

SMART COOLER AND ROOM HEATER

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Abstract: The air cooler and room heater are widely used in the world simultaneously in both summer and winter season. 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 air cooler. In summer season, it gives of cold air in the room and in winter season, it gives heating air through heating coil. In this project the cooling of air by using brine solution through copper tube and hot air by using heating coil. A 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.

Keywords:- Dual Shaft motor, Copper tube, Pump, Brine Solution, Heating Coil & Thermostat

INTRODUCTION

World always trying to invent new one. Somebody tries to find new one and tries to modify an ordinary one to implement a technology. Energy plays an important role in the material, social and cultural life of mankind. This is the result of population growth and increase in the standard of living which is directly proportional to energy consumption. In practice air cooler and heater 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 and Special design Cooling Chamber and in winter season, it gives heating air through heating coil. 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 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. In this project the ice cooler chamber for storing the cold water or cold ice bars or ice cubes which whose temperature decrease as time passes. This cold water or refrigerant is circulated through the copper tube with help aquarium pump which kept water cold for long times. The fan blowing against the copper tube which gives more cooling effect of air in the surroundings.

An Air cooler (also swamp cooler, desert cooler and evaporative cooler) is a device that cools air through the evaporation of water. Evaporative cooling differs from typical air conditioning systems, which use vapour compression or absorption refrigeration cycles. Evaporative cooling works by exploiting water's large enthalpy of vaporization. The temperature of dry air can be dropped significantly through the phase transition of liquid water to water vapour (evaporation). This 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 cooling potential for evaporative cooling is dependent on the wet bulb depression, the difference between dry-bulb temperature and wet-bulb temperature. In arid climates, evaporative cooling can reduce energy consumption and total equipment for conditioning as an alternative to compressor-based cooling. In climates not considered arid, indirect evaporative cooling can still take advantage of the evaporative cooling process without increasing humidity. Passive evaporative cooling strategies offer the same benefits of mechanical evaporative cooling systems without the complexity of equipment and ductwork.

COOLING OF AIR

Air cooling is a method of dissipating heat. It works by making the object to be cooled have a larger surface area or have an increased flow of air over its surface, or both. An example of the former is to add copper tube 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 onto the copper tube object one wants to cool. The addition of fins to a heat sink increases its total surface area, resulting in greater cooling effectiveness. In all cases, the air has to be cooler than the object or surface from which it is expected to remove heat. This is due to the second law of thermodynamics, which states that heat will only move spontaneously from a hot reservoir (the heat sink) to a cold reservoir (the air).

HOT AIR

In this system air is flowing through heating coil, the coil is heated by electric power. passing air gives hot air to the environment. Cooling coil are convenient appliances that provide focused and localised heat which is particularly suitable in a room for people that are elderly, ill or with limited mobility. But they can be expensive. They consume a lot of gas or electricity if used to heat up a space quickly, and are likely to cost a lot more than a central heating system. Ideally, room heaters should only be used as a secondary or supplementary source of heat. Even then, you should use the right heater for the space you want to heat,

and carefully control the temperature and the time you have the heater on. Heaters that have these controls are often cheaper to run.

PROBLEM IDENTIFICATION

Commonly air cooler which are used in today's life that needs cold water to cool that is not sufficient to body and also with that it can't use in winter season so in winter season cooler requires to store and one heater is required. We assumed that why not we it replaced in one equipment which work both cooling as well as heating a room by only one equipment. And there was problem from cold water so we replaced that with brine solution.

If individually both objects (Cooler and room heater) keep in home, then a lot of problems will involve. The main important problem is that more cost have to pay for buying the both object individually. This is not possible for a poor man, he cannot pay as much as the cost and beside it, this two objects require more space for storing. So it should design one object in which both feathers are maintained.

