

PERFORMANCE AND EMISSION STUDY OF IMITATED SYNGAS IN A DUAL
FUEL COMPRESSION IGNITION DIESEL ENGINE

By

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ABSTRACT

Biomass can be converted into a useful source of energy through gasification. The gasification product, which is a mixture of different gases, is known as synthesis gas or syngas. The composition of syngas fluctuates due to many factors such as operational errors of the gasifier as well as the type of feedstock used or due to the feeding rate fluctuation. Therefore it is difficult to assess the effect of syngas composition and diesel replacement ratio to the performance and emission when combusted in a compression ignition engine. In order to overcome this problem, controllable composition and conditions of imitated syngas is used in this study by selecting three compositions of syngas close to the real conditions. The objective of this study is to ascertain the possibility of using syngas as alternative to diesel fuel for an internal combustion engine while providing acceptable engine performance and emission levels. The test results on syngas performance and emission are compared with the results for diesel at engine speed of 1200, 2000, and 3000 rpm. The results of the performance test of both fuels are examined in terms of the engine's power output, exhaust temperature, brake specific fuel consumption, brake thermal efficiency, volumetric efficiency, and exhaust emission. A reduction in exhaust gas temperature is reported with syngas dual fuel operation reached up to 180°C with composition B at 1200 rpm and 51.1% diesel replacement ratio. Significant increase in the volumetric efficiency is reported with addition of syngas. It reached up to 38% for composition C at 3000 rpm and 23.5% diesel replacement ratio. Composition A emitted the lowest value of carbon dioxide and nitrogen oxides at 1200 rpm which reached up to 1% and 108 ppm respectively.