

# Combination of Refrigerator And Air-Conditioner

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**Abstract-** Refrigerator and air conditioner can be addressed as the basic needs for livelihood in today's world

*They consume huge amount of electricity and are relatively expensive for common people.*

*In this paper we propose an efficient system which has ability to merge domestic refrigerator and air conditioner into a combined system to reduce hardware cost so that it can be utilized to fulfill goals of common people.*

*Moreover, this system is a combination of open loop and close loop cycle and this machine runs under one compressor .*

*Our primary motive is to reduce space complexity, save electricity and reduce maintenance running cost. Since all energy cost are on rise, therefore this project is a way forward in realizing the economic as well as environmental demand.*

## I. INTRODUCTION

Refrigeration and air conditioning systems are responsible for roughly 30% of total energy consumption. This has led to increase in pollution and energy cost that cannot be afforded by poor men. Our project combines two units i.e. Refrigerator and Air-Conditioner into a single unit, such that the running cost becomes almost negligible. The name of the device is termed as Refrigerator cum Air-Conditioner where both the Refrigerator and Air-Conditioner are working on the cost of only Refrigerator.

In India, during summer season the temperature increases up to its peak mostly about range of 45°C to 50°C. During this season there is very increase in demand of cooling equipment's such as air coolers, air conditioner etc. If we talk about traditional air coolers, these coolers have very high demand in India because they are cheap and affordable in every aspect and most of the Indian population is belongs to the middle class and thus they can afford these traditional coolers. But these coolers too have disadvantages such as they consumes large amount of water i.e about 45 to 50 liters of water every day. Now if we come on air conditioner, the cost

this equipment is very high minimum it is about 20 to 25000 if we go for good ac in India. Also the electricity consumption of this air conditioning equipment is also very high i.e. about 2400rs per month for single air conditioner according to Indian standards. And these equipment's produce very adverse effect on the environment which ultimately leads to the global warming.

## II. COMPONENTS

### • COMPRESSOR

The Compressor is heart of the refrigeration system Hermetical compressor.

Operating Voltage 3Phase, 415 V .  
Power 1/3 hp.



### • CONDENSER

A condenser is used in refrigeration and air conditioning systems to cool down and condense incoming refrigerant vapor in to liquid.

Specification : 10\* 11(3 ROW)

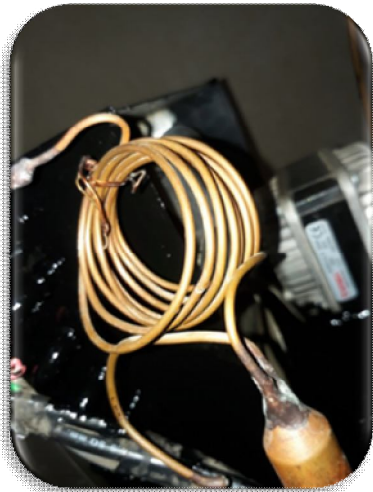


- **EVAPORATOR**

Power supply 230 V, AC, 50 Hz  
 Condenser support Yes

- **EXPANSION VALVE**

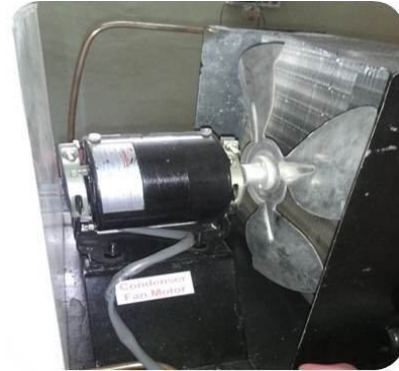
It causes a pressure drop of the working fluid.  
 We use the Thermostatic expansion valves.



- **MOTOR**

The three-phase induction motor, also called as asynchronous motor.

Specification : 230V, 50Hz .



**Fig: Fan Motor**

- **REFRIGERANT**

It is a substance which has ability to absorb the heat by changing its phase.



- **HAND VALVES**

The word is derived from the Latin valve the moving part of a door.

Valves control the flow of a fluid by opening, closing, or partially obstructing various paths.

- **DRIER**

Used for absorbing moisture content from refrigerant before entering the compressor.

### III. WORKING

Our system consists of four main parts. They are compressor, condenser, Evaporator, and cooling coil. There are sequence of operations. The working starts from compressor where, the fluid arrives in the form of cool low pressure gas. Then the compressor compresses the fluid to high pressure and high temperature gas . now the hot high pressure gas moves to condenser from compressor here the phase change occurs. The condenser condenses gas to a liquid under high pressure now the temperature is much cooler. The liquid goes through a very tiny diameter tube which is called

as capillary tube due to which the temperature and pressure is reduced and the refrigerant becomes cool. Further there is a T-section which connects the evaporator and Ac cooling coil and the throttling is done by the two manual hand-valves. Above designed system is scalable in a way that user can use as his needs like user can operate air conditioner or refrigerator or even both simultaneously. The refrigerant then passing through evaporator absorbs the heat from the substance and makes the substance cool then moving on refrigerant becomes low pressure gas and then it returns to the compressor and the process repeats.

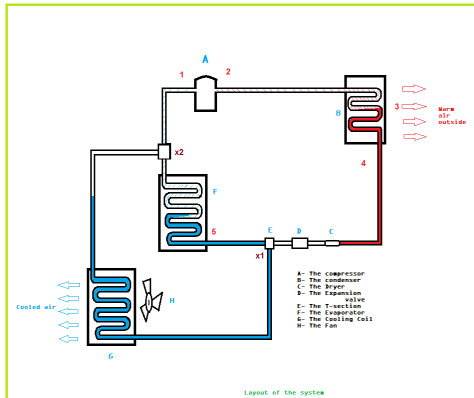


Fig : system architecture

IV. SAMPLE CALCULATIONS

1. For Refrigerant R134a

Evaporating Pressure Pressure Gauge reading

Refrigerating Effect

Load on Evaporator

$$Q_1 = m \times C_p \times \Delta T$$

$$= 2 \times 4.187 \times (28 - 9)$$

$$= 159.106 \text{ KJ} = 2.651 \text{ KJ/s}$$

Compressor Work (Wc) 0.47 KW Energy Meter reading

COP

$$\text{COP} = \frac{\text{Load on Evaporator}}{\text{Compressor Work}}$$

$$= \frac{0.9447}{0.47}$$

$$= 2.01$$

V. CONCLUSION

The main thing that concluded is using R134a is best move for combination of refrigerator and Air-Conditioner which gives with good COP of 2.01. Which is affordable for a common man with same consumption of electricity which is to be required for running the refrigerator. And less than the consumption of both the refrigerator and air-conditioner may consumes. And can occupy less space of area and very effective for 10\*10 room. As it is designed for 10\*10 room itself like medicals, hostels, small scales shops