The emission analysis of an IDI diesel engine fueled with methyl ester of waste frying palm oil and its blends

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1. Introduction

Diesel engines have a vital role particularly for transportation systems. The exhaust emissions from diesel engines fueled with conventional diesel fuel have caused air pollution and global problems. There is a general agreement that biodiesel and its blends with diesel fuel can provide a substantial reduction in HC, CO, and smoke emissions with slight performance loss in diesel engine. In comparison with diesel fuel, exhaust gas analyses with biodiesel have generally resulted in an increase in NOx emissions that is dependent upon the fraction of biodiesel in the fuel blend [1–11]. Some researchers [12–19] have studied the effect of biodiesel fuel properties (such as density, iodine value, cetane number and fatty acid composition) on NOx emissions. However, some researchers [20–23] have reported that no changes or reduction in NOx emissions when biodiesel was used in the engine.

The effect of different biodiesel fuels on performance and exhaust emissions of diesel engines has been discussing for long time. The combustion characteristics of an engine can vary in relation to the engine design, ambient conditions and fuel properties. Indirect injection (IDI) diesel engine exhibits two important advantages; not depend on fuel quality and produce low exhaust emissions depending on combustion chamber design [24–30]. The objectives of this study were to investigate the influences of biodiesel produced from waste frying palm-oil and its blends (B5, B20, B50) on the engine performance and exhaust emissions of an unmodified IDI diesel engine in terms of fuel properties of biodiesel, air–fuel equivalence ratio, fuel line pressure, injection timing...