International Journal of Latest Engineering Research and Applications (IJLERA) ISSN: 2455-7137

Volume – 02, Issue – 07, July – 2017, PP – 86-89

Utilizing mater of the waste heat source from engines

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Abstract: The internal combustion engine in addition plays the role of generating work for the engine, waste heat is extremely large. At the exploded stroke, the combustion chamber thermostats up to 2300-2500°C (for gasoline engines) and 1800-2000°C (for diesel engines). Therefore, the cooling units on both sides of the cylinder are important for the treatment and utilization of this waste heat, to maintain longevity and to ensure that engines operate at high efficiency.

Keywords: exhaust gas, high temperature, utilization, efficiency

I. INTRODUCTION

Today, internal combustion engines are used extensively and widely. Almost all fields, from agriculture, forestry, fishery to transportation, defense, aviation, use internal combustion engines as the main source of energy for vehicles. Since the 17th century, German engineers have successfully built a coal-fired internal combustion engine that laid the foundations for today's engines. In 1885, Daimler successfully built a gasoline-powered internal combustion engine. In 1897, Rudolf Diesel had succeeded in designing a heavy-duty diesel engine that was oil, creating a major turning point in mankind, as a precondition for the development of heavy industries, especially the automotive industry.

Internal combustion engines are thermal engines. In addition to the work, the amount of waste heat generated significantly affect the efficiency and longevity of the engine. So, we study "Some methods of salvaging internal combustion engine exhaust gas" to treat and utilize this amount of waste heat to help the engine get better efficiency, save fuel, and respond. Applicants are required today's environmental issue. When the engine is working, the parts that come in contact with the combustion gases will heat up. Thus, their temperature will increase drammatically (more than 400-500oC). In order to ensure the durability of the machine parts as well as the viscosity of the lubricant at the best value, and to keep the combustion temperature of the fuel in the engine without the occurrence of condensation in the cylinder, so we must cool the engine.

During operation, the temperature from the combustion chamber generates hot water. Hot water has a small density so it easily floats and goes out to the cooler. Here, the water is cooled by a pulley driven fan from the crankshaft of the engine exhausting the air through the heat sink. After heat dissipation, water has its own mass increasing and going down to the bottom of the tank and then cooling the engine to create a closed cycle.

Function of the system: Radiators from engine parts such as: piston, cylinder, cylinder cap, soupap… in order that they do not overload the heat; Helps maintain the lubricating oil temperature to a certain extent for the best lubrication; Extend engine life-long; Protection against corrosion due to heat, anti-pitting inside the engine; Coolant must be clean, free of impurities as well as metal corrosives, The cooling water temperature is not too low nor should it be too high. Usually around:

For high speed motors: T_{out} - T_{in} = 5-10°C

For low speed motors: T_{out} - T_{in} = 10-30°C

Water should be cooled from low temperature to high temperature.

Heat engine treatment as lubricant

After a period of work, labor generated from the combustion process, due to friction losses, becomes heat. This heat causes the temperature of the bearing to rise very high. If the lubricant is not applied, the friction surfaces will heat up to the maximum allowable temperature, which will melt the abrasion-resistant alloys. Lubricants in this role play the axial cooling role, the heat generated by the friction generated from the bearing, ensuring the normal working temperature of the bearing. Compared with water, the thermal conductivity of the lubricant is very small: 0.0005 cal/oC.g.s, of water is 0.0015 cal/oC.g.s. This means that the heat recovery capacity of the oil is very small. However, water can not replace the function of lubricant, as it depends on some other physical and chemical properties. Therefore, to lubricants to promote the cooling effect of friction surfaces. The lubricant lubricant requirement of the lubrication system must give the friction surfaces a sufficiently large amount of oil.

