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Modified Compression Ratio Effect on Brake Power of Single Piston Gasoline Engine Utilizing Producer Gas

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Abstract

An objective of this research is to test the brake power of Honda Model GX-120-four strokes-spark ignited engine. The producer gas was made from dry wood by the gasification process. The producer gas was used as a fuel for the engine. To study the effect of compression ratio and percentage of opened air inlet valve on break power, the compression ratio of 7.5:1 and 9.3:1 and percentage of opened air inlet valve of 30% and 75% were used. It was found that the brake power of compression ratio at 9.3:1 with 75% of opened air inlet valve was 1,443.6 Watts at 3,800 rpm showed the highest break engine power because the high compression ratio was high, and the brake power was also high as the basic theory of an ideal Otto cycle.

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Keywords: engine, compression ratio, producer gas, brake power;

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1. INTRODUCTION

Biomass is fuel that is developed from organic materials. It can be converted to other usable forms of energy such as methane like transportation, fuels like ethanol and biodiesel. There are 3 processes of biomass: First is a combustion process [1], second is a pyrolysis process [2] and third is a gasification process [3]. The most recently method to use biomass as fuel in Thailand is gasification process which converts biomass into combustible gas by using gasifier equipment. Generally, it is classified into 3 types of gasifier 1.upward draft gasifier, 2.downward draft gasifier and 3.cross draft gasifier that base on the direction of air/oxygen flow in the equipment. They are generated by the producer gas or syngas [4]. The modified spark plug engine is needed in order to use producer gas with a combustion engine. Many researchers used fuel such as hydrogen-ethanol fuel [5], natural-gas [6] and producer gas [7] with the spark plug engine, to study the brake power effect which used different fuels such as gasoline, producer gas with the engine to drive the water pump, and the brake power test was setup. The previous research showed that the efficiency of gasoline fuel was higher than producer gas [7]. The thermal efficiency was increased when the compression ratio was being increased refer from Ideal Otto cycle's theory [8]. This concept was conducted in order to study the performance of the spark plug engine which used producer gas.

The aim of this research studied the effect of compression ratio of single piston gasoline engine with utilizing the producer gas on brake power. This study was limited to modify the piston for increasing the new compression ratio.

Nomenclature

CR	Compression ratio
n	Engine speed
P_b	Brake power
T	Torque
V_c	Volume of a clearance space
V_s	Stroke volume

2. EXPERIMENT

2.1. Experimental unit

Figure 1 illustrates the updraft gasifier system and brake power test set. The updraft gasifier system was consisted of the updraft gasifier tank with 0.0793 m^3 in volume, speed-adjustable blower, gas test valve, cover, fuel inlet tube, cooling coil tube, water tank with 0.078 m^3 in volume, gas tank with 0.050 m^3 in volume, engine gas valve, gas mixer, and HONDA GX120 gasoline engine. To prevent the corrosion which occurred inside the gasifier tank and fireproof cement was coated inside the tank. Gas mixer of the engine carburetor was replaced with a gas tube (from gasifier system) and was installed a valve between the carburetor and the air filter.

Figure 2 shows a mechanism of the brake power test set which designed as a principle of rope brake. It was consisted of spring balancer, brake set, pulley and weight to increase the engine load.