

## International Journal of Innovative Research in Science, Engineering and Technology

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# Development of Refrigeration cum Air Conditioning

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**ABSTRACT:** Refrigerator has become a necessity of all households in India. In all metropolitan cities, environment degradation due to automobile & other factors is on the rise, therefore the requirement of air-conditioner has already been felt. Understanding the various challenges regarding the cost and space this project “ DEVELOPMENT OF REFRIGERATION CUM AIR CONDITIONING ” has been introduced as this refrigeration and cooling system which will run at a very low cost that can be afforded by a common man. This paper is about our attempt to merge Domestic Refrigerator and Air conditioner into a combined system such that an ordinary man can have a sound sleep which automatically increases his working productivity for the next day. In minimum construction, maintenance and running cost, this attempt is quite useful for domestic purpose so that our ultimate aim of the project that is those who cannot afford an Air Conditioner can have the comfort of Air Conditioner could be completed.

**KEYWORDS:** Refrigerator, Air conditioning, thermostats, working principle

### I. INTRODUCTION

#### 1. REFRIGERATION

It is a process of removing heat from a low-temperature reservoir and transferring it to a high-temperature reservoir.

Ammonia was one of the first refrigerants. An American society of refrigeration engineer defines as "The science of providing and maintaining temperature below that of surrounding atmosphere".

It means that continuously extraction of heat from a body whose temperature is already below the temperature of its surroundings.

##### 1.1 Components of vapour compression refrigeration cycle :

1. Compressor
2. Condenser
3. Expansion valve
4. Evaporator

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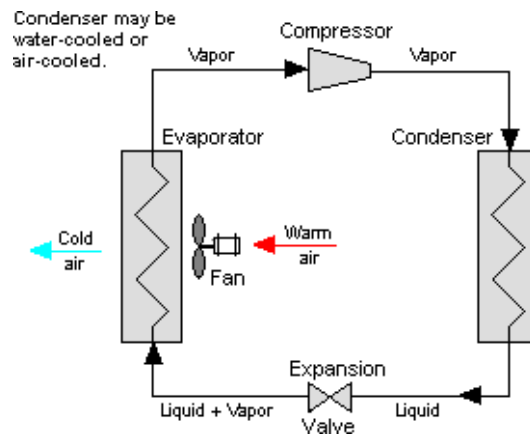


Fig : simple vapour compression refrigeration cycle

## 1. Compressor

The compressor's use is to pull the low-temperature and low-pressure vapour from the evaporator, through a suction line. Once the vapour is drawn, it will be compressed. This will cause the vapour's temperature to rise. Its main function is to transform a low-temperature vapour in to a high-temperature vapour, to increase pressure. Vapour is released from the compressor into a discharge line.

## 2. Condenser

Condensation changes gas to a liquid form. Its main purpose is to liquefy the refrigerant gas sucked by the compressor from the evaporator. As condensation begins, the heat will flow from the condenser into the air, only if the condensation temperature is higher than that of the atmosphere. The high-pressure vapour in the condenser will be cooled to become a liquid refrigerant again, this time with a little heat. The liquid refrigerant will then flow from the condenser to a liquid line.

## 3. Expansion Valve

Commonly placed before the evaporator and at the end of the liquid line, the expansion valve is reached by the liquid refrigerant after it has been condensed. Reducing the pressure of the refrigerant, its temperature will decrease to a level below its atmosphere. This liquid will then be pumped into the evaporator.

## 4. Evaporator

An evaporator is used to turn any liquid material into gas. In this process, heat is absorbed. The evaporator transfers heat from the refrigerated space into a heat pump through a liquid refrigerant, which boils in the evaporator at a low-pressure. In achieving heat transfer, the liquid refrigerant should be lower than the goods being cooled. After the transfer, liquid refrigerant is drawn by the compressor from the evaporator through a suction line. Liquid refrigerant will be in vapour form upon leaving the evaporator coil.

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## 1.2 AIR CONDITIONING

### 1.2.1 Components of Air Conditioning

1. Evaporator
2. Compressor
3. Condensor
4. Expansion valve
5. Cooling fan

### Working principle of Simple Air Conditioning :

An air conditioner collects hot air from a given space, processes it within itself with the help of a refrigerant and a bunch of coils and then releases cool air into the same space where the hot air had originally been collected. This is essentially how all air conditioners work.

The working of ac is similar to that of the working principle of refrigerator .

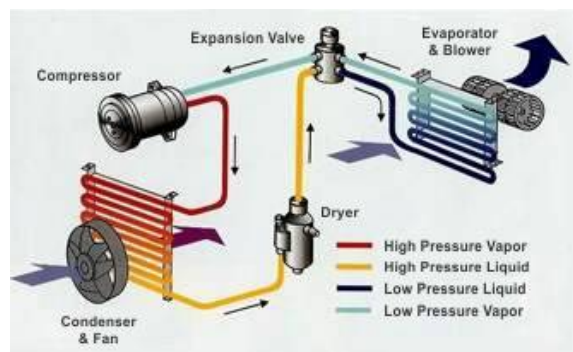


Fig: working of simple Air Conditioning cycle.

