Potential finding of energy gotten from biogas of urban wastes

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ABSTRACT
In most definitions energy is explained as ability of doing work. Sources of energy are divided into two groups: renewable and non-renewable ones. Biomass energy is one of renewable ones that its main sources are solid urban wastes and animal wastes. The gas which is spread from rubbishes contains organic materials that are volatile and they are dangerous for ozone layer. So by collecting this gas, not only greenhouse gases won’t spread, but also some energy is gotten by burning them. Land fill is a place for burying wastes that are gotten from physical and chemical reactions. The results of the research show that producing 50 million kilograms of rubbish daily in Iran, by the weight of 71% decay able materials can produce energy equal to 575350 barrel of oil in each day.

KEYWORD
Biomass energy, solid, urban wastes, greenhouse gases

Introduction

In most definition energy is expressed as ability of doing work. Sources of energy are divided in to two groups: Renewable and non-renewable ones. Biomass energy is one of renewable energies that its main sources are solid urban rubbishes and animal wastes. In the world there are different definitions for biomass. Europe association has presented the following definition for using biomass for producing electricity in Europe [1]. Biomass is all decomposable parts of productions such as: rubbishes, sewages agricultural wastes, forest Industries and industries that are related to them and renewable wastes of urban and industrial sites. Biomass energy that gives energy in the only source of renewable energy that gives energy in the forms of electricity heating, cooling and caefuls and it can be in the form of liquid, solid and gas. Besides, its other productions can be petrochemical materials, food and other materials [2]. The most important source of biomass is wood and jungle wastes, agricultural wastes, animal wastes, urban rubbishes and sewages and etc. Organic decomposable materials that are in animal wastes and their fermentation in non-aerobic situation and producing gas as a result of these processes, has made them one of the main sources of biomass. High volume of animal wastes in Iran and getting it in the form of compost in the farm has its own problems. In Iran every one produces 8% kilogram of wastes each day and by burying them we can get biogas that is useable in all industries, especially as fuel of boilers in power stations can be used [3]. Biogas is one of the renewable energies that besides producing energy can produce agricultural compost and increases the level of public health of the society and so it is a suitable way for repulsing waste materials. Sewage and solid wastes that are produced by industries and societies can pollute environment seriously and we can reduce the effects of these materials through getting biogas from them and so the energy of compost will be used. Getting biogas can be
done through non-aerobic processes and it is possible to save some of the costs through this process for example one of the problems that animal Aviculture are facing with it is controlling the wastes for reducing foul smell and other products that pollute the environment, biogas can help us to face with these problems[4].

Mechanism of producing biogas in the process of non-aerobic digesting is so me how complicated and it is affected by different chemical and biochemical factors. As a whole, this mechanism is divided into three Stages:

First stage: Hydrolyzing complicated and non-soluble organic materials and changing them to soluble materials

Second stage: Materials gotten from the first stage are broken by acid bacteria and as result organic acids are produced. Usually Hydrocarbons that have 5 or 6 carbons will be solved in water and will be used by acid bacteria and finally they will be changed to compounds such as: Hydrogen, format, Asetat, probionat and carbonic gas.

Third stage: All of the organic compounds and acids that are produced in Acid making stage will be changed to biogas by bacteria that can make methane.

There are three sources for producing biogas:

1. Urban rubbishes
2. Animal and agricultural wastes
3. Urban and industrial sewages

Land fills are places for burying solid wastes that are the results of chemical and biological reactions. Recycling land fill has different advantages such as environmental and economical ones and the most important of them is getting energy from them. Land fill gas has organic parts that are volatile and poisonous and they can damage ozone layer. Besides, because land fill gas is produced continually in along time it can be used as a fuel source for different application. Burying rubbishes in land fill and forming centralized sites of urban rubbishes has aims such as collecting biogas and preventing from the spread of green house gases.

Today, in most countries of the world, because of serious environmental laws, rubbishes aren’t burned traditionally. According to these laws, industries should install filters and other tools that can keep safe our environment, and because this method is expensive, the new method has been replaced, I mean, burying rubbish in land fill.

In the picture (1) we can see a sample of a land fill that shows method of burying rubbish and gathering gases through vertical pipes.

![Figure 1, a sample of a land fill](image)

Generally, the parts of a system for producing biogas include three parts:

1. Sediment little pool: there is a little pool beside digestive that has been made for combining water, with primary materials. This small pool is related to the lower part of digestive through a pipe and carries the materials mixed with water to digestive part. There is a special mixer that mixes the materials.

