ANALYSIS OF THE GAS PRODUCED FROM THE RICE HUSK GASIFIER MODEL 40D WITH GAS CONDITIONING UNIT AT DIFFERENT BLOWER SETTINGS

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Glory to God!!!

The quality of the gas produced from the rice husk gasifier is now easy to determine with the use of a gas analyser. Once gas quality is determined, we can now set the opening of the blower for the gasifier to produce gas with high energy content, thus maximizing the use of rice husk fuel for the gasifier.

Using rice husk gasifier model 40D, series of tests were conducted recently at CNC Design Lab by varying the blower setting of the gasifier reactor that is coupled to a gas conditioning unit. During the tests, three blower shutter openings were tested to see whether there is an effect on the composition and heat energy content of the gas from the gasifier when the blower setting is changed. The three blower shutter openings are: (1) Minimum, (2) Medium and (3) Maximum. The gasifier reactor tested is a moving-bed downdraft-type reactor with 40-cm diameter. The reactor uses a 2½-in. electric blower that supplies the air required to gasify rice husk fuel. The gas is cleaned and cooled in a 60cm-diameter by 180cm-high gas conditioning unit enclosing the wet scrubber, filter bed, and gas storage. The gas is temporarily stored so as to make it available for the stove gas burners when used for heating or for internal combustion engine when it is desired to be used for mechanical or electrical power generation.

Specifically, the gas conditioning unit utilizes a ½-hp pump that circulates water through the 2½in.-diameter by 1m-long cross-flow impact-type wet scrubber that sprays the gas with water to remove particulates and to cool it at the same time. The gas filter is made of 40cm-thick filter material from course sand. The gas from the reactor is being pulled by a ½-hp ring blower and is forced to the burners or to the intake manifold of an engine.

Gas samples were obtained at different blower shutter openings using an empty, sealed plastic bag and were allowed to cool down to ambient air temperature. The gas samples were analyzed using the Gasboard 3100P Gas Analyser, which gives the chemical composition of gases namely carbon monoxide (CO), methane (CH_4), hydrogen (H_2), carbon dioxide (CO_2), oxygen (O_2), and

hydrocarbons (CnHm). Aside from the gas composition, the energy content of the gas is also determined.

Table 1 shows the chemical compositions of gases obtained from the tests at different blower shutter openings. On the average of three runs, the CO content of the gas at minimum, medium, and maximum settings were 15.82%, 18.69%, and 17.42%, respectively. The CH_4, on the other hand, were 2.32%, 3.57%, and 2.97% for minimum, medium, and maximum settings, respectively. For the H_2, the gas compositions were 8.14%, 9.08%, and 9.35% for the minimum, medium, and maximum blower settings, respectively. It can be observed that for

Table 1. Composition of Gases Obtained from the Gasifier Model 40D at Three Blower Shutter Openings.

Blower Setting	CO (%)	CH_4 (%)	H_2 (%)	CO_2 (%)	O_2 (%)	CnHm (%)	Heating Value (kcal/m^3)
Minimum	15.82[a]	2.32[a]	8.14[a]	10.27[a]	3.63[a]	0.10[a]	896.67[b]
Medium	18.69[a]	3.57[a]	9.08[a]	11.28[a]	1.92[a]	0.11[a]	1114.67[a]
Maximum	17.42[a]	2.97[a]	9.35[a]	11.52[a]	2.16[a]	0.09[a]	1019.67[ab]

5% level of significance

CO and CH_4, gas compositions were higher when the blower shutter opening is set at medium than at minimum and maximum settings. However, for H_2 gas, its composition increases accordingly with respect to blower shutter opening -- that is, the wider the blower opening, the higher the percentage of H_2. For non-combustible gases like CO_2 and O_2, the composition of gases behaves like that of H_2 while CnHm behaves in like manner with CO and CH_4. The energy content of the gas, which is the most important parameter as far as gas is the focus, is highest in the medium setting than in the other two settings. To optimize the operation of the gasifier therefore, it is recommended that the blower must be set at medium opening so the full energy content of the gas can be utilized during operation. At 5% level of significance, however, analysis shown that there were no significant differences in the composition of the gas obtained for the three different settings. On the other hand, the heating value of the gas obtained at medium setting was found significantly different with that at minimum setting. Heating value of the gas at medium setting, however, is not significantly different from the heating value of the gas at maximum setting. While the percentage of gas compositions at minimum and at maximum settings are not significantly different at 5% level. It is more interesting to know in the next experiment at what velocity of the gas inside the reactor gives the highest energy content.

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