REVIEW ON WASTE HEAT RECOVERY FROM DOMESTIC REFRIGERATOR

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ABSTRACT

Domestic refrigerator are used for preservation of food in household application. Here energy is one of the important aspects from view point of the use of refrigerants and for the protection of environment. The waste heat from the system will create adverse effect on environmental conditions because heat present in the environment will increase the global warming. It will also affect the ozone layer. So a new and different way should be available for conserving energy through waste heat recovery. A different way has been find out to use waste heat from condenser of refrigerator system. The waste heat from the system can be used for specific purposes. This system is more useful for domestic purposes with less infrastructure ,maintenance and working cost .It is most different important approach to increase performance and make reuse of the waste heat from system. This system is technically suitable and economically reasonable shown by the study. The vapor compression refrigeration system is mainly depend upon the working of the compressor. Optimized design is possible through theoretical calculations, however may fail due to the reason that the uncertainties in the formulation of heat transfer from the refrigerant inside the condenser tubes to the ambient air.

Keyword: - *Ecofriendly, cost effective, global warming, waste heat recovery*.

1. INTRODUCTION

In Refrigeration System, the Heat transfer is vital perspective in regards to with vitality and being a basic piece of mechanical designing educational module. An extensive number of designing applications such as heat recovery systems encountered heat exchange process. The domestic refrigerator reject large amount of heat inside room which makes uncomfortable in summer due to increase in room temperature. So it is very important to reject this heat outside the room. The rejected waste heat can be utilized for several applications such as water heating, keeping food hot and much more. In 1834, the primary cooling framework was created in England. Later it is known as vapor pressure. The power programmed refrigeration framework created in 1897.The vapor pressure cycle is a procedure that cools an encased space to a temperature lower than the surrounding. To achieve this, warm should be expelled from the encased space into the environment. However, heat flow from a section of high temperature to the lower temperature. Warmth dismissal may happen specifically to the air on account of customary family unit cooler having air cooled condenser. A typical vapor compression system consists of main four components. They are compressor, condenser, throttling valve and evaporator.

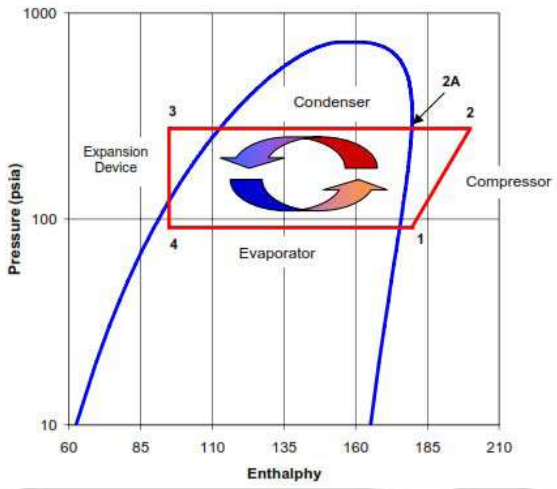

Fig -1: Pressure Enthalpy Curve

The first stage is evaporation and the refrigerant cools the enclosed space by absorbing heat. During the compression phase, the pressure of the refrigerant increases. This hot refrigerant moves through next stage, condensation the natural direction flows allows the release of energy into surrounding air. Finally during expansion stage the refrigerant temperature is lowered by what is called the auto refrigeration effect.

2. LITERATURE REVIEW:

S.C.WALWADE [1]: An attempt is to made to recover the waste heat from the 165 liters domestic refrigerator. This heat can be used for number of domestic and industrial purposes in minimum running cost. This recovered heat can be utilized for food and snacks warmer, grain dryer and water heater. An endeavor has been made to use squander warm from condenser of icebox. In least constructional, support and running expense, explored a WHRS and tested to recuperate buildup warm from domestic cooler

P.ELUMALI [2]: In this system, hot box is placed in between the components of vapor compression refrigeration system. By using this setup, waste heat is recovered. The temperature is increased inside the hot box. The temperature of box varies with time. He recognizes that the maximum waste heat which is emitted to the atmosphere is utilized. In this system utilized the maximum heat by using oven and heating water. By using this system power consumption in house for heating food items is reduced.

