

Portable and compact air conditioner

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Abstract- portable air conditioner. We can carry the air conditioner from 1 place to another. As per the title we were compact the size of existing window air conditioner as well as reduces the cost of AC and save power consumption as compared to existing 1050 watt air conditioner. We use some old part of car AC like compressor and condenser. We use capillary tube which rapidly achieve high as well as low temperature. Sensors automatically cuts the supply when there is highest cooling achieve and double-acting reciprocating compressor which is drive by B- grooved belt to 1hp electric motor and eco-friendly Refrigerant R-134a which is lowing cost and it does not affect the Ozone Layer depletion. R134a refrigerant has no strange stench, and is particularly suitable for automobile refrigerating system. Its boiling point is -26.2°C, and its purity is higher than 99.9%. Its moisture is less than 0.001%, so its refrigerating system is free of corrosion. The acid content of R134a refrigerant is less than 0.00001%, and the residue on evaporation is lower than 0.01% So that the air conditioner supports for saving energy.

1. INTRODUCTION

The idea of this work came from the my class in this lots of space occupied by air conditioner. And also influenced by the small size desert cooler which is portable, low-cost, and less power consuming. Basically our research work concerned on to achieve compactness by reducing the dimension of main frame and used small size air conditioner components. So we can easily carry from 1 place to another. For reducing power consumption electric motor of 746 watt used by the help of belt and pulley combination. The name have great qualities like the size of compact air conditioner is very less, low-cost, less power consuming from existing window air conditioner. In which mini reciprocating compressor used that is very effective in working and double-acting compressor. The second most important component used aluminium fin condenser for condense the refrigerant at constant pressure process and changes the phase from saturated vapour to

saturated liquid by rejection of latent heat. Then the refrigerant goes into drier filter which absorb the moisture content and dust particles of refrigerant. After that pressure reducing stage comes in cycle in which thermostatic expansion valve used that reduces the pressure from 15 bar to 2 bar and regulate the flow of refrigerant. And then refrigerant goes into serpentine flow type evaporator/cooling coil which give the cooling. Serpentine you only have some tubes, not necessarily as many feet or meters lost in your coil to create superheat. By the help of direct attachment of axial rotate blower and give us cool air. The cooling achieved by absorption of latent heat of vaporization from surrounding and convert the refrigerant from saturated liquid to saturated vapour. In overall cycle circulates R-134a refrigerant which have better heat conductivity, zero ozone depletion potential, non-toxic, non-reactive, inflammable and no adverse effect on ozone layer depletion so it is called eco-friendly refrigerant. Hose pipes used for flow the refrigerant from one part to another part without losing heat.

2. METHODOLOGY

A. Parts details:-

A.1. Compressor- A reciprocating air compressor is one which reciprocates inside a cylinder (liner) unit. The piston moves up and down continuously to pump the air after compression into the air receiver.



A.2. Condenser- For supports the compactness we use aluminium fin condenser which reject the latent heat of the refrigerant at constant pressure forced

convection and changes the phase from saturated vapour to saturated liquid.



Fig:2 Condenser

A.3. Drier Filter- drier filter used to remove for excess moisture content of refrigerant and also for filter the dust particles.



Fig: 3 Drier filter

A.4. Thermostatic Expansion valve – for sudden pressure drop we use thermostatic expansion valve and also regulate the flow of refrigerant.we use here capillary tube.

A.5. Evaporator/ Cooling coil- we use evaporator. it takes latent heat from atmosphere and provides cooling. In this stage refrigerant changes their phase from saturated liquid to saturated vapour.

A.6. Hose Pipe- we use flexible hose pipe for connecting the one component to another component without losing the heat.

B. Dimension of outer casing

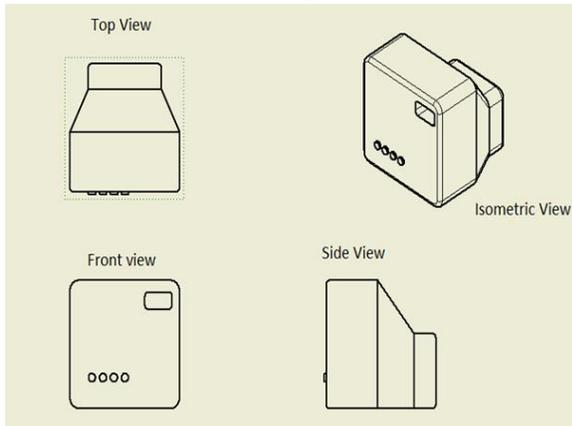


Fig: 4 different view of ac

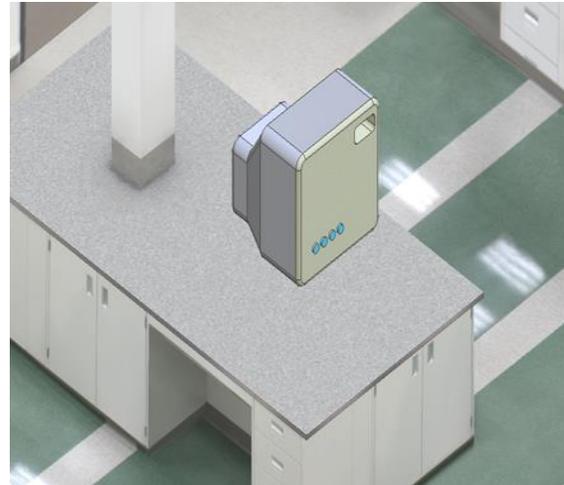


Fig: 5 real environment of ac

C. CALCULATION:

Mass flow rate (m) = 210/Net refrigerant effect

$$m = 210 / (h_1 - h_2) * 60$$

$$m = 210 / 40 * 60 = 0.0875 \text{ kg/sec.}$$

$$\text{compressor work (ws)} = m * (h_1 - h_2).$$

B.2 Calculation Coefficient of Performance

Sr. no	Initial pressure P ₁ (bar)	Final pressure P ₂ (bar)	Temp. T ₂ (K)	h ₁ (kj/kg)	h ₂ (kj/kg)	h ₅ (kj/kg)	COP = $\frac{h_2 - h_5}{h_1 - h_2}$
1	2	13	56	395	435	260	3.8
2	2	12	49	395	420	255	4.6
3	2	11	43	395	419	250	5.83

P1= Inlet pressure of compressor

P2= Pressure after compressor

T2= Temperature of condenser at outlet

h1= Inlet enthalpy of refrigerant of compressor

h_2 = Outlet enthalpy of refrigerant at compressor

h_3 = Outlet enthalpy of refrigerant at condenser

3. RESULT

So we conclude that conventional ac require 1050watt while this ac requires 746 watt .its coefficient of performance is also same as conventional ac.its energy efficient ratio is also same as conventional air conditioner.big thing is that its weight reduce to almost half than conventional air conditioner.also its cost is almost half of conventional air conditioner.

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