

SOME POSSIBILITIES OF USING BIOGAS AS AN ALTERNATIVE TO FOSSIL FUELS

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***Abstract:** In present time, the global energy production is mostly dependant on the fossil sources of energy (oil, natural gases and coals). Compared to classic fuels, biogas resulted from anaerobe digestion is permanently renewable, because it is obtained of biomass. As a result, the biogas produced through anaerobe digestion will not only improve the energetic balance of one country, but it will bring an important contribution on preserving natural resources and improving the environmental conditions, through reducing emissions with green house effect and reducing the global warming.*

The paper wants to reveal some of the advantages of using biogas, the most important being that biogas is a flexible source of energy, suitable for many applications, especially as fuel for vehicles or in the electric piles technologies. In order to be used as fuel for vehicle, biogas must be improved and transformed in bio-methane. The paper also presents a small biogas plant, which can be used by farmers.

Key words: *biogas. alternative fuels, biomass, biomethane*

INTRODUCTION

Biogas is one of the alternative fuels which can be successfully used as an alternative fuel, especially in rural areas. It is usually obtained through the process of anaerobe digestion, Thus, it will improve the energetic balance of one country and will also bring an important contribution to preserving the natural resources and improving the environmental conditions, through reducing the emissions of gases with green house effect.

The interest in biogas has further increased today due to global efforts of displacing the fossil fuels used for energy production and the necessity of finding environmentally sustainable solutions for the treatment and recycling of animal manure and organic wastes.

Biogas installations, processing agricultural substrates, are some of the most important applications of anaerobic digestion today.

In line with the other biofuels, biogas from AD is an important priority of the European transport and energy policy, as a cheap and CO₂-neutral source of renewable energy, which offers the possibility of treating and recycling a wide range of agricultural residues and byproducts, in a sustainable and environmentally friendly

Between the advantages of using biogas, we can number:

- A low dependence of fossil fuels
- An important advantage is its capacity of turning waste in valuable resources, through using these as row material for the process of anaerobe digestion
- Biogas is a flexible source of energy, suitable for many applications, In many European countries, biogas is used for co-generation of thermal and electric energy. Also, biogas is improved and used for supplying of natural gases network, used as fuel for vehicles or in electric piles technology

A biogas factory does not consists only in an energy supplier. The animal biomass resulted in the anaerobe digestion process represents a valuable soil fertilizer, rich in

Nitrogen, Phosphorus , Potassium and micronutrients, which can be applied on the soil with usual equipments, also used in the case of manure.

MATERIALS AND METHODS

Before using biogas as a fuel, both through its introduction in the natural gases network, or in the vehicles tanks, it must be purified, through removing all the contaminants substances and the carbon dioxide. In this way, an increase of its content of methane takes place. This process is named the improving of biogas. The methane concentration of biogas, which is normally 50-75%, is raised, through the improving process to a value up to 95 %. At this hour, there are some available technologies used removing the contaminant substances of biogas.

Biogas, fuel for auto vehicles

Using bio-methane in transport represents a technology of great potential, which determines important benefits to social-economical level. Biogas is already used as biofuel in countries such as Sweden, Germany and Switzerland.

The most automobiles which use gas are usual automobiles which use fossil fuel which are adapted to use gas, through adding a tank for liquefied gas, placed in the trunk and a motor supplying system with gas, in the same time with the preserving the capacity of functioning on classic fuel.

Automobiles for transporting heavy materials can be adapted to function on methane gas only, but in some cases are used dual motors, capable of function simultaneously with gas and with classic liquid fuels. Such a motor uses a diesel injection system, the gas being ignited through injection of a small quantity of diesel fuel. The dual motors need a less special design and are capable of equal performances with those of the classic diesel motors. But the emission values are not as satisfactory as those of the similar gas autovehicles and the construction technology of dual motors still remains a compromise between that of motor with sparkle ignition and diesel motors.

Autovehicles which function based on bio methane present substantial advantages compared to those which use gasoline or diesel oil. The total emissions of Carbon dioxide are much reduced, depending on the nature of raw materials used and the electric energy origin (Fossil or renewable) used in the process of gas improvement and in its comprimation, The particles and soot emissions are as well much reduced, even compared to last generation diesel motors.

From another point of view, one of the main advantages of biogas production is the ability to transform waste material into a valuable resource, by using it as substrate for anaerobe digestion. Many European countries are facing enormous problems associated with overproduction of organic wastes from industry, agriculture and households. Biogas production is an excellent way to comply with increasingly restrictive national and European regulations in this area and to use organic wastes for energy production, followed by recycling of the digested substrate as fertilizer.

A biogas plant is not only a supplier of energy. The digested substrate, usually named digestate, is a valuable soil fertilizer, rich in nitrogen, phosphorus, potassium and micronutrients, which can be applied on soils with the usual equipment for application of liquid manure. Compared to raw animal manure, digestate has improved fertilizer efficiency due to higher homogeneity and nutrient availability, better C/N ratio and significantly reduced odors.

