International Conference on Advances in Materials, Computing and Communication Technologies
In Association with International Journal of Scientific Research in Science and Technology
Volume 9 | Issue 1 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)

Experimental Investigation on Air Preheating System Using Waste Heat in Automobile

Vignesh S[1], Manikandan S[2], Sasikumar R[3], Senniangiri N[4]

[1]PG Student, M.E. Manufacturing Engineering, Erode Sengunthar Engineering College, Erode, Tamil Nadu-638057, India

[2]Assistant Professor, Department of Mechanical Engineering, Erode Sengunthar Engineering College, Erode, Tamil Nadu-638057, India

[3]Associate Professor, Department of Mechanical Engineering, Erode Sengunthar Engineering College, Erode, Tamil Nadu-638057, India

[4]Assistant Professor, Department of Mechanical Engineering, Nandha College of Technology, Erode, Tamil Nadu-638052, India

ABSTRACT

Generating electricity in present there is a shortage of fossil fuel, oil, exhaust gas, etc. An attempt has been made in this project, the exhaust gas is used to rotate the generator and this electrical energy is stored in a battery. It is also good with regard to economic considerations and engine efficiency. Burning of these fuels causes environmental problem like radio activity pollution, global warming etc. So that these (coal, oil, gas) are the limiting resources hence resulting new technology is needed for electricity generation, by using thermoelectric generators to generate power as a most promising technology and environmental free and several advantages in production. Thermoelectric generator can convert directly thermal (heat) energy into electrical energy.

I. INTRODUCTION

The output of the engine exhaust gas is given to the input of the generator blades, so that the electrical energy produced. This electrical energy is used to store the battery. This power, the alternate power must be much more convenient in availability and usage. The next important reason for the search of effective, unadulterated power are to save the surrounding environments including men, machine and material of both the existing and the next fourth generation from pollution, the cause for many harmful happenings and to reach the saturation point. The most talented power against the natural resource is supposed to be the electric and solar energies that best suit the automobiles. The unadulterated zero emission electrical and solar power, is the only easily attainable alternate source. Hence we decided to incorporate the solar power in the field of automobile, the concept of many Multi-National Companies (MNC) and to get relieved from the incorrigible air pollution.

II. LITERATURE REVIEW

1. Matthieu Cosnier ET al presented an experimental and numerical study of a thermoelectric air-cooling and air-heating system. They have reached a cooling power of 50W per module, with a COP between 1.5 and 2, by supplying an electrical intensity of 4A and maintaining the 5°C temperature difference between the hot and cold sides.
2. Suwit Jugsujinda ET al conducted a study on analyzing thermoelectric refrigerator performance. The refrigeration system of thermoelectric refrigerator (TER; 25 × 25 × 35 cm3) was fabricated by using a thermoelectric cooler (TEC; 4 × 4 cm2) and applied electrical power of 40 W. The TER was decreased from 30 ºC to 20 ºC for 1 hr and slowly decreasing temperature for 24 hrs. The maximum COP of TEC and TER were 3.0 and 0.65.
3. Wei He et al Conducted did Numerical study of Theoretical and experimental investigation of a thermoelectric cooling and heating system driven by solar. In summer, the thermoelectric device works as a Peltier cooler when electrical power supplied by PV/T modules is applied on it. The minimum temperature 17 degree C is achieved, with COP of the thermoelectric device higher than 0.45.Then comparing simulation result and experimental data. Riff and Guoquan 4Conducted an experimental study of comparative investigation of thermoelectric air conditioners versus vapour compression and absorption air conditioners. Three types of domestic air conditioners are compared and compact air conditioner was fabricated.
4. Riffat and Qiu compared performances of thermoelectric and conventional vapor compression air-conditioners. Results show that the actual COPs of vapor compression and thermoelectric air- conditioners are in the range of 2.6-3.0 and 0.38-0.45, respectively. However, thermoelectric air conditioners have several advantageous features compared to their vapor-compression counterparts.
5. Astrain, Vian & Domınguez conducted an experimental investigation of the COP in the thermoelectric refrigeration by the optimization of heat dissipation. In thermoelectric refrigeration based on the principle of a thermo syphon with phase change is presented. In the experimental optimization phase, a prototype of thermo syphon with a thermal resistance of 0.110 K/W has been developed ,dissipating the heat of a Peltier pellet with the size of 40*40*3.9 cm , Experimentally proved that the use of thermo syphon with phase change increases the coefficient of performance up to 32%.
6. Shen, Xiao et al investigated a novel thermoelectric radiant air-conditioning system (TE-RAC). The system Review Paper on Thermoelectric Air-Conditioner Using Peltier Modules employs thermoelectric modules as radiant panels for indoor cooling, as well as for space heating by easily reversing the input current.

III. COMPONENTS AND DESCRIPTION

The components that are used in the project EXPERIMENTAL INVESTIGATION ON WASTE HEAT HARVESTING SYSTEM IN AUTOMOBILE USING CATALYTIC CONVERTER are as follows,

1. CATALYTIC CONVERTER
2. EGR

3.1. CATALYTIC CONVERTER

A catalytic converter is an exhaust emission control device that reduces toxic gases and pollutants in exhaust gas from an internal combustion engine into less-toxic pollutants by catalyzing a redox reaction (an oxidation and a reduction reaction).

3.2. EGR

The NOx emissions reduction technique lies within the engine, wherein the engine re-circulates a portion of the exhaust gas back to the engine cylinders depriving it of certain amount of oxygen thereby leading to lower temperature burn.

