ABSTRACT
The most efficient and useful fossil fuel is playing a major role in developing countries particularly in Transport and also in all the sectors of modern day living. India is one of the fastest growing economies in the world and will continue to enjoy the demographic dividend for few decades. Energy is a critical input towards raising the standard of living of citizens. The energy strategy of country aims to chart the way forward to meet the Government’s recent ambitious announcements in the energy domain such as electrification (24X7 electricity) of all census villages by 2022. It is estimated that there is an energy demand of 175GW of renewable energy capacity by 2022. Fossil fuels will continue to occupy a significant share in the energy basket. However, conventional or fossil fuel resources are limited, non-renewable sources are to be extracted.

The rapid depletion of petroleum-based fuels, their over increasing costs and the environmental pollution caused by the burning of these fuels have led to an intensive research for Alternate Fuels. Bioethanol is a promising alternative fuel for Spark Ignition Engine. In this project an attempt has made to investigate the performance characteristics of Single cylinder 4-stroke VCR SI Engine using 0% (pure petrol), 5% (E5), 7.5% (E7.5) and 10% (E10) bioethanol-petrol blended fuels. The results of this work depict that 7.5% blend can perform successfully in engine designed for use with petrol without any modification.

OBJECTIVES:
- The study of alternate fuels for S I Engine have become increasingly important due to diminishing fossil fuels reserves and awareness of the increased environmental problems associated with burning of these fuels. Among different alternate fuels for petrol in S I Engine, bioethanol is considered to be most promising future fuels. The purpose of this experimental investigation is to study the effect of using various blends of bioethanol and petrol on performance of single cylinder 4 stroke VCR SI engine. The main objective of this works are as follows.
- To investigate Physico – Chemical properties of Petrol bioethanol blend as a fuel for Spark Ignition Engines.
- To Analyze the Petrol bioethanol blend as a fuel in Four stroke engine performance.
- To identify the best Petrol bioethanol blend that can be used as Alternative fuel to operate Spark Ignition Engine.

METHODOLOGY:
The Test Rig consists of Four-Stroke Petrol Engine (Air Cooled) to be tested for performance is coupled to Alternator. To facilitate the change in compression ratio, an auxiliary head-piston assembly above the main head has been provided. The auxiliary piston is operated up-down by hand wheel-screw rod assembly to fix the required compression ratio.

WORKING PROCEDURE of VCR Petrol Engine Test Rig:
- Release the locking bolt of the auxiliary piston screw rod assembly.
- Rotate the hand wheel and bring the indicator to the required compression ratio.
- Lock the screw rod assembly before conducting the experiment for the compression ratio selected.
- Open the 3-way cock, such that fuel flows into the engine.
- Supply the cooling water to the engine head.
- Start the engine and allow it to run on load condition for few minutes.
- Apply the load on the engine by operating the Torque controller which is synchronized with Alternator.
- Allow the engine to run at this load for few minutes and note the following readings.
- Engine Speed
- Energy meter
- Manometer
- Time for 10CC of fuel consumption & temperature readings
- Repeat the above-mentioned procedure at different loading conditions.
- Stop the engine after removing load on the engine.
- Change the compression ratio and repeat the above procedure.

RESULTS & CONCLUSIONS

The VCR Test results clearly depict that performance curve will satisfy the standard condition. Bio ethanol can be effectively used for blending with petrol. The Specific Fuel Consumption increases with increase in Brake Power. This can be seen in the graph. The SFC v/s BP graph for Compression Ratio 4 and 4.67 are accordance with SFC increases with increase in BP, but there is slight variation in Compression Ratio 5.5 for E10 blend. The Brake Specific Fuel Consumption v/s Compression Ratio graph for E7.5 blend is accordance with BSFC decreases with increase in CR. This clearly shows that 7.5% bio ethanol blend with petrol is the best blend for SI Engine. The emission test results are plotted for the CO & CO2, the 7.5% blend has less CO & CO2 value. Hence 7.5% is the best Petrol bioethanol blend that can be used as Alternative fuel to operate Spark Ignition Engine without any modification.

SCOPE FOR FUTURE WORK

This work can be extended to higher percentage of blends such as E25, E30 etc. Further this work can be extended to investigating the heat transfer characteristics and combustion behavior for different fuel blends for other engine designs. This work can be extended to carry out cost analysis. This work can be carried out for Specific bioethanol like corn based, sugar cane based, algae based, sorghum based, etc.