ANALYSIS OF GENERATOR EMISSION FUELLED WITH PETROL - KEROSENE MIXTURE

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***Abstract*— Due to the rapid increase in the fuel consumption the economy becomes a burden for some nations. The depletion of conventional fossil fuel like petrol sources causes a great concern throughout worldwide and has promoted research into alternate energy sources for IC engine. Petrol Engine widely uses prime mover for its smooth operation & low maintenance. The mixture of alternative fuel with the conventional fuel like petrol may be the solution of scarcity of conventional fuel for the spark ignition engine. The present work is mainly concerned with an analysis of petrol engine performance, combustion, noise and emission curves using mixture of petrol & kerosene. Generator emission fuelled with petrol-kerosene mixture, the performance curves for different mixtures are judged by running the engine under steady state conditions**.

***IndexTerms*— Emission, Engine Generator, Petrol-kerosene mixtures.**

I. INTRODUCTION

Due to the present energy crisis there arises a need to develop a clean energy system which can solve the purpose of emission reduction and performance enhancement. Several fuel systems like mixture of alcohol with diesel, hydrogen with LPG, CNG and blends of kerosene and petrol have turned out be the best alternative to be considered for SI and CI engines without major design change. Recent explorations and experimental investigations have opened the wide area of fuel system for these engines. This work is mainly concerned with the evaluation of the emission characteristics of petrol engine fuelled with blend of petrol & kerosene.

II. LITERATURE REVIEW

N. Seshaiah et al [4] tested the variable compression ratio spark ignition engine designed to run on gasoline with pure gasoline, LPG (Isobutene), and gasoline blended with ethanol 10%, 15%, 25% and 35% by volume. Also, the gasoline mixed with kerosene at 15%, 25% and 35% by volume without any engine modifications has been tested and presented the result. Brake thermal and volumetric efficiency variation with brake load is compared. CO and CO2 emissions have been also compared for all tested fuels. It is observed that the LPG is a promising fuel at all loads lesser carbon monoxide emission compared with other fuels tested. Using ethanol as a fuel additive to the mineral gasoline, (up to 30% by volume) without any engine modification and without any loses of efficiency, it has been observed that the petrol mixed with ethanol at 10% by volume is better at all loads and compression ratios. AI- Baghdadi M.A.S. [5] investigated experimentally and compares the engine performance and pollutant emission of a SI engine using ethanol–gasoline blended fuel and pure gasoline. The results showed that when ethanol was added, the heating value of the blended fuel decreases, while the octane number of the blended fuel increases. The results of the engine test indicated that when ethanol–gasoline blended fuel was used, the engine power and specific fuel consumption of the engine slightly increase; CO emission decreases dramatically as a result of the leaning effect caused by the ethanol addition; HC emission decreases in some engine working conditions; and CO2 emission increases because of the improved combustion. AI-Hasan M. [3, 9] Investigated the effect of ethanol blended gasoline fuels on emissions and catalyst conversion efficiencies in a spark ignition engine with an electronic fuel injection (EFI) system. Result showed that ethanol can decrease engine-out regulated emissions. The fuel containing 30% ethanol by volume can drastically reduce engine-out total hydrocarbon emissions(THC) at operating conditions and engine-out THC, CO and NOx emissions at idle speed, but unburned ethanol and acetaldehyde emissions are effective in reducing acetaldehyde emissions; but the conversion of unburned ethanol is low. Tailpipe emissions of THC, CO and NOx have close relation to engine-out emissions, catalyst conversion efficiency, engine's speed and load, air/fuel equivalence ratio. Moreover, the blended fuels can decrease brake septic energy consumption. Amit Pal, S. Maji, O.P. Sharma and M.K.G.Babu [2] operated a Kirloskar, four stroke, 7.35kW, twin cylinder, DI diesel engine in dual fuel mode (with substitution of up to 75% diesel with CNG). The results of this experiment of substituting the diesel by CNG at different loads showed significant reduction in smoke, 10 to 15 % increase in power, 10 to 15 %reduction in fuel consumption and 20 to 40 % saving in fuel cost (considering low cost of CNG). The most exciting result was about 33% reduction in engine noise which may prolong the engine life significantly and the consequent sound levels of giant diesel engine reduced to that of a similarly sized gasoline engine. He Bang-Quan,WangJian-Xin [1] investigated experimentally the effect of Denatured spirit (DNS) and DNS-Water blends as fuels in a four cylinder four stroke SI engine. Performance tests were conducted to study Brake Thermal Efficiency (BThE), Brake Power (BP), Engine Torque (T) and Brake Specific Fuel Consumption (BSFC). Exhaust emissions were also investigated for carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NOx) and carbon dioxide (CO2). The results of the experiments reveled that, both DNS and DNS95W5

