

# Analysis of cylinder pressure cyclic variability operating with butanol blends in a diesel engine

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## Abstract:

Butanol is a second-generation biofuel which obtained from the biomass feedstock sources to improve the fuel properties and performance of the recent fuels. However, there are certain grey aspects in the combustion characteristics of butanol blends in various operating speeds and loads. This previous work investigated the use of mineral diesel (D), palm biodiesel (B), butanol (10%)-diesel (90%) (DBu10) and butanol (10%)-palm biodiesel (90%) (BBu10) fuels. The objectives of this study are to investigate the cyclic combustion variations of cylinder pressure profiles and peak cylinder pressure,  $P_{max}$  and analyse the combustion stabilities using recurrence plot (RP) on tested fuels using a diesel engine. The results showed that higher peak cylinder pressures were observed for butanol blends with full load at 1100 rpm. Higher cylinder pressure cyclic variability occurred at high load and speed for all test fuels, especially DBu10 with higher COVP<sub>max</sub> values. Thus, in this case, DBu10 produced the most chaotic combustion irregularities and higher cyclic variations for the time series in those conditions. In conclusion, cylinder pressure variations in the time series were found to be affected by the fuel composition of butanol in the blends and types of fuel in engine operation.

**Keywords:** Mineral Diesel (D); Palm Biodiesel (B); COVP<sub>max</sub>; Recurrence Plot (RP)

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