International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878, Volume-8 Issue-4, November 2019

Performance Characteristics of VCR Engine by Adding Waste Plastics Oil to Diesel

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Abstract*: The waste plastics are collected at India in every year nearly 10 tons per day. The waste plastic has affects the humans being, house animals, birds and see foods earth and environment. The period of plastic decay may be taking nearly 1000 years. These waste plastics are used for filling purpose, or it may dump in back water area and ocean. But this technology process is recycling of these all type waste plastic in pyrolysis method. The pyrolysis methods the waste plastics are to heating the waste material in the vacuum chamber. In this study state condition 650 Celsius temperature need for melting and vaporizing. It condensed to make a fuel from waste plastics. It works like conventional fuel. This type of system can helping to reduced amount of waste plastic and can be provide 60% oil for gasoline to vehicles. The fuel does not emit any emission gases. It increases engine efficiency. This will be residue 5% of carbon block. The plastic oil will be mixed with diesel in some percentage like 5%, 10%, 20% and added with some additives, this additive is increase the engine performance, combustion characteristics and reduce emission. By making the use of pyrolysis technique, the levels of smoke is reduced which is verified by the experimental results. Brake Thermal Efficiency (BTE) also high when compared convention fuel. The pollutants such as carbon monoxide and NOx are presented in the waste plastic which is reduced by the proposed methods and it is observed that addition of oxygenates enhanced the combustion process

***Keywords* : VCR engine, AVL analyzer, and Smoke Meter**

I. INTRODUCTION

This process is converting the plastic into bio-fuel products. It is the fundamental technique of bio fuel product [1]. The principle of this process is the waste plastic materials have basically of hydrogen and carbon [2-3].

This waste plastic is formed in chains of Hydro-Carbon (HC) atoms which have link with heavily bonded molecules. Oil from the waste plastic is a complex mixture of HC, that has to be separated with purify in distillation process method [4]. The plastic compound structures have length hydrocarbon chain atoms, so it cannot break that compound chain of the atom. But it can be brake easily by mixing some additives and brake [5]. Plastic is a polished fraction of raw oil, or chemicals derived from raw oil system is called as monomers. Reaction of monomers leads to form polymers, which are extended structure atoms [6]. A small amount of polymers has oxygen in polyethylene terephthalate whereas others contain polyvinyl-l chloride (PVC) it is prepared from vinyl chloride in terms of chlorine, and it is processed with a small proportion of that raw oil which has used to produce the monomers in ethane propene utilized in the manufacture [7-8] of polymers in poly-ethene (commercial polymer), and polypropylene produce the plastic oil.

Manuscript published on January 30, 2020.
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II. PROPOSED SYSTEM

The engine setup have variable compression ratio type engine. This engine power is 3.54 kW and its engine speed is 1450 rpm. VCR diesel engines have a separate fuel tank for both diesel and petrol. It is useful to taking reading with a Fuel Switching System (FSS). In diesel tank, initially diesel is filled, and then the petrol is filled, and check the fuel consumption is measured by sensor. A Differential Pressure Sensor (DPS) is used to measure airflow quantity in the engine. It is mounted on head of the engine which measures the combustion pressure. By changing the eddy current resistance value of dynamometer which controls the engine speed and engine load. The AVL exhaust gas analyzer and smoke meter are used for measuring the emission parameters of the exhaust gas and smoke intensity respectively in VCR Engine. Figure 1 and 2 shows the VCR engine workflow.

1. Eddy Current Dynamometer.
2. Fuel Pump.
3. VCR Arrangement.
4. Air Stabilizing Tank.
5. Air Filter.
6. AVL Smoke Meter
7. AVL Di-gas Analyzer

Fig. 1.VCR Engine

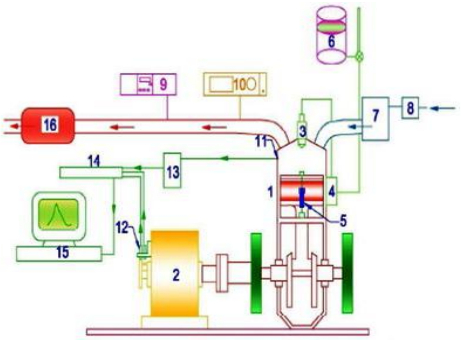

Fig. 2.VCR Engine workflow

III. RESULTS AND DISCUSSION

This graph shows the NOx emission by AVL GAS Analyzer. Depent of the variation of load that curve has to be change. The maximum emission accord at load for diesel is 320 ppm,and plastic oil has - 280 ppm. When compared to diesel with plastic oil fuel less NOx emission. Figure 3 shows the versus.