OBJECTIVES

There has been an increasing concern in recent years over the increasing of temperature due to discharge of industrial and vehicle waste air into environment. Due to increasing temperature, everyone wants comfort zone for living. Beside it in winter season the coldness increases as much as heat in summer season, so roomer heater in required for the comfort zone. Air condition systems is not possible for every people though in developing countries (for instance, India), this technique which is less expensive and economically feasible is used. It has been selected for the present study using some cheap cost for the creating comfort zone. Therefore, the objective of the present work is to test the ability of Smart cooler and heater in creating a comfort zone in both summer and winter season.

MAIN COMPONENTS OF THE SET UP

DOUBLE SHAFT ELECTRIC MOTOR

A double shaft *electric motor* is a device for converting electrical power into mechanical power. An electric motor will try to deliver the required power even at the risk of self-destruction. Therefore, an electric motor must be protected from self-destruction. Motors may be ruined by physical damage to the windings but, usually, the enemy of a motor is excessive heat in the windings. Overheating breaks down the thin varnish like insulation on the windings. When the insulation fails, the motor fails. Overheating is the result of excessive current flow or inadequate ventilation. Accumulation of dust and dirt on and in the motor can reduce ventilation and heat removal.



Figure 1:- Double Shaft electric motor

Variable speed may be desirable for some farm applications. An electric drill is a universal motor, and its speed can be varied by lowering the input voltage. Usually, speed in an electric drill is controlled with a solid state electronic device called a silicon controlled rectifier (SCR controller). The input current of the motor would look much like that of the light. Direct-current motors may be used for special applications such as feed supplement metering where variable speed is desirable.

COOLER FAN

The fan used to control the air speed and the direction of air to be throughout for the surrounding it depends on the design of the fins of the fan. In this there should be two fans used, first fan should be for the cooling medium and second fan should be for the heating medium. It should be designed for the throughout the air.

COPPER TUBE

Since primitive man first discovered copper, the red metal has constantly served the advancement of civilization. Archaeologists probing ancient ruins have discovered that this enduring metal was a great boon to many peoples. Tools for handicraft and agriculture, weapons for hunting, and articles for decorative and household uses were wrought from copper by early civilizations. The craftsmen who built the great pyramid for the Egyptian Pharaoh Cheops fashioned copper pipe to convey water to the royal bath. A remnant of this pipe was unearthed some years ago still in usable condition, a testimonial to copper's durability and resistance to corrosion.

Modern technology, recognizing that no material is superior to copper for conveying water, has reconfirmed it as the prime material for such purposes. Years of trouble-free service in installations here and abroad have built a new reputation for copper piping in its modern form—light, strong, corrosion resistant tube. It serves all kinds of buildings: single-family homes, high-rise apartments and industrial, commercial and office buildings.

Today, copper tube for the plumbing, heating and air-conditioning industries is available in drawn and annealed tempers (referred to in the trades as "hard" and "soft") and in a wide range of diameters and wall thicknesses. Readily available fittings serve every design application. Joints are simple, reliable and economical to make—additional reasons for selecting copper tube today, nearly 5,000 years after Cheops, copper developments continue as the industry pioneers broader uses for copper tube in engineered plumbing systems for new and retrofitted residential, industrial and commercial installations.



Figure 2:- Copper tube

SUBMERSIBLE PUMP

A submersible pump (or sub pump, electric submersible pump (ESP)) is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids.

Electric submersible pumps are multistage centrifugal pumps operating in a vertical position. Liquids, accelerated by the impeller, lose their kinetic energy in the diffuser where a conversion of kinetic to pressure energy takes place. This is the main operational mechanism of radial and mixed flow pumps. Here pump lifts the water from bottom surface to various parts of an air cooler.