as fuels increase BThE, BP, engine torque and BSFC. The CO, HC, NOx and CO2 emissions in the exhaust decreased. The DNS and DNS95W5 as fuels produced the encouraging results in engine performance and mitigated engine exhaust emissions.

III. PROBLEM DEFINITION

The main objective of the experiment is to investigate the effects of replacing individual petrol and kerosene with their optimum mixture of blends and to prove the reduction of nitrogen oxides, carbon dioxide, carbon monoxide, hydrocarbons in a spark ignition engine. The experimental setup consisting of Honda Portable Genset Model E1000K was attached with Di-gas analyzer, load bank and air measurement box devices. Modifications in the engine fuel supply system were done to use the blends of kerosene and petrol.

An electrical power load circuit was attached to the test engine to allow variation of the engine power using the bulb switches. Combinations of different values of engine load were used in the experiment to evaluate the performance, pollutant emissions of the engine to compare between petrol and kerosene fuels and their mixtures.

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IV. METHODOLOGY

All research work is described is a very brief manner in the form of thesis methodology. All relevant information were analyzed to construct a precise summary of background information which included the history of petrol and kerosene, advantages and limitations of it, physical and chemical properties of petrol and kerosene and their emissions. At the same time, comparison between petrol and kerosene were also noted. The emissions from the tailpipe of the engine such nitrogen oxide (NOx) un burnt hydrocarbon (HC), carbon dioxide (CO2) and carbon monoxide (CO) were also being explained.

Department to collect emission data from the exhaust engine and simultaneously engine performance was also be recorded. The experiments were conducted using different loads to collect the emission data. All the data were analyzed to make comparisons between petrol and kerosene and their respective blends. A conclusion was made after analyzing the data collected from the experiments.

V. ENGINE SPECIFICATION

Table 1 Specifications of Honda Generator

Ignition system	TCI
Starting system	Recoil starter
Fuel tank capacity (L) (Kerosene Rum)	6.1
Fuel tank capacity (L) (Petrol Rum)	35
Continuing Running Hrs	8.7hrs
Frequency (Hz)	50
Rated Output (VA)	650VA
Maximum Output (VA)	750VA
Dry Weight (Kg)	30
L X W X H (mm)	482 X 328 X 438