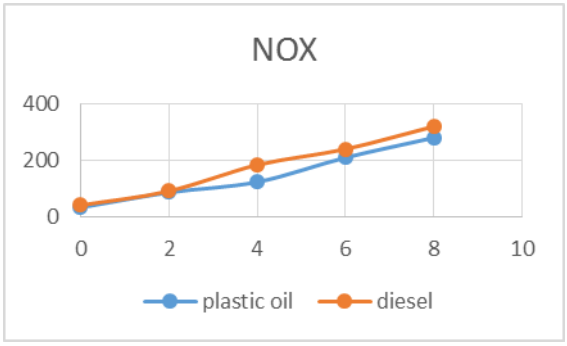

Fig. 3.Load vs NOx

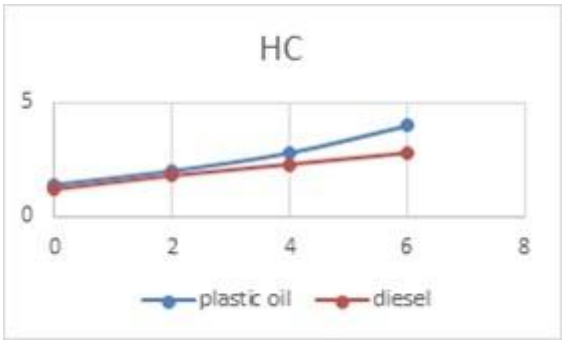

Fig 4. Load vs HC

This graph shows the HC emission by AVL GAS Analyzer. Depent of the variation of load that curve has to be change. The maximum emission accord at load for diesel is3.1 ppm,and plastic oil has – 3.6 ppm. When compared to diesel with plastic oil fuel little bit higher HC emission. Figure 3 shows the versus.

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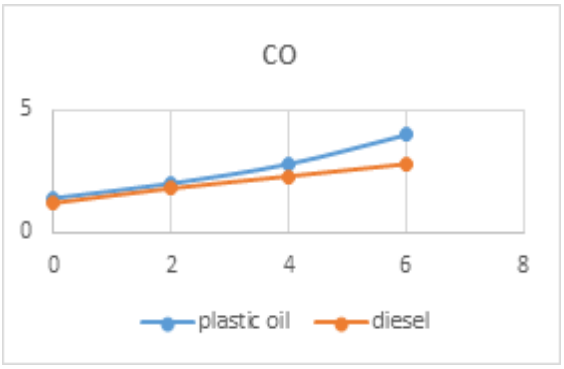


Fig. 5Load vs CO

This graph shows the CO emission by AVL GAS Analyzer. Depent of the variation of load that curve has to be change. The maximum emission accord at load for diesel is3.4 ppm,and plastic oil has – 3.8 ppm. When compared to diesel with plastic oil fuel little bit higher CO emission. Figure 3 shows the versus.

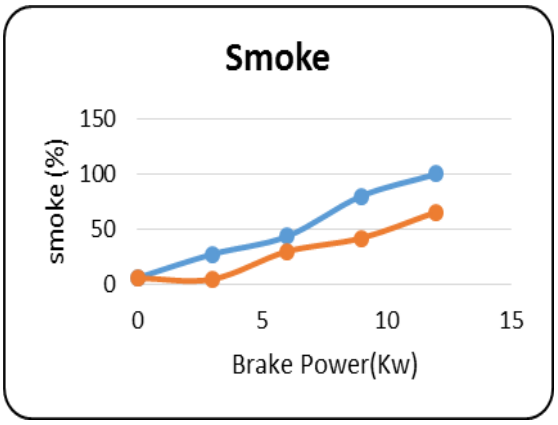
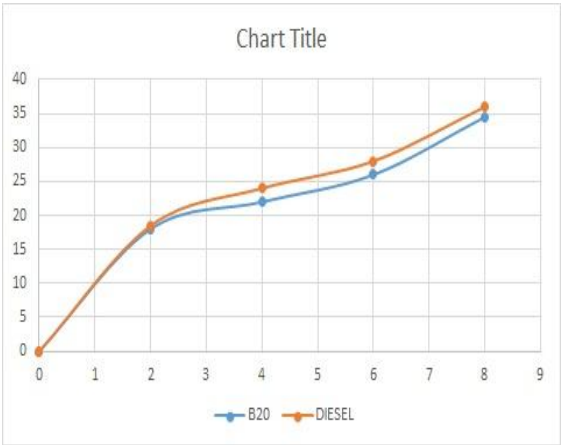


Fig .6 Load vs Smoke Opacity

This graph shows the smoke density emission by AVL GAS Analyzer. Depent of the variation of BHP that curve has to be change. The maximum emission accord at BHP for diesel is 75ppm,and plastic oil has – 84 ppm. When compared to diesel with plastic oil fuel little bit higher smoke density emission.

.MECHANICAL EFFICIENCY



This graph shows the η_{MECH} by VCR engine. Depent of the variation of load that curve has to be change. The maximum η_{MECH} accord at load for diesel is 33%,and plastic oil has 36%, When compared to diesel with plastic oil fuel less NOx emission. Figure 3 shows the versus.

IV. CONCLUSION

The VCR Engine setup has did not do any major modifications on experiment l setup and it gives performance result in such way of this process. BTE for the blend has higher when compared gasoline fuel. This blended fuel emission of CO has to be decreased compared to diesel and also NOx emissions. These engine parameters like performance test, gas analyzer, and smoke test of a compression ratio engine with different blend ratio fueled compared with that of diesel. This may be due to better combustion, and increase in the energy content of the blend. The maximum brake power obtained for B20. The emission of NOx from the B20 of plastic oil blend with diesel is lower than that of diesel. The experimental result also proves that lower and medium percentages of waste plastic oil can be substituted for diesel fuel.

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