

Performance and Emission Characteristics of Spark Ignition Engine Running with Gasoline, Blends of Ethanol, and Blends of Ethiopian Arekie

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Abstract : Petroleum fuels have become a threat to the world because of their toxic emissions. Besides, it is unknown how long they will last. The only known fact is that they are depleting rapidly and will not last long. So the world's concern about finding environmentally friendly alternative fuels has increased recently. Hence alcohol fuels are found to be the most convenient alternatives to use in internal combustion engines. This research intends to introduce Ethiopian locally produced alcohol as an alternative in the blended form with gasoline to use in spark ignition engines. The traditionally distilled Arekie was purchased from a local producer and purified using fractional distillation. Then five Arekie-gasoline blends were prepared with the proportion of 5,10,15,20 and 25%v/v (A5, A10, A15, A20, and A25, respectively). Also, absolute ethanol was purchased from a local supplier, and ethanol-gasoline blends were prepared with a similar proportion as Arekie-gasoline blends (E5, E10, E15, E20, and E25). Then an experiment was conducted on a single-cylinder, 4-stroke, spark-ignition engine running at a constant speed of 2500 rpm and variable loads to investigate the performance and emission characteristics. Results showed that the performance and emission parameters are significantly improved as the ratio of Arekie and ethanol in gasoline increases at all loads. Among all tested fuels, E20 exhibited better performance, and E25 exhibited better emission. A20 provided a slightly lower performance than E20 but was much improved compared to pure gasoline. A25 provided comparable emissions with E25 and was much better than pure gasoline. Generally, adding up to 20%v/v Ethiopian Arekie in gasoline could make a better, renewable alternative to spark ignition engines.

Keywords : alcohol fuels, alternative fuels, pollutant emissions, spark-ignition engine, Arekie-gasoline blends

Conference Title : ICGPE 2023 : International Conference on Geosciences and Petroleum Engineering

Conference Location : Istanbul, Türkiye

Conference Dates : February 16-17, 2023