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Calorific value enhancement of fusel oil by moisture removal and its effect on the performance and combustion of a spark ignition engine

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ABSTRACT

The major limitation in the usability of fusel oil as blend fuel in spark-ignition (SI) engine is the presence of moisture that plays a negative role in the calorific value (CV). The main objective of the current study is to improve the CV of fusel oil by the extraction of moisture content. In addition to this, it is aimed to conduct comparative study on the effect of the improvement of the CV of the blend fuel on the combustion and performance. The experiment is conducted in an SI engine under and engine speed of 4500 rpm, 60 throttle open and at different blending ratio of gasoline-fusel oil. The parameters examined in the current study are the effects of test fuels upon the brake power (BP), the brake thermal efficiency (BTE), the brake specific fuel consumption (BSFC), the in-cylinder pressure, the rate of heat release (ROHR), the rate of pressure rise (ROPR), the mass fraction burned (MFB), the combustion durations (CD), the indicated mean effective pressure (IMEP) and the coefficient of variation of the indicated mean effective pressure (IMEP) (COV_{imep}). With the reduction of the moisture content of the fusel oil from 13.5% to 6.5%, the improvement on the CV is reported to be by 13%. The BP, BSFC and BTE have slightly improved with the extraction of moisture. On the comparative study on the combustion and performance, the peak cylinder pressure, the maximum ROPR and the IMEP increased, and its corresponding COV reduced after reducing the moisture content at 10% concentration of fusel oil. CD has also reduced with the moisture extraction. As a con-