

## The performance of an HCCI-DI engine fuelled with palm oil- based biodiesel

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### ABSTRACT

The increasing requirements to control emission and fuel economy are become important recently. Furthermore, the hazardous components produced by internal combustion engine forces many researchers to consider with alternative fuel which is environmental friendly and renewable sources. This study intends to investigate the performance and emission level by using palm oil blends with diesel operated on HCCI-DI engine. In this study, an experiment has carried out on single cylinder diesel engine with port fuel injection (PFI) attached at the intake manifold. Thus, PFI introduced to control combustion, it is plugged onto compression ignition engine, therefor it will completely covered 3 basic element; controlling fuel air mixing, controlling ignition timing and introducing new fuel. The HCCI-DI engine was operated at 1800 rpm with different fuel injection quantity;  $\omega = 1.1, 1.4, 1.7$  and lambda  $\lambda = 1.8, 2.3, 2.9$ . It has found that different fuel injection with difference palm oil blends percentages is significantly affects the engine efficiency. Blended fuels PO5 and PO10, produce higher nitrogen oxide ( $\text{NO}_x$ ) and unburned hydrocarbon (UHC) emission exchange at DI mode. At HCCI-DI mode of combustion, blended fuels PO5 and PO10 increase  $\text{NO}_x$  and reduce UHC. Meanwhile carbon dioxide ( $\text{CO}_2$ ) and carbon monoxide (CO) slightly reduce which no significant change for varies  $\omega$ . The usage of palm oil blends on HCCI-DI engine increase the break specific fuel consumptions (BSFC) and brake mean effective pressure (BMEP) and reduce the engine performance include engine power compare with conventional diesel fuel. Thus, palm oil biodiesel operated in HCCI-DI mode of combustion have an optimal PFI quantity to operate in minimal emission levels.

### KEYWORDS:

HCCI-DI engine; Palm oil; Hazardous components