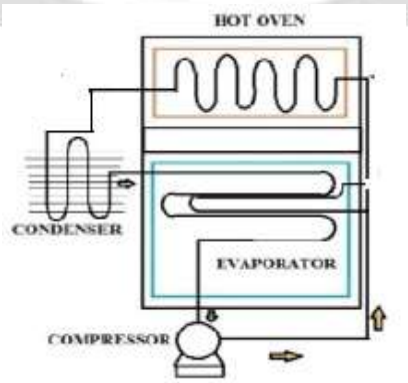

Fig -2: Heat recovery system for air heating as hot oven

TANAJI SHINDE [3]: Domestic refrigerator runs continuously to the preservation of food. The warmth is rejected from condenser is of low quality .He investigate that the raising the consolidating strain to accomplish the higher nature of waste warmth. While the framework is working on full load condition it gives higher cop when contrasted with when no load condition. The temp difference between the water inlet and outlet is 10 centigrade obtained.

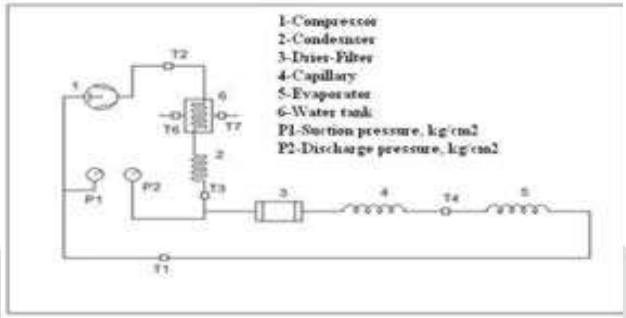

Fig -3: Circuit Arrangement in WHRS

N.B.CHAUDHARI [4]: In this system study on thermos siphon heat recovery system. Utilization of heat for heating the water for residential and commercial use. This system eliminates the need of pump. The quantity of heat recovered by the condenser was theoretically calculated. It is in the range 375 watt to 407 watt. This is totally depending on a rate of water circulation.

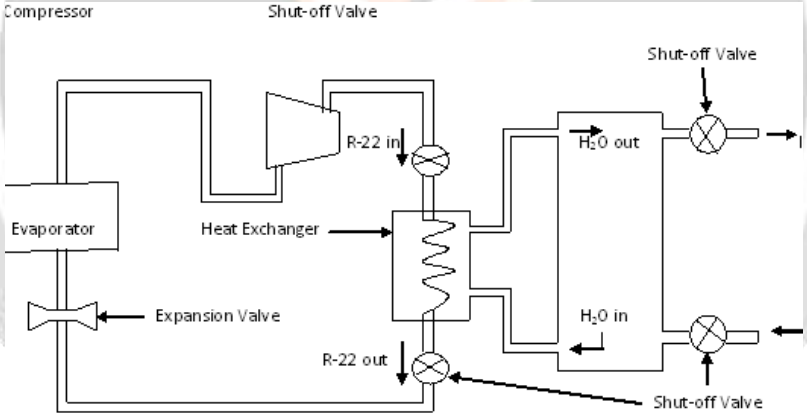

Fig -4: Schematic of the thermo siphon heat recovery system

PATIL AND DONGE [5]: Modify the domestic refrigerator to recover the waste heat from condenser. It can introduce the water tank containing the condenser coil of the residential refrigerator. It expands the temperature up to 40 centigrade. But the main drawback is that it has no mobility.

ROMDHANE B.SHARMA [6]: Develop a system in which the air cooled condenser is replaced by heat exchanger to heat the water. This system increases the temperature up to 60 centigrade. This paper also analyzed the economic important of power saving.

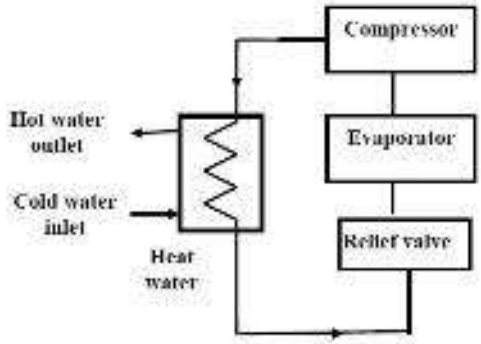

Fig -5: Heat recovery system for water heating

A.M.VIBHUTE [7]: As domestic refrigerator rejects heat inside the room which make uncomfortable in summer due to increase the temperature. This heat collects in heating box. In this system we observed that COP of refrigerator was 1.1 without waste heat recovery and after heat recovery COP is 1.22 means increases COP is 10.91 %. Heat recovery in heating box the temperature is obtained up to 18 degree centigrade above atmospheric temperature.

