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Applications of Biofuel Technologies for Third World Countries

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作者姓名

Ashley Nicole Anderson

Forrest Keith Tower

Abstract

Innovative, inexpensive, sustainable fuel for cooking and light can be produced with an anaerobic digestion biogas system. A biodigester was designed from parts that are locally available to purchase and maintain in a developing nation.

The prototype was designed, built and the engineering was approved and tested. Research and testing of techniques used to produce biogas were recorded and analyzed. The digester successfully produced enough biogas to connect to a stove and burn. Research and testing continued on different ways to pressurize the biogas. A burn time of eleven minutes was recorded. A Bunsen burner was designed, again from locally available parts, in order to enhance the flame to use for cooking. The designed digester and burner worked satisfactorily to burn the biogas collected in the system. Using small scale tests, additional research and testing continued on the most efficient production of the biogas.

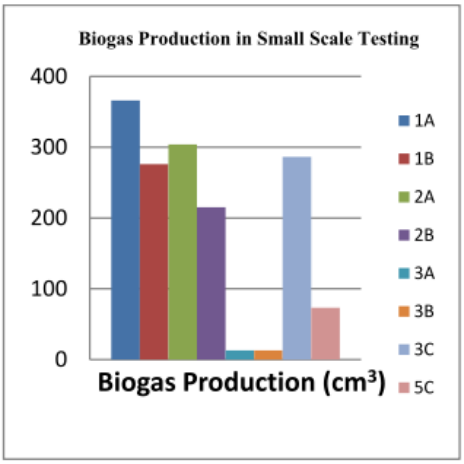

Figure 1 Small Scale Results

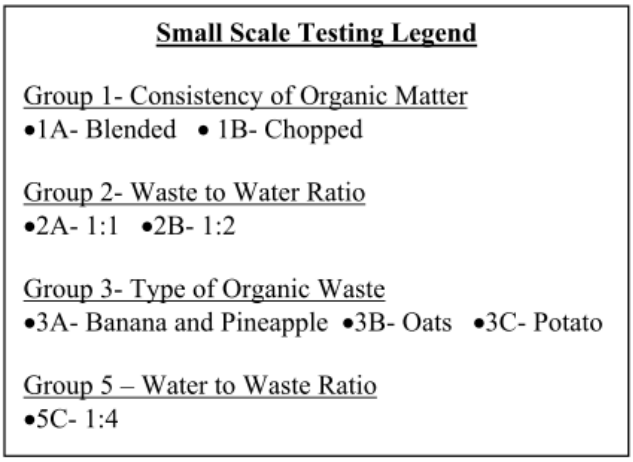

Figure 2 Small Scale Testing Legend

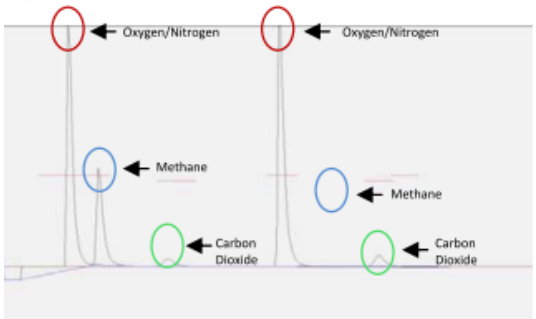

Figure 3 Gas Chromatogram

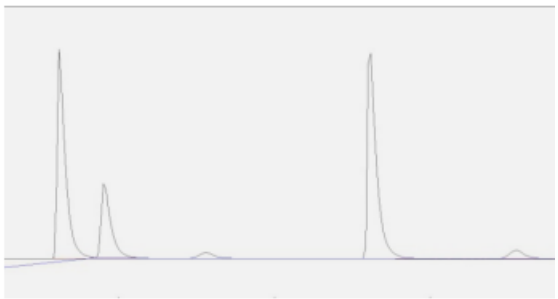

Figure 4 Gas Chromatogram

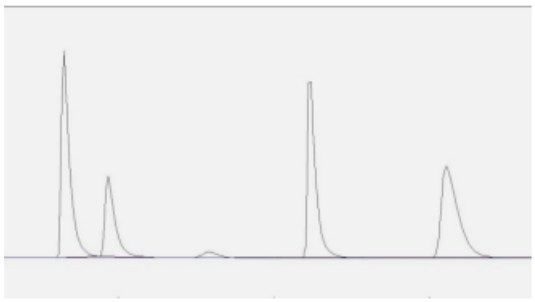

Figure 5 Gas Chromatogram

Figure 6 Gas Chromatogram

Figure 1 shows the results of the small scale biogas testing. The results from the small scale testing showed that the best variables for producing biogas are using school compost, ie apples, bananas, oranges, cucumbers, grapefruit, grapes etc, which has been blended to acquire the most surface area with a 1:1 ratio. Figure 3 shows the results of a sample of methane (first three peaks) and of the biogas that was produced (last two peaks). The first peak is the nitrogen and the oxygen in the sample. The second peak is the methane and the third peak is carbon dioxide. The first biogas sample that was tested had no methane so there was an absence of the second peak. This was similar for Figures 4 and 5. Figure 6 shows a sample of the final biogas product which is producing methane as shown by the blue circle. Figures 3 through 5 lack a methane peak due to leaks in the biogas system and limited time within testing periods.

The hypothesis was proved correct. An innovative, inexpensive, sustainable fuel for cooking and light using an anaerobic digestion system that can be built completely in developing nations such as Honduras was created. The biogas was ignited using a stove which provided heat for cooking. The biogas was not tested using a light; however, since the biogas can burn, this is theoretically possible. The final system achieved these goals.

評語

本研究是嘗試用簡單之器皿工具來構建一套把廚餘和生機廢物轉化成甲烷系之氣體燃料，以供第三世界較貧困地區作為能源，以減少砍伐森林。本研究構思相當巧妙，值得肯定。