EXHAUST GAS VAPOUR ABSORPTION SYSTEM

Pooja M. Goyal[1], Sushma N. Datkhile[2], Swapnil V. Gaikwad[3], Uday B. Fand[4], Prof. Mr. R. D. Shelke[5]

[1] *Student, Mechanical, PESMCOE, Pune, Maharashtra, India*
[2] *Student, Mechanical, PESMCOE, Pune, Maharashtra, India*
[3] *Student, Mechanical, PESMCOE, Pune, Maharashtra, India*
[4] *Student, Mechanical, PESMCOE, Pune, Maharashtra, India*
[5] *Professor, Mechanical, PESMCOE, Pune, Maharashtra, India*

ABSTRACT

The project focuses on the manufacturing of exhaust gas vapour absorption refrigeration system to recover heat from exhaust gas & use it for absorption refrigeration system. In S.I. engine or diesel engine 30% to 32% energy go waste in exhaust. So it's important to recover energy from exhaust.

In this, NH_3 & H_2O refrigeration system is used. By the heat of exhaust gas, liquid ammonia change into vapour phase & this vapour gets condensed into condenser. This condensed ammonia is used to cool the air in the condenser which is created due to suspension system. So we get cooling effect.

In this system we use generator which contain NH_3 & H_2O instead of compressor to run the AC system of cars. As we will be replacing compressor of AC system by generator, we save electricity which was used to run compressor. In this system we decrease the fuel consumption by 10% & also this system helps to reduce the depletion of ozone layer which mainly affect on environment.

This system divided in two systems, first is air conditioning system & another is suspension system.

Keyword: - *Generator, evaporator, exhaust gas temperature piston cylinder arrangement, heat exchanger , coefficient of performance, refrigerating effect, ammonia water absorption system.*

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1. INTRODUCTION

Exhaust gas energy is being invested in many forms. The first form is the most familiar and that is using it for supplying domestic hot water for residences which is the most worldwide spread form of exhaust gas energy use. We are trying to use this exhaust energy to run the AC system of automobile preferably car.

1.1 Need of the Project

To create a cooling unit, which will aid the billions of people without electricity that to environmental friendly.

1.2 Problem Defination

1 Our current four wheelers AC work on electrical energy by using refrigerant as FREON (a dichlorofluorocarbon) which consequently uses more petrol. So to overcome these disadvantages, we are

designing a system in which heat of exhaust gases is used & ammonia is used as refrigerant. Thus this reduces 10% of our current fuel consumption.

2 Our approach will be using the following cycle- Design—Implement—Check at every milestone of our project thus helping us to design the best system with more efficiency without compromising the safety.

1.3 Objective

1 Recover waste energy of suspension system and run air conditioning system.

2 Save fuel which burns for working of A.C.

3 To increase the mileage of vehicle.

1.4 Scope

This project will include design, analysis, material selection, manufacturing. Our area of research will be Design—Analysis—Implementation i.e. from start of the project (designing) to implementation of the mechanism as a working model which includes complete study of –

- Design of machine elements
- Material Selection
- Manufacturing
- Refrigeration and Air conditioning.

1.5 Expected Outcomes

Expected outcomes of the project will be—

- Reduction in consumption of electrical energy
- Reduced heat ejection
- Reduction in fuel consumption
- Negligible emission of harmful gases.

2. WORKING PRINCIPLE

When vehicle is run on bumpy road then suspension spring continuously move up and down. We attach piston to the vehicle frame because of linear motion of piston high pressure air comes out from cylinder. This high pressure air provide to air tank. In air tank high pressurized air is stored and when we want to turn on A.C. system this high pressurized air send to the heat exchanger by using knob. Low temperature coolant pass through the heat exchanger & also high pressurized air pass through it. Here heat exchange occurs and air temperature becomes 15 C to 20 C which is further send at the required place which is to be cooled.

When coolant comes out from heat exchanger its temperature is increased by few Celsius, then this coolant is send through exhaust gas system and its temperature become low and then it will again send to the heat exchanger. For better performance we can use nitrogen sealing. This is all about working of the A.C. system.

The machine does not contain any moving parts, does not consume any mechanical energy except for experimental purposes and is relatively easy to manufacture. Cylindrical tubes function as both the absorber system and the exhaustgas the condenser is air-cooled and the evaporator contains 40 l of water that can freeze. This ice functions as a cold storage for the cabinet.