The agricultural biogas plants are considered those plants which are processing feedstock of agricultural origin. The most common feedstock types for this kind of plants

are animal manure and slurries, vegetable residues and vegetable by products, dedicated energy crops, but also various residues from food and fishing industries.

The Chinese type (Figure 1.a) is an underground reactor of typically 6 to 8 m³. It is supplied with household sewage, animal manure and organic household waste. The reactor is operated in a semi-continuous mode, where new substrate is added once a day and a similar amount of decanted mixed liquid is removed once a day. The reactor is not stirred, so the sedimentation of suspended solids must be removed 2-3 times per year, occasion when a large portion of the substrate is removed and a small part (about one fifth of the reactor content) is left as inoculums.

The Indian type (Figure 1 b) is similar to the Chinese type as it is a simple underground reactor for domestic and small farming waste. The difference is that the effluent is collected at the bottom of the reactor and a floating gas bell functions as a biogas reservoir.

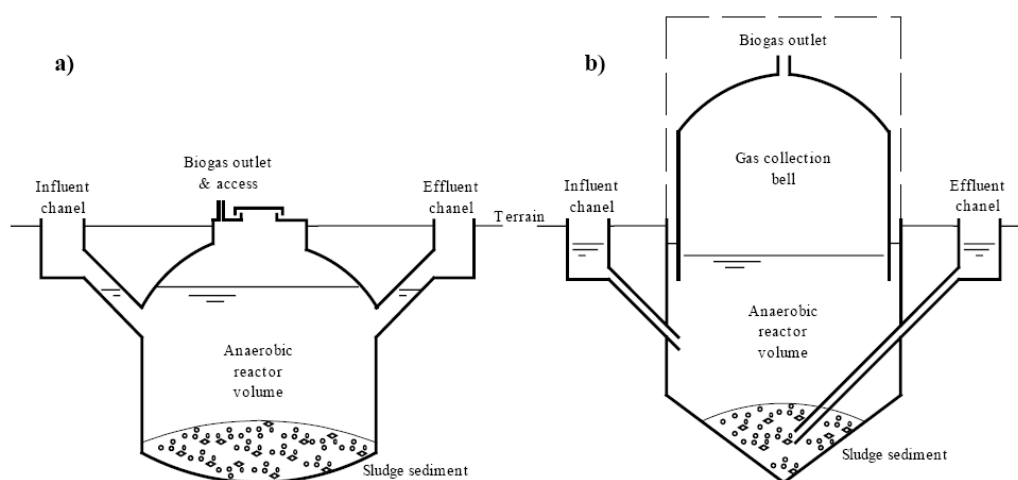


Fig. 1. Two differeny types of biogas plants

a- chinese type

b- indian type

Another small scale biogas plant is the displacement type, which consists of a horizontal cylindrical reactor. The substrate is fed at one end and the digestate is collected at the opposite end. The substrate moves through the reactor as a plug flow, and a fraction of the outlet is re-circulated to dilute the new input and to provide inoculation.

The farm scale biogas plants have various sizes, designs and technologies. Some are very small and technologically simple, while others are rather large and complex, similar to the centralised co-digestion plants. Nevertheless, they all have a common principle layout: manure is collected in a pre-storage tank, close to the digester and pumped into the digester, which is a gas-tight tank, made of steel or concrete, insulated to maintain a constant process temperature. Digesters can be horizontal or vertical, usually with stirring systems, responsible for mixing and homogenising the substrate, and minimising risks of swimming-layers and sediment formation.

Digestate is used as fertiliser on the farm and the surplus is sold to plant farms in the nearby area. The produced biogas is used in a gas engine, for electricity and heat production. About 10 to 30% of the produced heat and electricity is used to operate the

biogas plant and for domestic needs of the farmer, while the surplus is sold to power companies and respectively to neighbouring heat consumers.

RESULTS AND DISCUSSIONS

The applications of biogas as a fuel has many opportunities, in this paper were presented only some of them, which are small scale biogas plants. In all these plants, a bioreactor must be used, and the originality of the biogas plant can consist in the type of this bioreactor. We propose the use of a self pressured bioreactor with two membranes separation module, which can be used in different forms. But the great advantage of using biogas is that of the raw material used for its obtaining, and that is waste of agricultural origin. In this paper we showed that biogas can be used as a biofuel used for energetic needs, but also a fuel for automobiles, after small modifications of their motors.

CONCLUSIONS

Biogas is a valuable resource, which can be successfully used as fuel, especially in rural areas, but not only in them. The limitation of using biogas in our country is determined by the fact that a biogas plant, even in a small scale, is for now, an expensive solution, but we hope that in the future this disadvantage will be overcome and biogas will be a more and more used biofuel.

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