INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

SPECIAL ISSUE FOR
NATIONAL LEVEL CONFERENCE
"Technology Enabling Modernization of Rural India (TMRI- 2018)"

AN EXPERIMENTAL INVESTIGATION TO REDUCE NOX AND PM EMISSIONS FROM CI ENGINE

VINAY SONI[1], AMIT TIWARI[2], DR. NEERAJ KUMAR[3]

1.M. Tech Scholar, Department of Mechanical Engineering, Suresh Gyan Vihar University, Jaipur, India.

2.Asst. Prof, Department of Mechanical Engineering, Suresh Gyan Vihar University, Jaipur, India.

3.Prof and HOD, Department of Mechanical Engineering, Suresh Gyan Vihar University, Jaipur, India.

Accepted Date: 19/03/2018; Published Date: 01/04/2018

Abstract: In this paper we are focusing on reducing the Nox percentage by applying different methods such as used chemical agents for improved the cetan number of diesel engine due to the fuel quality is improved and emission chances is less. One of the major reasons for incomplete combustion of fuel is carbon deposition is present in chamber which causes the stroke is not completed properly. We found during investigation NOx percentage is high in emission of gases due to this efficiency of CI engine is reduced. Some techniques are used for solving this issue by adding ethanol and butanol chemicals.

Keywords: Ethanol, Butanol and experimental setup

Corresponding Author: VINAY SONI

Access Online On:

www.ijpret.com

How to Cite This Article:

Vijay Soni, IJPRET, 2018; Volume 6 (8): 134-139

PAPER-QR CODE

INTRODUCTION

The strategies and procedures to diminish emanation of contaminations from inner burning motors as a rule diminish its execution. Considering the inconceivability of a transient adjustment in the present norms of vitality utilization, the best route for decreasing natural effects depends on chemical agents. It apply implies, for the momentum level of innovation, to limit entropy age. In particular, for inward burning motors, a sensible arrangement is the decrease on contamination development by controlling some ignition parameters in such way that motor execution is kept unaltered. A compelling route for diminishing nitrous oxide (NOx) outflows might be expert by changing the motor burning procedure through the reusing of depleted gases. This procedure is proficient by adding burning items to the crisp fuel-air blend amid the admission procedure. This innovation is known as Exhaust Gas Recirculation (EGR) and has been connected in both start motors and pressure start motors. The nearness of latent atoms lessens the temperature and the burning weight repressing the arrangement of NO by the warm instrument, and builds the explosion resistance, (Heyhood, 1998).

ETHANOL

Most of the energy we use is achieved from the fossil fuels. Regular leaps in the fossil fuel prices requirement of the neat energy is also boosting. Therefore we need an alternative fuel such as biogas, vegetable oil, natural gas etc. Many researches has already been done on the ethanol to be used in the IC engines and its characteristics are compared to gasoline. It enhances the compression ratio and performance of the engine because of its high flammability temperature, evaporation heat and octane number.

BUTANOL

The research to make the bio butanol a cost competitive product against the fossil fuel is presently going on and yet no satisfactory results have been found. The calorific value of gasolie is 42.9 MJ/kg, whereas butanol has 33 MJ/Kg and ethanol has 26.8 MJ/kg. This lead the butanol near to gasoline that it can prove itself a replacement to gasoline in the energy field.

FLEX-FUEL VEHICLE (FFV)

In Italy, nine distinct ethanol both hydrous and anhydrous are employed in flex-fuel automotive over a ceremony of World Test cycle. When ethanol was implemented in 75 and 85 percent proportions with gasoline, the NOx emissions decreased to 30 to 55% and CO2 emissions amplified for the 10, 15, 20 percentage ethanol blends.

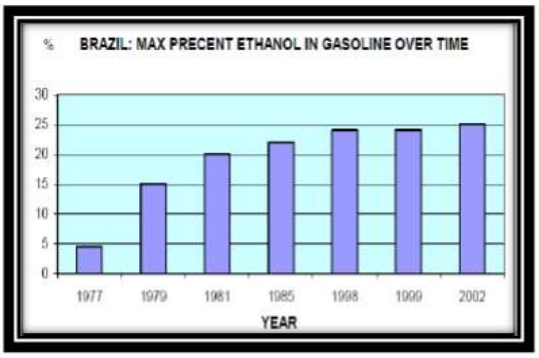

Fig 1. Ethanol Utilization over-time

EXPERIMENTAL APPARATUS AND METHODOLOGY

The exploratory mechanical assembly involved a water powered dynamometer with the helper instruments permitting a total checking of the primary motor parameters, for example, torque, control, fuel utilization, air utilization, temperature and related weights. A gas analyzer was utilized for estimating the centralizations of CO2, CO, O2, NOx and unburned hydrocarbon, in the burning items. This analyzer additionally gave the air-fuel proportion in light of the convergence of some particular gases in the fumes framework. The dynamic weight inside the chamber was additionally estimated. The sensor was introduced in the chamber head as an intend to track thumping event. The essential component was a piezoelectric sensor with an operational band from 0 to 250 bar. This component was related to a framework set for securing and information treatment. The flag got by the sensor was increased and handled by a dynamic flag analyzer. This framework was in consistence with the ISO TAG4/WG3 (1999) and the Vianna et al. (1999), techniques for information securing. For frequencies, the most

Fig 2. Test Rig

extreme vulnerability was 1.96% of the deliberate an incentive up to 1.2 kHz and of 3.2% for frequencies running in the vicinity of 1.2 and 1.6 kHz. The tests were isolated in three phases. The principal arrange led in a normally suctioned motor, for which the pressure proportions were set to both 8.12:1 and 8.9:1. Tests were additionally led with turbocharging, Test 3 and 4. These tests, under full load, permitted the appraisal of the impact of the fumes gas distribution in the worldwide execution of the motor, for each arranged design.

