Asian Journal of Scientific Research, 2013 v6,(3)456-466
ISSN 1992-1454 / DOI: 10.3923/ajsr.2013.

Performance of a Compression Ignition Engine Fuelled by Diesel and Imitated Syngas

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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 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 the feeding rate fluctuation. Therefore it is difficult to assess the effect of syngas composition and diesel replacement ratio to the performance 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. The test results on syngas performance are compared with the results for diesel at engine speed of 2000 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 and volumetric efficiency. It is generally shown that the use of syngas leads to lower brake power and brake thermal efficiency. In addition, different syngas compositions are shown to respond differently to the engine performance.

Key words: Biomass, syngas, gasification, compression ignition engine

INTRODUCTION

Biomass is available in varying amounts throughout the developing world from densely forested areas in the temperate and tropical regions of the world. However, these amounts of biomass are considered wastes and are being disposed in an unrestricted manner. Thus, there is a need to introduce some technologies to convert these wastes into alternative fuel because the petroleum fuel is subject to depletion while biomass is a renewable energy source as its supplies are unlimited. There is also the ability to grow trees and crops and the waste will always exist.

Biomass can be converted into useful energy through the process of gasification and this process will in turn produce syngas. Conditions of syngas produced from the gasification process usually fluctuate 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 (Tomishige *et al*., 2004). Therefore, it is difficult to assess the effect of conditions to the performance when combusted in a compression ignition engine. In order to overcome the situation, imitated syngas may be used at different compositions as fuel in compression ignition engines.