2. Ferment storage: it is one of the most important parts of biogas system. It includes a closed space that is filled with primary materials and by fixing heat, moisture and not being air and water in that space, fermenting of materials is started. In this way a good environment is formed for growing and increasing bacteria that produce methane and finally methane is produced.

3. Gas storage: the volume of storage tank depends on the volume of produced gas. Producing gas depends on kind and volume of fermented materials, temperature of fermentation storage and time of remaining materials in the storage tank.

Reviewing the researches that have been done in Iran: Omrani et al (1386) surveyed the situation of getting methane from Bamshur land fill in Shiraz. They surveyed economical, technical and healthy sides of getting methane on the basis of analysis and variables affecting on the volume of gas and so on the basis of experimental and theoretical frame.
Boghlandashti and Lari (1387) did the process of measuring potential of getting electricity from the land fill of Shiraz. They calculated the amount of electricity and biogas that may be gotten from this land fill, on the basis of field studies and determining the combination of wastes that had been buried. Finally they decided about the place of installing a PowerStation with a generator motor that its fuel was biogas and could produce 1065 kilowatt hour of electricity.

Adl et al surveyed theoretical measuring and electrical power that could be installed in a land fill in Mashad. The results of modeling showed that producing gas in the land fill about two years after burring the rubbishes reached to its highest volume and then started its falling and during 50 years nothing was remained.

Theoretical power of producing biogas in Mashad was estimated between 183 to 238 cube meters on tone. Trust able electrical power by 1395 was estimated 157 kilowatt hour in present conditions.

**Materials and Methods**

In this part, we will survey orderly estimating of getting energy from solid urban rubbishes. BoughlanDashti and Lari (1383) got the potential of producing biogas from a land fill in Shiraz. In this research, composition of rubbishes of Shiraz on the basis of their weight was 71% metal and 4% other materials. In normal conditions, the percent of getting methane from the land fill was 48.2% during 4 years about 850 million kilos of rubbishes have been buried in this land fill. This land fill was surveyed in 1383 and the volume of its gas was 232.2 (m$^3$/h). Now, by paying attention to data of Shiraz land fill and generalizing it to all country of Iran, we can measure the potential of getting energy from the rubbishes of Iran.

Although the compound of rubbishes of the cities is different with each other, but we suppose that their average production is similar to Shiraz. So we can consider the percent of decay able materials of the rubbishes of Iran about 71%. The amount of producing rubbish in Iran is 50 million kilograms in a day.

\[ W_{\text{land fill}}^\text{year} = 41464 \text{ (million Kg)} \]

\[ W_{\text{land fill}}^\text{year} \] is the amount of rubbish that has been carried to the land fills of Iran during 4 years.

Paying attention to the weight of rubbishes of Shiraz land fill and volume of produced gas, we can get the volume of gas that is produced in Iran;

\[ Q_{\text{land fill}} = \text{volume of gas of land fills in Iran} \]

\[ V_{\text{day}} = \text{volume of gas of land fills of Iran in a day} \]

Paying attention to this case that percent of methane from Shiraz land fill has been 48.2%, we can calculate the energy that is gotten from this gas:

\[ E_{\text{day}} = 4.81(\text{TJ}) \]

Because land fill gas is produced continually, if we consider coefficient capacity of exploiting this source between 80%- 95%, we can get the average of energy that is gotten in a year.

Paying attention to heating value of oil, we can calculate the value of biogas that is producing from the land fill:

\[ N_{\text{day}} = 575.35*10^3 \text{ (Barrel)} \]

The energy gotten from biogas of land fills has an income equal to 52.48 million dollars in a day.

**Results and discussion**

As it was said before, in Iran about 50 million kilos of rubbish is produced each day. By managing correctly in relation with collecting urban wastes, we can get much energy from the land fills. The results of potential finding about the income of getting energy from the land fill show that we can have an income equal to 52.48 million dollars each day, that under any conditions we can have such an income, because this income has no cost for us, but buy biogas of land fill we can get much energy that needs powerful management in this field. Results of potential finding has gotten in a form of theory one and with a series of hypothesis so getting such an income isn’t possible. In small cities, creating foundations in landfills will have much cost because the volume of produced rubbish is low little energy will be produced that in comparison with primary costs, it will be too low and worth less.

**References**


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