

Suspension Operated Air Conditioning System

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Abstract— Current air conditioning system can reduce the fuel economy of vehicle by about 50 percentages and reduce the fuel economy of today mid-size Vehicle by more than 20 percentages while increasing NOx by nearly 80 percentage and CO by 70 percentages. This idea comes out as efficiency of vehicle decreases because of compressor. After implementing this idea, the efficiency of vehicle will increase by decreasing compressor specification. The main concept is that the air conditioning effect will get on the basis of suspension system in vehicle. As a team, we designed the suspension operated air conditioning system. This system runs on the suspension of vehicle and will make the refrigerant is compress that store in receiver. We start to the project by first attempting to come up with an original idea to fit the trouble. After implementing this idea, to increase the efficiency of vehicle.

Keywords: NOx, Air Conditioning System

I. INTRODUCTION

We has needed and used energy at an increasing rate for his sustenance and well-being ever since he came on the earth a few million years ago. Primitive man required energy primarily in the form of food. He derives this by eating plants or animal which he hunted. Subsequently he discover fire and his energy needs increase as he started to make use of wood and other biomass to supply energy needs for cooking as well as for keeping himself warm with passage of time man started to cultivate land for agriculture with further demand for energy man began to use the wind for sailing ship and for driving wind mills and the force of falling water to turn water wheels .Till this time it would not be wrong to say that the sun was supplying all the energy need of man either directly or indirectly and that man was using only renewable source of energy.

The VCS and VAS cycle is use to air conditioning system. This is very expensive than another. Different types of method we are use in vehicle.

In our project we introduce a new concept of air conditioning. In this type of AC system no any type of engine power is used. It only works on the vehicle suspension.

II. OBJECTIVE

- 1) To eliminate the compressor which is main work absorber
- 2) To increase the efficiency of vehicle.
- 3) To use the suspension energy into compressed air, which can be useful various purposes.
- 4) To control the pollution.
- 5) To deceases the global warming effect which generally increases due to conventional air conditioning system.

III. CONSTRUCTION AND WORKING

A. **Construction-** It Consist of Following Component of an Air Conditioning System. [1]:

- 1) **Pneumatic Actuator** -Pneumatic actuator is generally used for compressing an air. The air is sucked from atmosphere. The actuating force in this system comes from vehicle suspension system.
- 2) **Pressure vessel**-The compressed air from actuators passed to pressure vessel for storage. It works as a receiver. It supplies an air according to system requirement. It also used for on/off system according to our will by passing the excess air to atm

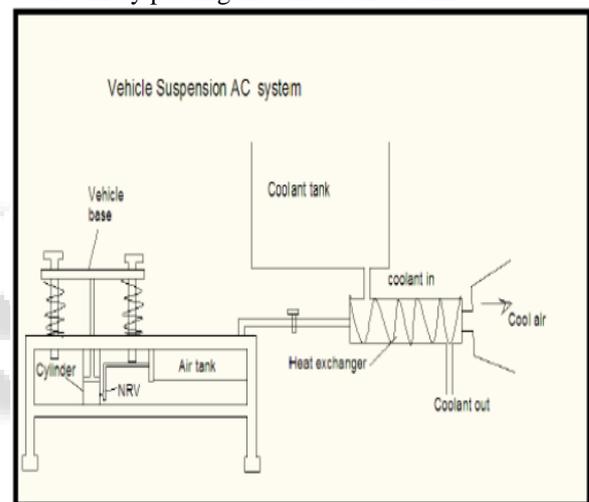


Fig. 1: suspension operated air conditioning (ac) system

- 3) **Pressure gauge**-It is device used to measure the pressure compressed air It is connected to pressure vessel. It ensures that proper pressure is achieved or not. In this project the mechanical type bourdon tube pressure gauge is used.
- 4) **Condenser**-When saturated vapors come in contact with a surface having a temperature below the saturation temperature, condensation occurs.
- 5) **Pneumatic non-return valve**-Multiple check valves can be connected in series. For example, a double check valve is often used as a back flow prevention device to keep potentially contaminated water from siphoning back into municipal water supply lines. There are also double ball check valves in which there are two ball/seat combinations sequentially in the same body to ensure positive leak-tight shutoff when blocking reverse flow; and piston check valves, wafer check valves, and ball-and-cone check valves.
- 6) **Coolant tank**-In this project the coolant tank is for the purpose of cooling of air.
- 7) **T- connector**-In our project the T-Connector that jointthree port together.it is usually shape of capital T. tee

connectors can be used to transfer of fluid from one port from into two port.

- 8) PU tube-These are work as a duct. These are much flexible and supplies air through them to required location. Up tube can sustain much pressure, made up of plastics.

B. Working:



Fig. 2: pressing pneumatic cylinder

In these system actuator placed along with suspension system of a vehicle. When vehicle run over a road because of uneven road surface vehicle suspension accordingly suspension of vehicle move in up and down manner. As actuator is placed along with suspension actuator gets actuating force. In these way we get compressed air and then this air is passed to the pressure vessel for storage. The Compressed air from pressure vessel now passes to the system through port. 'T' connectors distribute compressed air to different ports. It has also provision for bypassing an excess air to the atmosphere. A Non-return valve is used for allowing compressed air only in one direction. The high temperature and high pressurized air is passing to the condenser where temperature and pressure of air reduces, then cool air is to the cabinet of the vehicle. We can use water as a coolant in a condenser. Supply of coolants can be done either by pump or by natural convection.