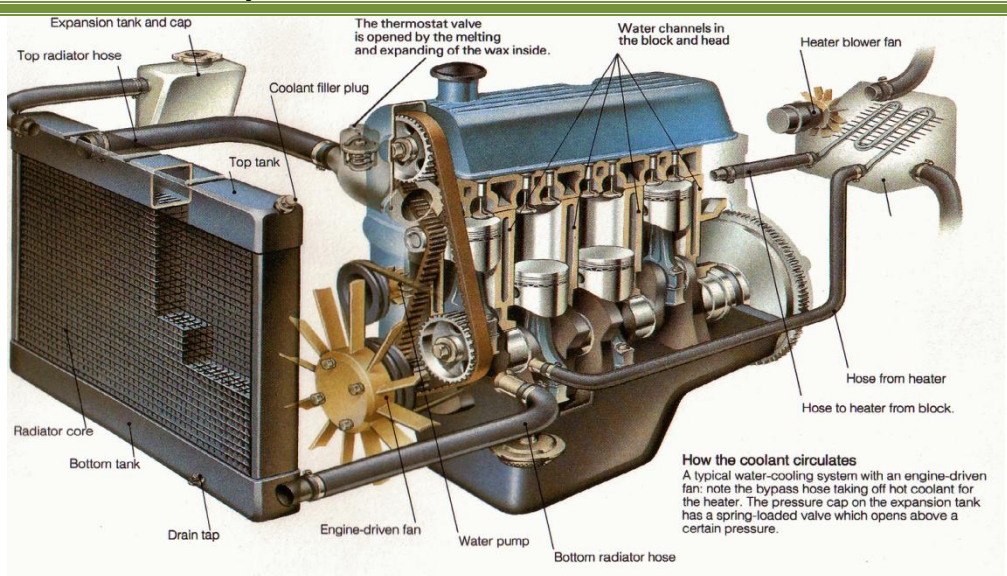

Figure 1. Work diagram of the cooling system in the vehicle

Working Principle

The lubricant contained in the crankcase is pumped by the oil sucked through the filter float from the bottom of the machine to the filter filter and then into the main oil line in the body to lubricate the main shaft of the crankshaft. A portion of the oil from the main bearings, which flows through the oil holes drilled inside the crankshaft, to the bar bearings. This oil continues to flow through the oil slots of the nozzle into the transmission parts, lubricating the piston, cylinder, piston and silver head of the rod ... (if in the body of the oil pass the oil along the path This comes to the lubrication of the piston pin and the silver end of the rod and then sprays the hole above the small end to cool the top of the piston). At the same time, oil along the oil groove to lubricate the camshaft bearings and the oil groove on the bonnet to lubricate the transmission parts. After circulation through all lubrication components, the oil returns to the crankcase. In the oil filter is equipped with safety valve, when the filter is blocked by dirty, oil pressure will open this valve to the oil off the main oil filter. Pressure and oil temperatures are the pressure gauge and the oil temperature indicator. When the oil temperature exceeds 80oC, the viscosity decreases, and the control valve opens to lubricate the oil through the cooling tank. The pressure control valve ensures that the oil pressure in the system is stable regardless of engine speed.

Reducing friction increases the performance of the machine and its components.; Protect details from rust; Continuous cleaning of machine parts; Reduced wear on parts; Ensure friction of the friction unit; In addition, the oil-cooled system has another important function of cooling the engine.

II. SOME METHODS OF UTILIZING THE WASTE HEAT

1. Utilize waste heat for absorption refrigerator

Today, car engines and cars are growing. Accompanying the development of the engine, people also go along the development that is the features of the car. And the automotive cooling system is among them. Today, we will learn about one of its important steps. It's an absorption chiller system that uses heat from the engine exhaust. The heat potential of the exhaust gas has been analyzed and found to be sufficient to supply the air conditioning system, which is an environmentally friendly method. With just a little ac energy, combined with the amount of exhaust heat we can operate the car's cooling system. In the case of cars with large amounts of heat at the front of the vehicle, about 25% of the total amount of heat supplied is quite high with very high exhaust emissions and about 25% is quite high with coolant. Therefore, if the waste heat can be used to power the air conditioning system will save and fuel energy can be used effectively.

When the engine is working, the heat will radiate rather high, the heat generated will be absorbed by the generator and the generator of the chiller plant system including the generator, the absorber, the condenser and the pump cage. And make the car cooling system operate.

Absorption of exhaust fumes from the high-temperature conversion engine to low temperature for the chiller. Reduce the temperature of the exhaust at the internal combustion engine, increasing engine power. Reducing environmental pollution by absorbing heat from exhaust fumes. Save on refrigeration costs.