IV. PRODUCT DESCRIPTION

4.1. WHY?? Mild steel???

The term ‘mild steel’ is also applied commercially to carbon steels not covered by standard specifications. Carbon content of this steel may vary from quite low levels up to approximately 0.3%. Generally, commercial ‘mild steer’ can be expected to be readily weldable and have reasonable cold bending properties but to specify ‘mild steel’ is technically inappropriate and should not be used as a term in engineering. Mild steel is the most widely used steel which is not brittle and cheap in price. Mild steel is not readily tempered or hardened but possesses enough strength.

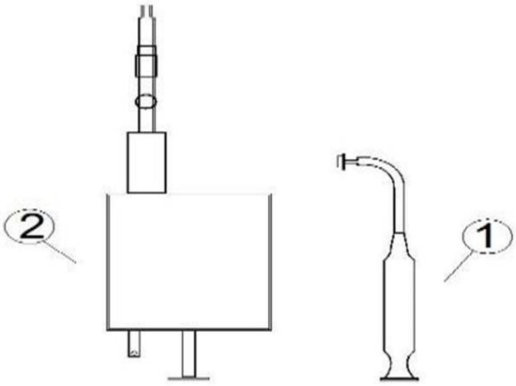
4.2. Mild steel Composition

- ✓ Mild steel contains –C45
- ✓ Carbon 0.35 to 0.45 % (maximum 0.5% is allowable)
- ✓ Manganese 0.60 to 0.90 %
- ✓ Silicon maximum 0.40%
- ✓ Sulfur maximum 0.04%
- ✓ Phosphorous maximum 0.04%
- ✓ Mildest grade of carbon steel or mild steel contains a very low amount of carbon - 0.05 to 0.26%
- ✓ Tensile strength – 63-71 kgf/mm2
- ✓ Yield stress -36 kgf/mm2
- ✓ Izod impact valve min -4.1 kgf m
- ✓ Brinell hardness (HB) - 229

V. WORKING PRINCIPLE

The project consists of EGR & catalytic converter. The function of the catalytic converter to reduce the emission control of the exhaust gas from the engine which the EGR helps to recirculate the waste heat produced in the exhaust system.

VI. 2D DRAWING



1.CATALYTIC CONVERTER
2.EGR (EXHAUST GAS RECIRCULATION)

VII. CONCLUSION

A strong multidiscipline team with a good engineering base is necessary for the Development and refinement of advanced computer programming, editing techniques, diagnostic Software, algorithms for the dynamic exchange of informational different levels of hierarchy.

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work.

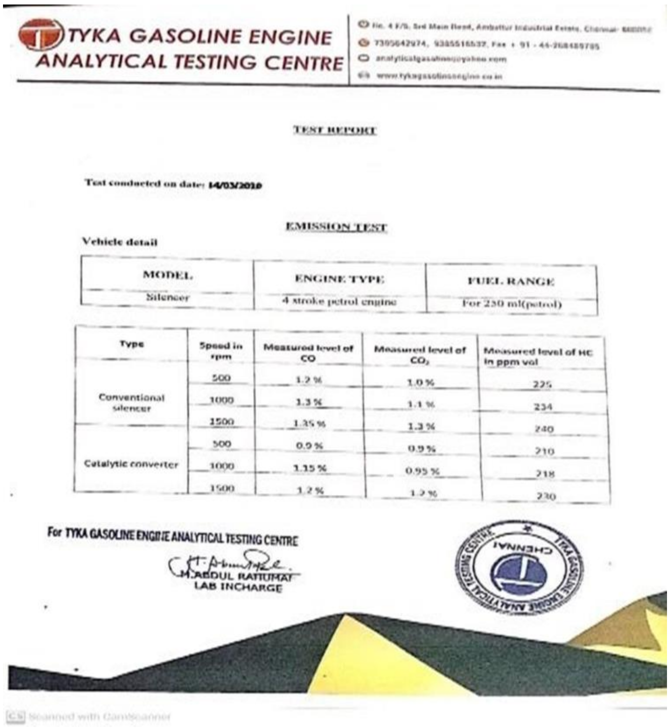
We are proud that we have completed the work with the limited time successfully. The “EXPERIMENTAL INVESTIGATION ON WASTE HEAT HARVESTING SYSTEM IN AUTOMOBILE USING CATALYTIC CONVERTER” is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality.

We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work. Thus we have developed a “EXPERIMENTAL INVESTIGATION ON WASTE HEAT HARVESTING SYSTEM IN AUTOMOBILE USING CATALYTIC CONVERTER”. By using more techniques, they can be modified and developed according to the applications.

VIII. REFERENCES

[1]. Manufacturing technology (Machine Processes & Types)-G.K.Vijayaraghavan.
[2]. Engineering economics & cost analysis (Cost of Material)-S.Senthil, L.Madan, N.Rabindro Singh.
[3]. Design data book -PSG College of technology
[4]. Strength of materials-R.S Kurmi

IX. TESTING REPORT



TYKA GASOLINE ENGINE ANALYTICAL TESTING CENTRE

TEST REPORT

Test conducted on date: 14/03/2019

EMISSION TEST

Vehicle detail

MODEL	ENGINE TYPE	FUEL RANGE
Silencer	4 stroke petrol engine	For 230 ml(petrol)

Type	Speed in rpm	Measured level of CO	Measured level of CO_2	Measured level of HC in ppm vol
Conventional silencer	500	1.2 %	1.0 %	225
	1000	1.3 %	1.1 %	234
	1500	1.35 %	1.3 %	240
Catalytic converter	500	0.9 %	0.9 %	210
	1000	1.15 %	0.95 %	218
	1500	1.2 %	1.2 %	230

For TYKA GASOLINE ENGINE ANALYTICAL TESTING CENTRE

M.ABDUL RAHUMAT
LAB INCHARGE

X. PHOTOGRAPH OF THE MODEL