## II. COMPONENTS OF THE MODEL

1. Compressor
2. Condenser
3. Receiver
4. Expansion valve
5. Thermostat (2)
6. Temperature sensors (2)
7. Evaporator 1 (refrigerant )
8. Evaporator 2 (Ac )
9. Capillary tubes.
10. Refrigerant (R134A)

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## 2.1 Conditions of the inlet and outlet opening temperatures of thermostats:

equipment	inlet	outlet
	open	open
refrigerator	18°C	-5°C
Ac	24°C	18°C

**Table:** shows temperatures at which opening of inlet and outlet values

## III. WORKING PROCEDURE FOR ARRANGEMENT OF DESIGN:

- First the compressor is placed of which the outlet of the compressor is attached to the inlet of the condenser
- The outlet of the condenser is now attached to the inlet of the receiver .
- The purpose of the receiver is to store the refrigerant in it and allows to send constant refrigerant for further procedure.
- Then the outlet of the receiver is now attached to the expansion valve where the controlling or the throttling process is done .
- Now ,from the expansion valve two outlets are given out.
- One outlet is attached to the refrigerator and the other outlet is attached to the Air conditioning chamber.
- The flow of refrigerant is controlled by placing the thermostats to each of the outlets of expansion .
- The sensors are attached to the thermostats which in turn regulates the flow of refrigerant.
- Then the outlets of the both refrigerator and Ac are again joined together at one place as shown in fig.
- Then the refrigerant is again sent to the inlet of the compressor.

## IV. WORKING PROCEDURE OF THE DESIGN

- The vapour refrigerant from the outlet of the evaporators is sent in to compressor where it is compressed and is converted into high pressure vapour refrigerant.
- Then the high pressured vapour refrigerant is sent to the condenser .In the condenser the vapor refrigerant is then converted into high pressured liquid refrigerant with help of external cooling fan which cools the refrigerant in the condenser.
- Now the liquid refrigerant is sent to the receiver or dryer where it stores the refrigerant .It is used to send the refrigerant constantly to the expansion valve.  
The refrigerant from receiver is now sent to the expansion valve.  
The expansion is also known as throttling valve which regulates the flow of refrigerant where the high pressured liquid refrigerant is converted in to low pressure liquid .
- Now the expansion valve is divided into two outlets. One outlet is connected to refrigerator and the other outlet is connected to Air conditioning chamber.
- In between these two ,two thermostats with a temperature sensor is placed for both outlets ,which is used to control the flow of refrigerant to the cooling chambers i.e., one for refrigerant and other for Ac.
- 70% of refrigerant is sent to refrigerator and remaining 30% is sent to Air conditioning chamber.

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- The thermostats are programmed in such a way that the opening and closing of the valves are controlled according to the temperatures given in the table .
- In both the cooling chambers ,refrigerant observes the heat from the products which are placed in those cooling chambers.
- The low pressured liquid refrigerant is converted into vapour refrigerant at the end of the outlet .
- The both the outlets of refrigerant and Ac are again connected together and the vapour refrigerant is now sent to the compressor .
- The process is repeated .

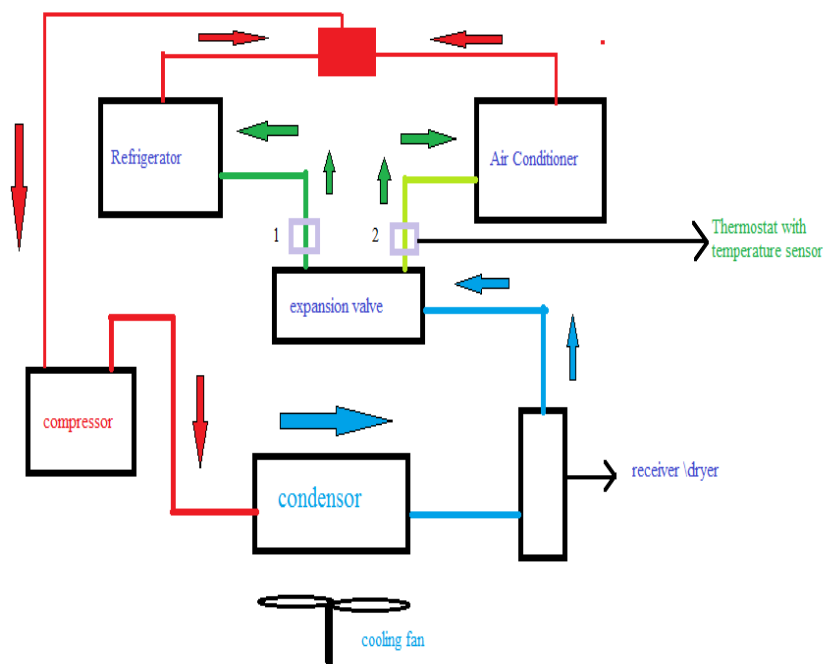


Fig : shows the components and working of the design

## V. CONCLUSION

we conclude that the space and the electricity required by this design is less. It is more effective when it is combined refrigerator and air conditioning.

## VI. FUTURE SCOPE

It can also be operated by using non-conventional source of energy .  
It can be implemented in automobile .



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