

Design and Fabrication of Hybrid Fridge-Fan Cooler

Samiran Lakhe¹, Prafulla Ganar², Jai Bhelave³, Pratik Bothale⁴, Shubham Mrudangwar⁵, Prashant Yeshambhare⁶, Sumit Karanjekar⁷

^{1,2,3,4,5,6} *Students of Mechanical Engineering, Department of Mechanical Engineering, G.H. Raisonni Academy of Engineering and Technology Nagpur-440028(India)*

⁷ *Assistant Professor, Department of Mechanical Engineering, G.H. Raisonni Academy of Engineering and Technology Nagpur-440028(India)*

Abstract- This paper gives information about a working model of refrigerator and fan cooler in combination. This is by combining two units i.e. domestic refrigerator and fan cooler into a single unit. This device will run on single energy input. Refrigerator and fan cooler can run at a same time and if we have to run refrigerator only then there is arrangement that only refrigerator will run and not the fan cooler. According to necessity we can use this device. The most important part is that we are saving water by using this device. As common man can't afford both AC and refrigerator so he or she can take advantage of both units at lower cost. It is helpful for rural people as there is less availability of water in village. The another advantage is that it occupy less floor space than individual unit. The motivation for the project comes from rising cost of individual refrigerator and AC. This project is economic and helpful to every individual.

Index Terms- Refrigerator, Fan cooler, Economic, Water Savage, Affordable

I. INTRODUCTION

The idea of this project explores the possibility of combining two units i.e. fridge and Fan-Cooler into a single unit, such that the running cost becomes almost negligible.

The name of this concept is termed as fridge- Fan-Cooler where both the fridge and Fan- Cooler are working on the cost of only fridge. This is how we are trying to make the environment and a common man comfortable.

By this project a common man could have a sound sleep so that his productivity for the next day increases.

Nowadays this device is necessary at every place such as home hospitals industries etc.

As temperature got rises very rapidly and there is need of such kind of device. So we merge the two devices i.e. Refrigerator and Fan cooler we are using exhaust fan in this device. It collects air from three sides of refrigerator and throws it forcefully at front side.

So we can use this device for preserving food as well as for making ice, cooling of water beverages and to get cool air somehow.

II. LITERATURE REVIEW

Prof. S.K. Gupta

The paper reported about the attempt he made of combining two units i.e. domestic refrigerator and air conditioner into a single system.

Due to which there is less power consumption the cost will be reduced and it requires less floor space.

Common man can afford it .It is helpful where there is less or congestible area it consumes very less energy.

He uses two evaporator as one for refrigerator and one for air conditioner.

As he used two evaporator the cooling effect get decreases somehow but as it necessary to implement two evaporator and for more cooling effect of air conditioner they require high capacity compressor near about one tone and large space of freezer.

III. WORKING PRINCIPLE

The compressor compresses the refrigerant and rise its pressure and temperature. Then vapor form of refrigerant is moved to the condenser where its pressure and temperature decreases, so that vapor gets converted to liquid form. Then that liquid is moved to capillary tube and from their it moved to

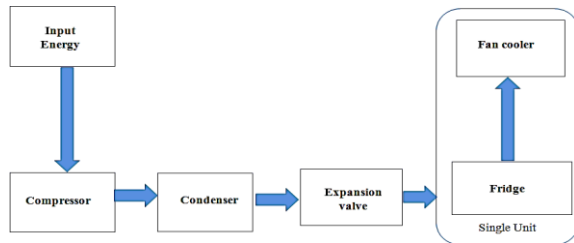
evaporator, where we get cooling effect. The liquid refrigerant is converted from liquid to vapor form at middle of evaporator. Evaporator extracted heat and gives cool air.

IV. EXPERIMENTAL PLAN

A. Experimental setup

This system comprises of single compressor single condenser two evaporator one for refrigerating and one for fan cooler, capillary tubes.

