WASTE MANAGEMENT: SOME ENERGY RECOVERY PROCESSES

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Abstract

Biomass energy is one of humanity's earliest sources of energy particularly in rural areas where is often the only accessible and affordable source of energy. The use of biomass fuels provides substantial benefits as far as the environment is concerned. Biomass can be converted into liquid, solid and gaseous fuels with the support of some physical, chemical and biological conversion processes. Wastes are indispensable elements of human life. Solid wastes comprise garbage, paper, plastics, metals, wood and synthetic materials. A natural part of the life cycle, the waste occurs when any organism returns substances to the environment. Waste management is required to prevent deterioration of the ecological balance. Solid waste management was one of the most significant environmental issues encountered in developing countries. The natural wastes are disposed of by the ecological system. Important is the elimination of waste of natural artificial. There are various options available to convert solid waste to energy. Mainly, the following types of technologies are available: pyrolysis, gasification, anaerobic digestion, sanitary landfill, incineration, and other types. The gasification of biomass is a thermal treatment, which results in a high production of gaseous products and small quantities of char and ash. The pyrolysis process occurred by thermal degradation of the wastes in the absence of oxygen/air. The biogas production is the process conversion of a cellulosic material to methane gas in anaerobic conditions.

Keywords: Waste management, Energy recovery, Solid waste.

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1. Introduction

Biomass fuels potential includes wood, wood wastes, short-rotation woody crops, agricultural wastes, short rotation herbaceous species, bagasse, industrial residues, waste paper, sawdust, bio-solids, grass, municipal solid waste, waste from food processing, aquatic plants and algae, animalwastes, and a host of other materials. Worldwide biomass ranks fourth as an energy resource, providing approximately 14% of the worldȏs energy needs all human and industrial processes produce wastes, that is, normally unused and undesirable products of a specific process [1-5]. Biomass thermo-chemical conversion technologies such as pyrolysis, liquefaction and gasification are certainly not the most important options at present; combustion is responsible for over 97% of the worldȏs bio-energy production [6-9].

Biogas can be obtained from several sources. It is obtained from decomposing organic material. There are various options available to convert solid waste to energy. Mainly, the following types of technologies are available: (1) pyrolysis, (2) gasification, (3) anaerobic digestion, (4) sanitary landfill, (5) incineration, and (6) other types.

2. Experimental considerations for pyrolysis and gasification

The pyrolysis products are collected within three different groups as non-condensable gaseous products, condensable as tarry liquids and wax degradation products and solid residue. The products are analyzed mainly in liquid state using a Fisons Ins. Gas Chromatograph (model GC 8000) equipped with a flame ionization detector, 30 m long, and 0.25 I.D. ZB-625 capillary column. The biogas production is the process conversion of a cellulosic material to methane gas in anaerobic conditions. Collected waste cooking oil was centrifuged and filtered to remove burned food bits, etc. Preheating was done to remove unwanted moisture present in the oil. The cooking oil is heated to 395 K to remove all water present in the oil. The catalyst (KOH) is dissolved into methanol by vigorous stirring in a small reactor. The oil is transferred into the biodiesel reactor and then the catalyst/alcohol mixture is pumped into the oil. The final mixture is stirred vigorously for 2 hours at 313-380±2 K. A successful trans esterification reaction produces two liquid phases: ester and crude glycerin. Crude glycerin, the heavier liquid, will collect at the bottom after several hours of settling. Phase separation can be observed within 10 minutes and can be complete within 2 hours of settling. Complete settling can take as long as 20 hours. After settling is complete, water is added at the rate of 5.5 percent by volume of the methyl ester of oil and then stirred for 5 minutes and the glycerin is allowed to settle again. Washing the ester is a two-step process, which is carried out with extreme care. A water wash solution at the rate of 28 percent by volume of oil and 1 gram of tannic acid per liter of water is added to the ester and gently agitated. Air is carefully introduced into the aqueous layer while simultaneously stirring very gently. This process is continued until the ester layer becomes clear. After settling, the aqueous solution is drained and water alone is added at 28 percent by volume of oil for the final washing [10-17].

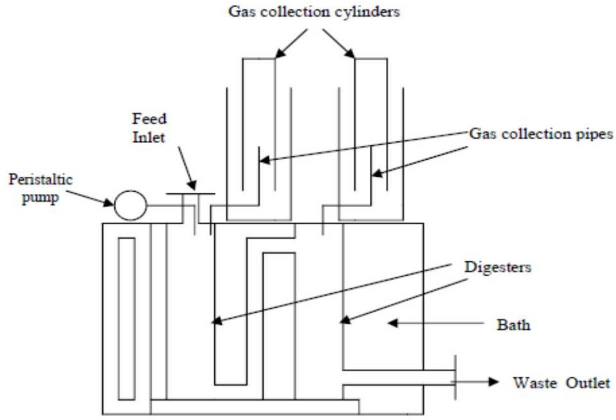

Fig. 1. Experimental set-up for batch anaerobic digestion of manure and/or straw slurries.

3. Conclusion

All living organisms have to produce some kind of waste and it has to be collected to be taken elsewhere. Many cities and towns deals with solid waste by creating a landfill; some use incinerators to burn the trash. Solid waste is a necessary in life. Unsuitable waste management practices result in the loss of resources and energy, which could be recycled and produced from a large part of the solid waste. Waste-to-energy technologies cover to create renewable energy from waste matter, including municipal solid waste, industrial waste, agricultural waste, and waste byproducts. The main categories of waste-to-energy technologies are physical technologies, which process waste to make it more useful as fuel; thermal technologies, which can yield heat, fueloil, or syngas from combustible organic wastes; and biological technologies, in which bacterial fermentation is used to digest organic wastes to yield fuel. Biofuel from wastes include new products such as ethanol, biodiesel, hydrogen and biogas from bio-wastes.

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