Investigation on Emissions of Spark Ignition Engine Utilizing Biogas At Various Torque Level

A. Arul Peter
Associate Professor, Department of Mechanical Engineering, Vels University, Chennai, Tamilnadu, India

Abstract: The depletion and degradation of fossil and conventional fuels enforces the world to search alternative fuels. At the same time emission is another criteria restricts the combustion of fuel according to the norms framed by the globe. In this work gasoline engine was run by petrol, B15 and B25 of biogas blends with petrol. The results concluded that B25 has better than B15 and petrol based on emission point of view, fuel consumption and torque generation.

I. INTRODUCTION

Though the literature count is minimum in the field of engine run by biogas blends with petrol some of the literatures are explained in detail. Feroskhan et al (2017) discussed purification and methane enrichment of biogas running engines. They concluded that the removal of non-combustible gas CO2 from biogas utilized in engines improve its performance and better control on emission characteristics. Willian Cezar Nadaleti et al (2018) conducted experiments on SI engine using biogas as alternative fuel combined with hydrogen to improve combustion characters. They observed advanced ignition reduced emission of CO2, NOX and also the improvement in brake thermal efficiency. Eui-Chang Kwon et al. (2016) examined the performance on small SI engines for various control volumes in 5 kW engine and found improvement in brake thermal efficiency and brake power. Porpatham et al. (2011) performed experiments on SI engine using biogas with different compression ratios and concluded that at higher compression ratio the power output and brake thermal efficiency was improved. Porpatham et al. (2006) found the addition of hydrogen with biogas run the engine had good brake thermal efficiency and brake power and reduction in hydrocarbon levels.

In this work an attempt has been made experimentally on the gasoline engine using the fuels petrol, B15 and B25 blends of biogas with petrol. The emissions and torque were measured and discussed in the analysis of results.

II. EXPERIMENTAL SET UP

Fig 1 Shows line diagram of the experimental setup where the engine is coupled with torque measuring equipment and the AVL gas analyser.
III. RESULT AND DISCUSSION

Fig 1 depicts Torque and specific fuel consumption. It was concluded from the measurement pure gasoline was consumed by the engine to produce the same torque generated by other two blends B15 and B25. B25 has been reduce for maximum torque generation almost five times lower than minimum torque.

The same trend was adopted in the emission of carbon monoxide from the same gasoline engine. B25 has given better results than B15 and gasoline shown in Fig. 3. Half of the CO reduction was observed from the measurement for B25 blend.

In comparison with gasoline and B15 blend the complete combustion was observed from the measured results of CO$_2$ emission from the five gas AVL analyser shown in Fig 4.
The complete combustion of B25 blend yielded lesser value of Hydrocarbon emission for the maximum torque generated from the engine measured by gas analyser exhibited from the Fig. 5. Almost one third of reduction was observed for maximum torque generated by the gasoline engine by using the B25 blend. The same trend was exhibited in NO\textsubscript{X} emission in fig. 6.
IV. CONCLUSION

The measured results exhibits B25 blend was better than B15 and petrol from the emission of CO, CO$_2$, HC and NO$_x$ for maximum generation of torque. At maximum torque the reduction was found in emission of gases in all three fuels diesel and biogas blends of B15 and B25.

REFERENCES


