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Air conditioning powered by engine exhaust

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Abstract--- The conventional automobile air conditioning system draws power from the engine. This project aims at introducing a turbo charger in order to transform the kinetic energy of the exhaust gas in to useful power to run the compressor of the AC system. This avoids the extraction of power from the engine.

Keyword— Exhaust gas, Turbocharger, Generation of rotary motion from exhaust, Exhaust energy recovery

I. INTRODUCTION

Today, energy crisis and environmental pollution have become two primary problems which are concerned by the countries all over the world. As one of the largest consumers of oil and also the largest pollutant emission sources, IC (Internal Combustion) engine becomes an important object for energy saving and emission reduction. At present researchers mainly focus on following two aspects for reducing energy crisis and relieving polluting gases. One is the research on IC engine alternative fuels owing to the shortage of petroleum resources and the soaring oil prices; the other is to explore new technologies for IC engine energy saving, including the technologies for IC engine waste heat recovery.

Nowadays climate changes are becoming unpredictable. Average atmospheric temperature is increasing at a significant rate. We find it difficult to cope up with the sudden changes in the weather conditions hence the need for an efficient air condition system is increasing. So, the present automobile AC system is hence more often put use. This situation demands for an improvement in the contemporary system. The increasing fuel prices are also one of our main concerns. The power required for the working of the AC system is usually drawn from the automobile engine, which in turn results in increased fuel consumption. A recent comprehensive study of fuel consumption for vehicle AC on a state-by-state basis using thermal comfort based approach shows that US uses an estimated 7 billion gallons of gasoline every year for air conditioning vehicles. This is equivalent to 6% of domestic petroleum consumption, or 10% of US imported crude oil. The study further shows that vehicle air conditioning loads are the most significant auxiliary loads and outweighs even other significant loads such as rolling resistance, aerodynamic drag or driveline losses. The fuel economy of vehicle drops substantially when the AC compressor load is added to the engine. The AC increases the fuel consumption of a conventional gas-fuelled car by approximately 35% and significantly higher for hybrids. So energy efficient air-conditioning systems are getting significant attention from the automotive industry to improve fuel economy of their vehicles. These situations led us in a search for an alternative powering solution for the automobile air-conditioning system, which does not extract power directly

II. METHODOLOGY

An AC system consists of a compressor, condenser, expansion valve and evaporator. Here we are introducing a turbocharger to the system which is driven by the engine exhaust. Turbocharger runs the centrifugal compressor. That is drop in enthalpy gain in kinetic energy of the exhaust is used to run the gas turbine which in turn runs the compressor by a shaft. The high pressure and compressor temperature vapour refrigerant from the compressor is transferred to the condenser. Condensed refrigerant is in the form of liquid (Latent heat of condensation), slight drop in pressure (negligible), change in its phase from vapour to liquid. The refrigerant then made to expand in the hand operated expansion valve to ensure pressure drop drastically very close to atmosphere pressure. The low pressure and expansion temperature liquid refrigerant then enter into the evaporator absorb heat from the cooling space their by undergoing the change from liquid to gaseous state (Latent heat of vaporisation). This change of phase equals the amount of heat absorbed resulting in cooling of the space (refrigerating effect).

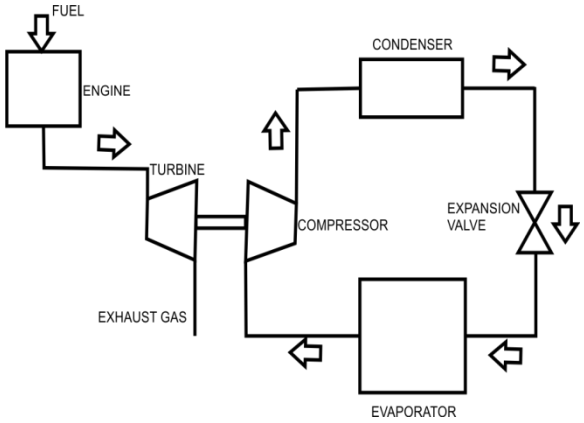

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Figure: circuit diagram

III. RESULTS AND CONCLUSIONS

In this work the conventional AC system is studied in detail and come to a conclusion that the air conditioning system uses the power from the engine shaft and reduces the mileage. The major advantage of the "air conditioning powered by engine exhaust" is the system uses the kinetic energy of the exhaust to run the compressor, it offers a better utilisation of exhaust. By using the exhaust run the compressor and can achieve the cooling. The project not only aims to reduce the cabin temperature but also to increase the mileage. An acceptable alternative for increasing the mileage of the vehicle is the air conditioning powered by engine exhaust. The assembled components of AC system are attached to the single cylinder engine by using flanges and connectors. And the system is run for 15 minutes and achieved a cooling rate of 2-4 degree Celsius. The condensing temperature is about 38 to 40 degree Celsius and evaporator outlet temperature varies between -12.22 to 10 degree Celsius. In which waste heat recovery from the exhaust is done effectively with the muffler noise reduction. By adopting this system there is a reduction in the fuel consumption rate in turn.

Final setup

IV. ACKNOWLEDGMENT

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