These analyses additionally permitted a superior comprehension of the impacts of the EGR innovation on the activity of the motor. As a first conclusion, the outcomes demonstrated that the motor exhibited better general execution including lessening of the outflows when working under supercharging. The second stage was directed with the turbocharger, still under full load, and intended to induce regardless of whether the beneficial outcomes. In the third and last organize, tests were directed under incomplete burdens, keeping the supercharging and the improved arrangement.

Fig 3. Dynamometer

RESULTS AND DISCUSSION

The experimental results obtained in Procedure 1 allowed the investigation of, both, engine performance and emissions levels. In addition, it was possible to infer the effects of the recirculation in the progress of the flame front, for the engine with compression ratios of 8.2:1 and 8.9:1. When applying turbo charge the compression ratio was fixed at 8.2:1.

The tests were conducted under full load, varying the degree of recirculation (EGR) as well as engine speed. Here, only the results at 3000 rpm are shown and discussed since for the remaining speeds the trends were the same. Figures 2, 3 and 4 show the dynamic pressure

against crank angle for different degree of gas recirculation as well as ignition timing, for three configurations, Test 1, 6 and 3, respectively.

It can be observed that, keeping the amount of fuel and the spark timing, while increasing the presence of inert gases in the combustion chamber, the flame front was decelerated resulting a displacement of the pressure curve in relation to the Top Dead Center (TDC). The maximum pressure falls from 38 MPa, without recirculation, to 30 MPa with 8.11% of EGR. One of the consequences is the reduction of the network of the cycle, considering that the curves, in the compression stage, are coincident until very close to the TDC. The practical results were, then, lower torque and power, which, in turn, decreases the engine global performance.

The NOx, CO and HC volume parts were estimated in all the tests announced. The effectiveness of the EGR in hindering the development of NO and, thusly, decreasing the discharge of NOx with the motor under full load can be watched.

CONCLUSIONS

Correlation between the motor in its standard arrangement and subsequent to applying turbocharging and distribution proportion of 4.2% demonstrated lessening of 20%, 61% and 52% in the emanations of NOx, HC and CO separately. The expansion in control was 33% with 3% lessening in the particular utilization at 3000 rpm. The points of interest and impediments of the utilization of EGR innovation in motor with supercharging, under full load, were the same as under incomplete burdens. This work displayed the outcomes just for 3000 rpm, nonetheless, comparative patterns were accomplished for different rates.

REFERENCES

1. Simeon Iliev. A Comparison of Ethanol and Methanol Blending with Gasoline Using a 1-D Engine Model Procedia Engineering 100 (2015) 1013 – 1022

2. B.M. Masum, H.H. Masjuki, M.A. Kalam et al. Effect of alcohol-gasoline blends optimization on fuel properties, performance and emissions of a SI engine www.elsevier.com/locate/jclepro

3. A. F. Kheiralla, Mohamed El-Awad, Mathani Y.et al. Effect of Ethanol/Gasoline Blends on Fuel Properties www.uofk.edu/uofkej U of KEJ Vol. 1 Issue 2 pp. 22-28 (October 2011)

4. Hu¨seyinSerdarYu¨cesu, TolgaTopgu¨ et al. Effect of ethanol–gasoline blends on engine performance and exhaust emissions in different compression ratios Applied Thermal Engineering 26 (2006) 2272–227.

5. Nazrul Atan1, Azizul Mokhtar, Najib et al. Experimental Investigation on Ethanol-Petrol Blends Operating with a Petrol Engine: An Overview ISSN: 1662-7482, Vols. 773-774, pp 465-469.

6. Ambarish Datta, Achin Kumar Chowdhuri et al. Experimental Study on the Performances of Spark Ignition Engine with Alcohol-Gasoline Blends as Fuel International Journal of Energy Engineering.

7. Puneet Singh1, Rishi Pareek et al. Testing of the gasoline-ethanol blends in Carburetor type spark ignition engine Volume 6, Issue 6, June (2015), pp. 43-51 Article ID: 30120150606005 International Journal of Mechanical Engineering and Technology.

8. C.Argakiotis1, R.Mishra1, C.Stubbs et al. The Effect of using an Ethanol blended fuel on Emissions in an SI Engine ISSN 2172-038 X, No.12, April 2014.

9. Ali M. Pourkhesalian 1, Amir H. Shamekhi *, FarhadSalimi Alternative fuel and gasoline in an SI engine: A comparative study of performance and emissions characteristics Fuel 89 (2010) 1056–1063.

10. Mustafa Canakcia, Ertan Alptekina et al. Impact of alcohol-gasoline fuel blends on the exhaust emission of an SI engine. Renewable Energy 52 (2013) 111-117