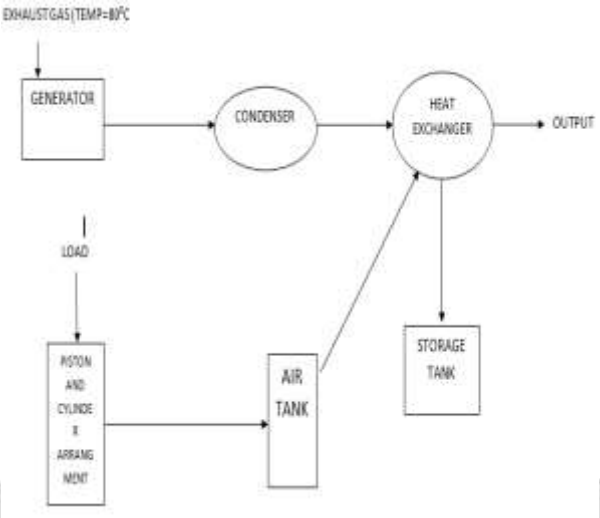

Fig. BLOCK DIAGRAM OF SYSTEM

3. WORKING OF EXHAUST GAS VAPOUR ABSORPTION SYSTEM

When adequate amount of force is applied on piston cylinder arrangement , air is compressed in cylinder & therefore air is stored in air tank.Externally heat is given to generator in which NH_3 & H_2o is present. Vapours of NH_3 are form after a certain time which are a paas through pipes and given to a condenser(water cooled). After condensation of vapour of NH_3, it is passed through the heat exchanger. In heat exchanger,compressed air is cooled i.e. exchange between NH_3 & air . Hence at the output, we get cooling effect.

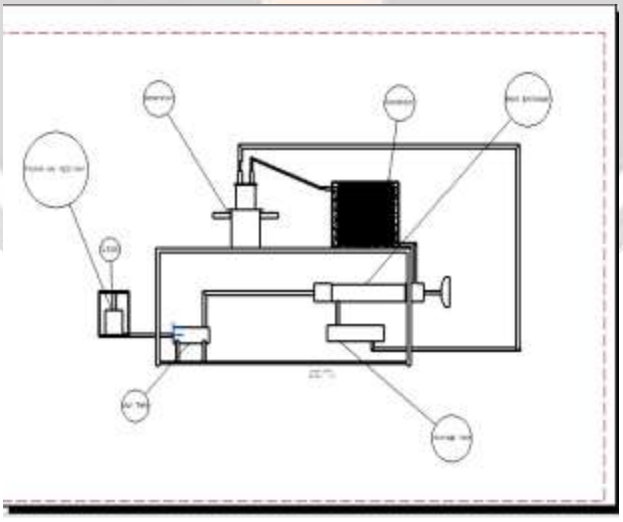

Fig. SETUP DIAGRAM OF EXHAUST GAS VAPOUR ABSORPTION SYSTEM

4 COMPONENTS OF EXHAUST GAS ABSORPTION SYSTEM

4.1 Generator

In the generator Exhaust heat will comes through the exhaust recovery system where ammonia liquid vaporise and temperature and pressure increases. Generator generally works same as compressor in VARS system. Generator is made up of stainless steel. It is drilled with the help of vertical drilling machine for fitting of electric heater. A heater is sealed to prevent the leakage of water ammonia mixture from generator. Another hole is made to upper part of generator for admitting the mixture of calcium carbide & ammonia from the pump placed in absorber. Third opening is made at the bottom for drain out the mixture from generator to absorber.

4.2 Shell and Tube Heat Exchanger

When the medium containing waste heat is a liquid or a vapour which heats another liquid, then the shell and tube heat exchanger must be used since both paths must be sealed to contain the pressures of their respective fluids. The shell contains the tube bundle, and usually internal baffles, to direct the fluid in the shell over the tubes in multiple passes. The shell is inherently weaker than the tube, so that the higher-pressure fluid is circulated in the tubes while the lower pressure fluid flows through the shell. When a vapour contains the waste heat, it usually condenses, giving up its latent heat to the liquid being heated. In this application, the vapour is almost invariably contained within the shell. If the reverse is attempted, the condensation of vapours within small diameter parallel tubes causes flow instabilities. Tube and shell heat exchangers are available in a wide range of standard sizes with many combinations of materials for the tubes and shells.

4.3 Condenser

The condenser is kept fully immersed in the barrel fully filled with water. Water is used as a coolant in the condenser barrel here because water has the best heat transfer properties than air. Any leakages can also be detected easily because of the bubbles formed in the water. The leakage of NH3 can also be absorbed by water so, the leakage of the refrigerant is not harmful to the material

4.4 Evaporator

An evaporator is a device used to turn the liquid form of a chemical into its gaseous form. The liquid is evaporated, or vaporized, into a gas. Evaporator cabinate is mounted on middle storey of the frame. It is made of thin metal sheet having internal tubes for circulating the refrigerant. It has two ports namely inlet & outlet port. Inlet port is connected to receiver and outlet port is connected to absorber.

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5. ADVANTAGES

1. It requires no power for its operation.
2. It is easy for maintenance.
3. It requires very no skill or no skill for its operation being the self activated.
4. It is multi-purpose.
5. It is cheap as compared to the conventional power generation unit.
6. Waste is utilized to produce the best.
7. So many installation locations having zero scarcity but ampleness of the space.

6. CONCLUSION

- The system is an absorption cycle based cooling process wherein it is primarily charged utilizing the sun to drive the Ammonia salt Absorption Cycle.
- Our system with refrigerant storage has the advantage of accumulating refrigerant during the hours of high exhaust gas isolation.
- Every aspect of absorption cooling technology is governed by the properties of working fluids. Hence the advent of new working fluids would enable completely different.
- Among the major working pairs available, NH_3-$CaCl_2$ is used considering its advantages over other working fluids.

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