Figure 3:- Submersible pump

BRINE SOLUTION

The brine solution should allowed to flow from the copper tube. And the flow should be maintained by the submersible pump. We study here basically aqueous solutions of common salt (NaCl , $M=0.023+0.0355=0.0585$ kg/mol), i.e. water / sodium-chloride liquid mixtures, called brines. Although the main motivation is the study of sea water (that to a first approximation seawater with 3.5%wt salts is a 0.6 molalNaCl solution in water), common salt solutions have other interests: freezing mixtures, food conditioning, body fluids, de-icing (salt has been used as the most cost-effective road de-icer, since the mid-20th century). Pure water and pure sodium-chloride properties are compiled in Table 1.

Table 1. Properties of pure substances at 15 °C and 100 kPa, or at the phase change at 100 kPa.

Substance	Molar mass. M kg/mol	Melting temp. T_f K	Boiling temp. T_b K	Melting Enthalpy h_{sl} kJ/kg	Boiling Enthalpy h_{lv} kJ/kg	Density (mass) ρ kg/m ³	Thermal expansion $\alpha \cdot 10^6$ K ⁻¹	Sound speed c m/s	Thermal capacity c J/(kg K)	Thermal conductivity k W/(m K)
Water	0.018	273	373	333	2260	999	150	1500	4180	0.6
Ice	0.018	273	373	333	2260	921	150	3500	2040	2.3
Salt	0.058	1074	1690	496	2970	2170	130		850	6.5
Molten salt	0.058	1074	1690			1490	110		1440	0.30

Density refers to a single-crystal sample of halite; granular material show lower densities according to the void fraction (typical values for table salt may be 1230..1290 kg/m³; and around 890 kg/m³ for table sugar).

HEATING COIL

In this we can use the cooking coil as a heating element. Cooking Coils are manufactured out of high temperature resistant nickel alloy tube. Each coil consists of two individual elements (One element in case of 1000W) to give three ratings when used with a rotary switch. The sizes vary from 5" to 8" in diameter and are available in single or dual coils. It's capacity is 1200W.

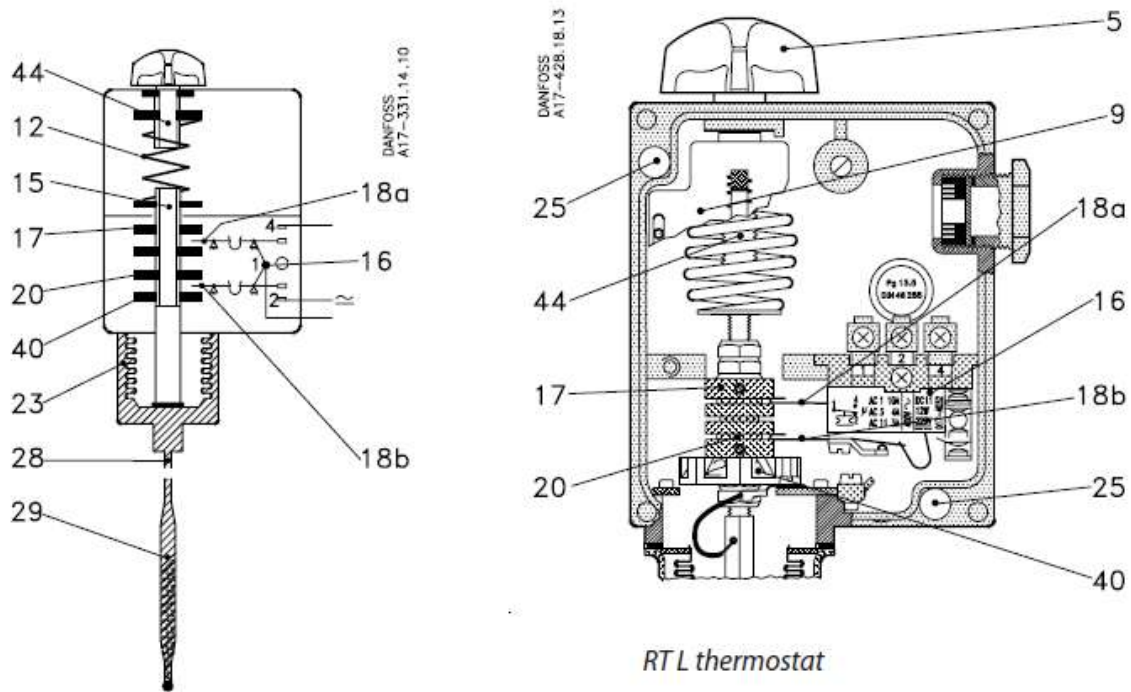
Nickel is a high-density, high-strength metal with good ductility and excellent corrosion resistance and high temperature properties. Ni has many unique properties including its excellent catalytic property. Nickel Catalyst for Fuel Cells. Nickel cobalt is seen as a low-cost substitute for platinum catalysts. Two-thirds of all nickel produced goes into stainless steel production. Also used extensively in electroplating various parts in variety of applications. Ni-base super alloys are a unique class of materials having exceptionally good high temperature strength, creep and oxidation resistance. Used in many high temperature applications like turbine engines.