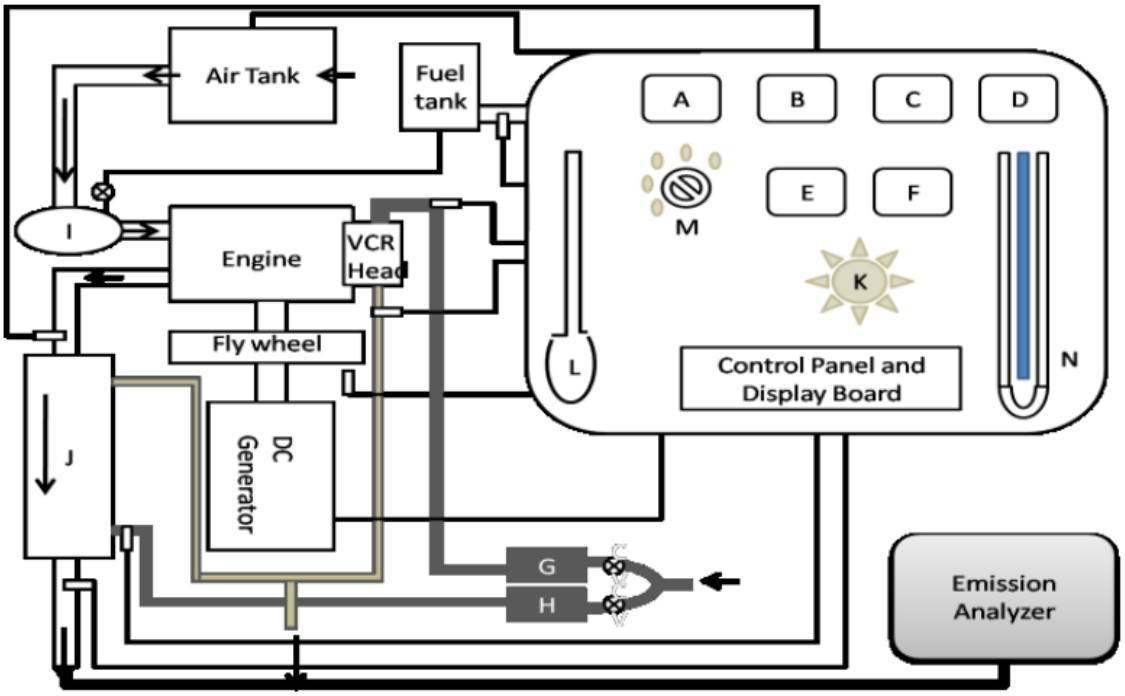
VI. EXPERIMENT SETUP

The analysis was first performed on the petrol fuel system. The engine was up for around five minutes to reach a steady condition using the original petrol fuel from the fuel tank of the engine. As the engine was ready to run, the throttle of the engine was adjusted to be in a fully open position to allow more petrol fuel be supplied into the test engine, thus ensuring the maximum speed. The engine running at maximum speed had been selected as the reference point to compare the performance between petrol and kerosene. In this experiment, the loads were fixed at 0W, 100 W, 200 W, 300 W, 400 W, 500 W, and 600 W for SI engine as the main application of SI engine are for small personal use and usually loads for 200 W to 400 W are connected to them. Figure 1.1 shows the schematic diagram of experimental set up. All the data collected which included the engine speed, body temperature, exhaust temperature, voltage, current and concentration of emissions were recorded when steady-state is reached for each set of load values. Next loads were applied to the system by operating the electric bulbs.

With the help of gas analyzer we get the values of nitrogen oxides, carbon dioxide, carbon monoxide, hydrocarbons, oxygen for kerosene, petrol and their blends at different set of kerosene, petrol and their blends at different set of loads were

recorded. After that, the test was performed on the kerosene fuel system. Before kerosene was allowed to flow into the combustion chamber, the remaining petrol in the carburetor had to be drained. Then, different sets of load were added to the system to evaluate the engine performance. Again, the data were recorded at steady state for each set of load values. All the collected data are then analyzer for comparative performance between petrol and kerosene fuel system.

Figure 1 Experimental setup



CONCLUSION

The main aim of this research work was to find the optimum mixture of kerosene-petrol fuel mixture to have less emission. mixing kerosene with petrol in SI engines is more practical than using kerosene alone. However, before using these mixture in the engines, the performance and emission curves must be examined. An experimental study has been carried out to evaluate performance and exhaust emissions for various concentration of kerosene addition to petrol in the Engine.

Experimental results indicated that using optimum kerosene-gasoline blend, the output torque of the engine increased slightly, the carbon monoxide and hydro carbon emissions decreased dramatically as a result of the leaning effect caused by the kerosene addition, and the CO2 emission increased because of the improved combustion. Carbon monoxide and Hydro Carbon emissions were reduced approximately by 80% and 50%, respectively, while the CO2 emission increased 20% depending on the engine conditions. It is further observed that low fraction kerosene/ gasoline blends can be used in SI engines without any modification. Kerosene gasoline blended fuel may lower HC and CO emissions. The most interesting thing is that kerosene addition to petrol improves the SI engine cold start and lower Carbon monoxide and Hydro Carbon emissions significantly.

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