Fig. 3: Connection of Receiver to Condenser

The condenser is used in shell and tube type. The air is supplied inside tube and coolant is supplied in outside of tube for the purpose to produce cooling effect.

Function-

- Heat exchanger.
- Liquefies heat laden vapor

- Hot vapor enters at top of condenser
- Hot liquid leaves at bottom

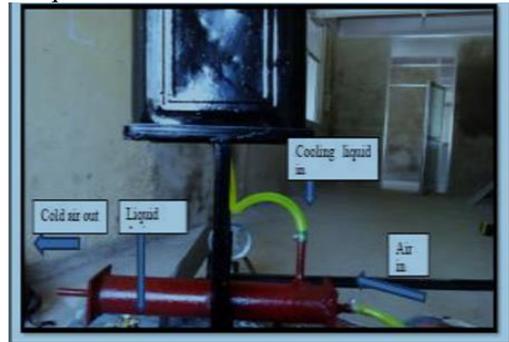


Fig. 4: water tank to condenser

This cooling liquid is store in air tank and supply the cooling liquid in inlet port of condenser. Then hot water is drain to condenser from outlet port and the cool of air also cooling effect is produced. This cooling air is pass to vehicle cabin for the purpose of comfort air conditioning.[1 & 2]



Fig. 5: suspension operated air conditioning

Load to be calculated-

- 1) Metabolic Load

It is the load due to heat produce due to high levels of chemical activity in the cells that maintain the human body temperature at a temp of 37.0 degree centigrade while performing necessary body function. For an average man metabolic rate is 80W.

- 2) Radiation Load

Radiation load is the load imposed on the system because of the heat radiated by the sun. It has three forms direct, diffuse and reflected. Out of these, direct radiation is more prominent. This type of load is noticeable in sunny days.

- 3) Ambient Load

This type of load needs to be accounts when ambient temperature is more than cabinet temperature. The heat transfer to the cabinet either by conduction through vehicle body or by heat ambient air directly comes in a cabinet.

- 4) Exhaust Load

Overall heat transfer coefficient of the surface element in contact with the exhaust pipe and it should be calculated by assuming no external convection since the exhaust temperature is measured at the outer side of the bottom surface.

- 5) Engine Load

Similar to the exhaust load above, the high temperature engine of a conventional or hybrid car can also contribute to the thermal gain of the cabin.

- 6) AC Load

The duty of the air conditioning system is to compensate for other thermal loads so that the cabin temperature remains within the acceptable comfort range. In cold weather conditions, positive AC load (heating) is required for the cabin. Inversely, in warm conditions, negative AC load (cooling) is needed for maintaining the comfort conditions. The actual load created by the AC system depends on the system parameters and working condition.

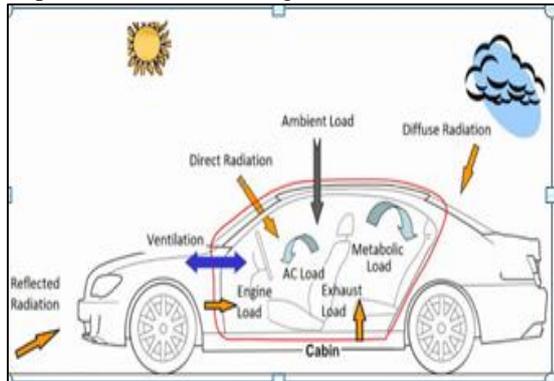


Fig. 6: cooling load on vehicle

1) Merits

- 1) No required fuel for working of the system.
- 2) Eliminates use of compressor, so cost of system reduces.
- 3) Compressed air can be used for other task such as brakes and cleaning purposes.
- 4) Air available freely without any cost from atmosphere.
- 5) Air is non-flammable so system is safe.
- 6) Easily portable in the tube, ducts and pipes.
- 7) System is open to atm. reduces needs of return lines.
- 8) No need of lubrication of a component.
- 9) Simple construction and ease of handling.
- 10) Pollution as well as global warming effect reduces effectively.
- 11) Excess compressed air can be used for driving pneumatic tools.
- 12) Air enables high working speed to be obtained.

2) Demerits-

- 1) Capital cost is high.
- 2) Increase weight of vehicle

3) Applications -

- 1) To operate pneumatic tools
- 2) Spray Painting
- 3) Refrigeration and air conditioning systems
- 4) Gas turbine power plants
- 5) Supercharging of I.C Engines
- 6) Conveying materials like sand and concrete, coal mixtures etc.in pipe line
- 7) Pumping of Water
- 8) Driving the mining machinery
- 9) In Blast furnaces
- 10) Robotics

IV. CONCLUSION

This project is made with pre planning that it provides flexibility in operation. This innovation has made the more desirable and economical. This project USING VEHICLE SUSPENSION AC SYSTEM is designed with the hope that it is very much economical and helps full to all vehicles to produce the compressed air. This project helped us to know

the periodic steps in completing a project work. Thus we have completed the project successfully. It has been a great experience while completing our project we come across lot many practical knowledge as well as experience. We had an opportunity to learn how project are been done. In this way we increase the efficiency of vehicle and also reduce the global warming and harmful gases which can affect for the human, animal and plant.

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