Figure 3:- Heating Coil

THERMOSTAT

The thermostat is used to control the heat with the help of thermostat the heating coil can be automatically switched off. RT L pressure controls are fitted with a switch (17-4032) with an adjustable neutral zone. This enables the units to be used for floating control. The neutral zone switch contact arms (18a) and (18b) are operated by the spindle guide bushes (17) and (20). The upper guide bush (17) is fixed while the lower guide bush (20) can be moved up or down by the setting nut (40). In this way the neutral zone can be varied between a minimum value (equal to the mechanical differential of the unit) and a maximum value (depending on the type of RT unit).



Key sketch RTL thermostat

Where following are the component's name.

5. Setting knob
9. Regulation range scale
12. Main spring
15. Main spindle
16. Switch
17. Upper guide bush
- 18a and 18b. Contact arm
20. Lower guide bush
23. Bellows element
25. Fixing hole
28. Capillary tube
29. Sensor (bulb)
40. Neutral zone setting nut
44. Temperature setting spindle

CONSTRUCTION

Smart cooler and heater is mainly consist on dual shaft motor a dual shaft motor is fixed with the help of foundation and the fans are mounted an the both side of the motor which works like blower. It is covered by the body on one side of blower we arranged a media of heating it means a heating coil is mounted on the body and respectively on second blower we arranged a media of cooling a system of cooling in which copper tube is mounted on the body and it is connected by the pump which is mounted in the reservoir and reservoir on the bottom side of the project as shown in figure.