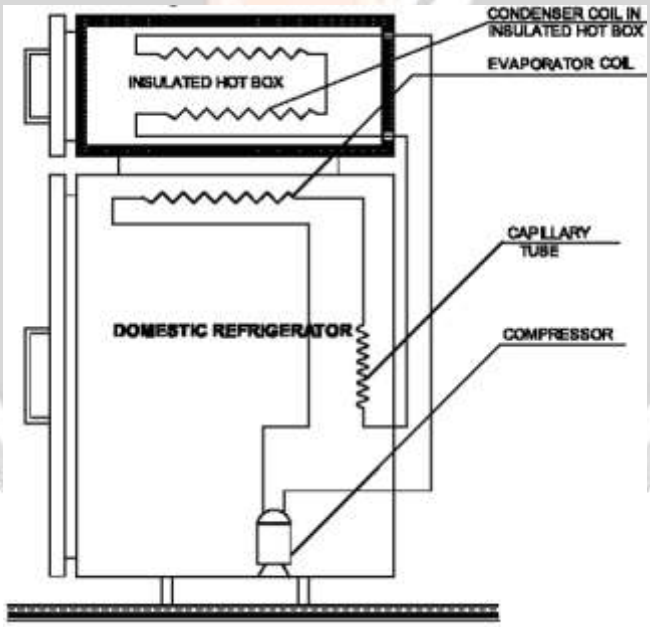

Fig -6: Proposed setup

SANMATI MINI [8]: Developing multi purposes warming apparatus for utilization of waste heat from the domestic refrigerator. This heat has several household uses like food warming, domestic fermentation, the maximum temperature reached up to 50 degree centigrade of their apparatus. The system does not require any additional power supply.

SHREEJITH K [9]: They analyzed waste heat recovery system for domestic refrigerator at various load conditions (no load, 40 watt load and 100 watt load). This system is used for increase the temperature of water by using single tube heat exchanger coiled around and over the air cooled condenser.

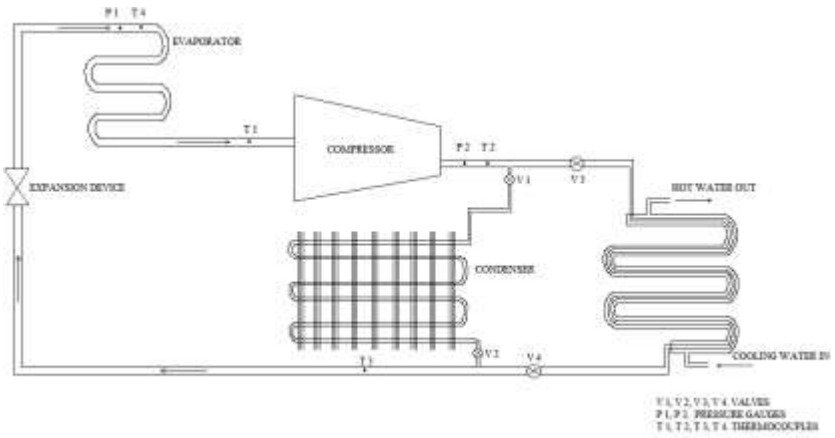

Fig -7: Schematic Diagram of experimental apparatus

LAKSHYA SONI [10]: He developed system which rejects less heat to environment. So it is safer in environmental aspects and runs at normal conditions. They fixed the insulated cabin on the top of refrigerator which contains copper coils and hot water sink. The temperature of the refrigerant is increased. The cooling of this refrigerant is done by water sprinkles on containers. These water drops are collected in hot water sink.

G.G. MOMIN [11]: He modified the domestic refrigerator to increase the COP. He utilized waste heat of condenser to the water in the water storage tank. There is increase in water temperature up to 60℃. It can see framework while working under full load condition gives a superior COP when contrasted with no load condition. In this way more ideal and productive framework can be worked to give better outcomes.

S.B.LOKHANDE [12]: He concluded that while startup, energy consumption of refrigerator varying with time and after some time it remain constant. Refrigerant effect is directly proportional to the temperature difference between the refrigerant and article placed.

M.S.TANDALE [13]: He can use the R717 Kirloskar reciprocating compressor having capacity of 950 kilo watt. By using this temperature of water outlet is 70° C. When the temperature of water inlet is of 25° C, the flow rate of water is 70000 liters per day and this system saves the 390 IFO per day. It also reduces the CO2 emission.

M.M.RAHMAN [14]: He build a heating recovery tank consists of two cylindrical boxes. The inner box filled with water and is coiled with the tube which is carrying high temperature refrigerant at the outer surface. He found that this setup increase the efficiency of the compressor.

3. CONCLUSIONS

The technique of heat recovery is used for different applications. It increases the coefficient of performance up to 12%. The system has low initial cost and there is no adverse effect on the global environment. The temperature obtained by the system is near about 50° C theoretically.

4. REFERENCES

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