCUSSION

By this experiment we came with the following results

1. Increase in the efficiency and effectiveness of ordinary fan.
2. Achievement of 6 to 8-degree temperature drop by using simple mechanism.
3. Satisfied maximum thermal comfort condition in minimum investment of energy.
4. Decrease in the room temperature
5. Achievement of optimum design with minimum capital investment

The achievement of good cooling system by the usage of Nano size cooler made the market comfortable. Not only in the hot summers but also in the winter when required of cooling one can adopt such type of techniques. The performance of heat transfer is one of the most important research areas in the field of thermal engineering. There are a large number of refrigerants, which are used to transfer heat from low temperature reservoir to high temperature reservoir by using vapour compression refrigeration system. There are various obstacles faced in working of different refrigerants due to their environmental impact (R11, R12), toxicity (NH3), flammability (HC) and high pressure (CO2) which makes them more hazardous than other working fluids according to safety and environmental issues. Researchers observed the performance of different environmental friendly refrigerants and their mixtures in different proportions

CONCLUSION

The system of cooling can make the human comfortable and flex through which the adoption rate in the market should be going high. The adoption of cooler will be maximum in the hot summers due to which these type of innovation or techniques to be introduced. This is the simplest design where the run winding and start winding are connected in parallel and 90° electrically apart. It is usually used in small pumps, fans and blowers where the capacity is below 1 horsepower. It has a low starting torque but high starting current. Since the torque is low, the ability to start the motor is only practical for low load condition. The run winding is make from bigger diameter wire and shorter turn for lower resistance and high inductance properties. The start winding is make from smaller diameter wire for higher resistance and low inductance properties. When power is connected to the motor, both the windings will be energized with the current in the run winding lags the current in the start winding by about 30° electrically. This out of phase effect on the stator produces a starting torque and causes the rotor to start rotating. Typically, the speed of the motor is 1800 rpm or 3600 rpm when running without any load. When the load is connected, the speed can go down to 1725 rpm and 3450 rpm respectively.

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