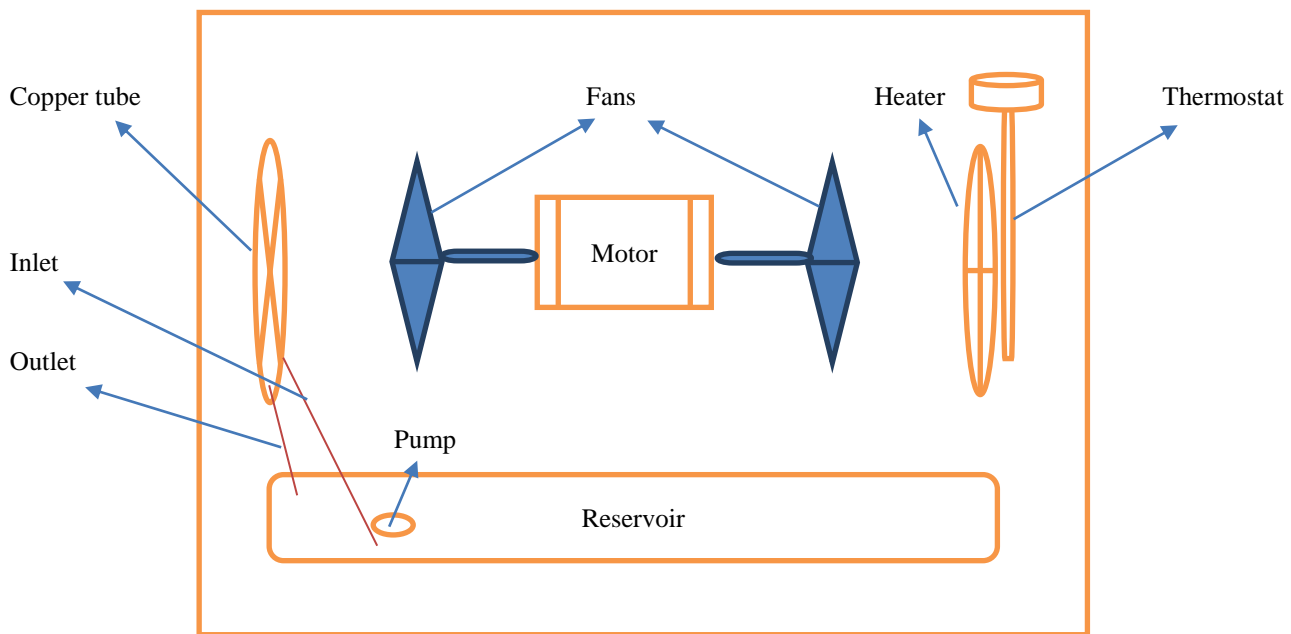


Figure 6.1:- Layout of smart cooler and room heater

WORKING PRINCIPAL

The working principal of our project “Smart cooler & room heater” is very simple in that the electricity is provided to the three components, motor, heater and pump. But at a time electricity is not provided to all it is provided only two it means that when we have to use the heater than electricity is provided only to the heater and motor and when we have to use the cooler than we have to provide electricity to the motor and submersible pump.

When electricity is provided to the motor than motor runs at high speed and it through air to the front as well as back side with the help of the fans mounted on the motor. And on the back side of the project the heating coil is fitted when we need heater we provide electricity of 220V to the heating coil so heat is produces their and air throughout by fan travels from heating media and it get heated. Similarly the working of cooling media is when we need the cooling media we have to close the heater starts providing the electricity to the submersible pump and motor when we start submersible pump it pumps the brine solution to the copper tubing and so the copper tubing gets cold and sir throughout by fans of motor the air travels from the copper tubing area and it get cooled by the copper tubing.

ADVANTAGE

1. At running of condition, there is no vibration.
2. Easy starting.
3. Reduce moisture in winter season and increase moisture in summer season
- 4 Create comfort zone in both season
5. Cost is low.
6. Easy construction and working.
7. Required less space.

DISADVANTAGE

1. Cooling efficiency is low than Air condition.
2. Brine solution is required for cooling.
3. Heater required more power consumption.
4. Power is required for running.

RESULT

The result from the project “Smart cooler and room heater” is observed that it gives a good cooling to a room and as well as a significant heating to a room is obtained from a single system.

CONCLUSION

The air cooler and heater are widely used in the world simultaneously in both summer and winter season. 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 air cooler. In summer season, it gives of cold air in the room and in winter season, it gives heating air through heating coil. In this project the cooling of air by using copper tube and hot air by using heating coil. A 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 inpractice.

FUTURE ENHANCEMENT

There has understandably been an increasing concern in recent years over the increasing rate of temperature in summer season and decreasing temperature in winter in the world due to growth of people and destroy of tree plant as well as the release of exhaust gases into the atmosphere from automobile and industrial engines. Technological breakthroughs like the Smart cooler and room heater can be the answer to maintain the temperature and create a comfort zone in both summer and winter season. Currently, the Smart cooler and room heater is only suitable for use in houses and small office. But R&D departments have taken the subject into consideration and are going into developing and redesigning the Smart cooler and room heater to make it possible to be installed in small house and office keeping its dynamic properties stable and sustaining in both summer and winter season or increasing its efficiency.

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