The exhaust fan is use at upper part that is a fan cooler for the purpose of absorbing air and throws it outside. The evaporated used for freezer is plate type evaporated and for exhaust fan fins type of



evaporated is used.

Fig1: working system of model

B. Data Processing

There are two evaporators which are working at different temperature with single compressor it uses capillary tubes for expanding purpose. The compressor is of reciprocating type and it is a single acting. In double door fridge the arrangement is made in such type that the ice making compartment has been taken in lower part of refrigerator, so we can fixed exhaust fan at upper part of refrigerator. The temperature of ice making compartment can go down up to -14 degree Celsius. Capillary comes from dryer then it will go into the freezer compartment then the outlet of evaporator of freezer is the inlet capillary tube of fan cooler. Fan cooler consist the fins type Evaporator from which the gas flow and from then the outlet capillary is go to the compressor.

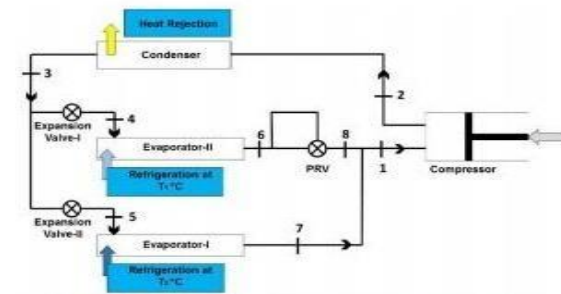


fig2: Multi evaporator system with single compressor

Actual Working model



Fig3: Actual Working model

Table 1: Refrigerator Specifications:

1	Compressor:	365BTU
2.	Condenser	10 W
3.	Exhaust fan	25W
4.	Refrigerant	R-134a(1,1,1,2-tetra fluoroethane)
5.	fins type condenser pressure:	15psi
6.	compressor type:	reciprocating

Table 1: Refrigerator Specifications

The COP of the above system can be calculated as

$$COP = \text{Desired output} / \text{Required input.}$$

$$COP = Q/W.$$

The COP of refrigerator is

$$COP = T_2 / T_1 - T_2$$

$$W = H_2 - H_1$$

$$H_2 = h_2 + X_2 L_2$$

$$H_1 = h_1 + X_1 L_1$$

V. CONCLUSION

We have successfully combined two unit i.e. fridge and fan cooler into a single unit for the purpose of refrigeration and getting cool air. The energy consumption is very less by this device. This device consumed almost 3 units per day. As its running cost

is very less, a common man can afford it. It is very much useful for domestic purpose and especially at those places where floor space is less. It can be used widely in rural areas as there is shortage of water. A device is made in such a manner that we can either use both unit at a same time or we can use it individually. So our attempt of making this kind of device is successful.

REFERENCES:

- [1] Prof.S.K.Gupta, “Feasibility Study and Development of Refrigerator cum Air Conditioner”, International Journal of scientific and research publication,(2014),Volume4,Issue12.
- [2] HuangB.J. ChinC.J. & DuangC.L. 2000, “A design method of thermoelectric cooler”, International Journal of Refrigeration, 23:208-218.
- [3] RoweD.M.,2006,Thermoelectrics handbook:Macro to Nano, CRC, Taylor& Francis
- [4] J.K...Jain and Hindoliya D.A, “Development and Testing of Regenerative Evaporative Cooler”, International Journal of Engineering Trends and Technology, Vol.3, No. 6, Pp 694-697, 2012.
- [5] M.P.Poonia, A.Bhardwaj, Upender Pandel and A.S.Jethoo A.S, “Design and Development of Energy Efficient Multi- Utility Desert Cooler”, Universal Journal of Environmental Research and Technology, Vol. 1 Pp 39-44, 2011.
- [6] B.Chandrakant, Kothare and Nitin B. Borkar, “Modified Desert Cooler”, International Journal of Engineering and Technology, Vol.3, No.2, Pp 166-172, 2011.