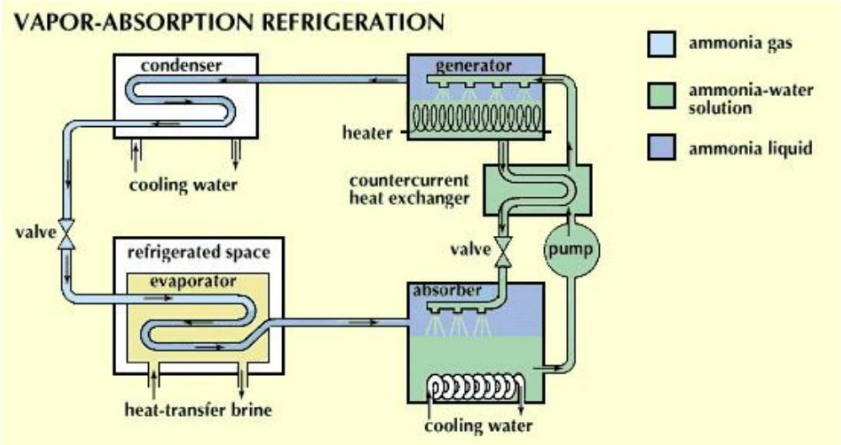

Figure 2. Vapor absorption refrigerator

In general, the absorption chillers, as well as the compressed air vapor compressors (VCVs), only replace compressors with generators capable of absorbing heat. The absorption cycle based on the principle of liquid ammonia absorption is reduced by vapor pressure. Heat is applied to generators, including Ammonia solution, ammonium rich. The basic activity of the ammonia absorption cycle is as follows: The high-pressure ammonia from the generator is fed into a condenser into a high-pressure liquid that releases 1 heat, which generates a heat that can be used for dykes. Heating or providing heat for the generator at the next cycle. High-pressure liquid ammonia continues to undergo a pressure drop, where it is fed to the evaporator, where the liquid at low pressure is boiled or evaporated. This vapor will provide a mistaken refrigeration product for automotive conditioning (usually at 10 degrees Celsius). Besides, it also has the function of taking the heat of automobile parts to increase productivity of the engine. Low pressure ammonia is now fed back into the generator with a pressure boost pump to re-cycle the system.

In the absorption chiller system as shown in the figure, the compressor is replaced by an absorber, pump, generator and pressure reducing valve. These components in the system perform the same function as the compressor in the VCR system. The coolant will be put into the absorber, which contains water (Pure) absorbs and transfers heat and supplies water to the condenser for heat from the liquefaction process. Water absorbed will pass through a capacitor to prevent it from being suspended during the absorption. Then returned to the transmitter to resume the cycle. The water will be weekly powered by the energy pump described above.

2. Utilize the heat source for mini generators

The issue of fuel economy in most transportation vehicles is what puts people at the top. At present, scientists in the world are both Vietnam is always looking for and invent different sources of energy to be able to replace the resources are gradually depleted. Scientists have come up with alternative sources of energy: gas, alcohol, hydride, etc. However, these types of energy are not popular for a variety of reasons. Thus, in order to make full use of the fuel, exhaust emissions are high and the use of this energy source is of great interest to mini generators.

Thermoelectric generators consist of three major components: thermoelectric materials, thermocouples and thermoelectric systems combined with heat sources. Thermoelectric Materials: Thermoelectric materials generate electricity directly from heat by converting the difference in temperature into a voltage. These materials must have high conductivity (σ) and low thermal conductivity (κ) to become a good thermoelectric material. Low thermal conductivity ensures that when one side is hot, the other side remains cold, creating a great voltage.

Thermoelectric module: A Thermoelectric module is a circuit that contains thermoelectric materials that generate electricity from direct heat. A thermal power module consists of two dissimilar materials in their ends: one type n (negatively charged); And semiconductor type p (positively charged). A direct current flows in the circuit when there is a difference in temperature between the two materials. In general, the current intensity is proportional to the temperature difference.

Thermoelectric systems: Using thermoelectric modules, a thermoelectric system generates energy by taking heat from the source. To do that, the system needs a large temperature gradient, which is not easy in actual applications. The cold side must be cooled by air or water. The heat exchanger is used on both sides of the modules to provide heating and cooling.

Figure 3. A heat exchanger that releases waste heat from the vehicle's exhaust system into electricity can improve fuel economy

III. CONCLUSION

A particular automobile engine emits a lot of emissions. About one-third of heat is lost through heat transfer into the environment. Utilizing waste heat will contribute to reducing engine friction, which has the potential to reduce fuel consumption. Initial tests of the system have shown energy savings of up to 7% as well as reduced emissions. The researchers believe that the system, called OVER7, is a clever approach to motor vehicle design. One of the most important features of this system is that it does not have to heat all of the oil in the oil but rather heat the active oil in the engine lubrication system by using the excess oil. The ring is connected from the cylinder head directly to the oil pump, or the oil pipe.

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