Efficient Method Of Biogas Production

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ABSTRACT

The purpose.Creating ecologically and economically efficient biogas production technology by using high-water plant eichhornia and amaranth silage instead of animal and poultry manure, corn silage, which are considered scarce and expensive.

Methods:

Research was conducted in the field of creating a biogas device, which is becoming more and more widespread abroad as a source of renewable energy. Two biogas devices with a volume of 1.5 and 22 m3 were installed in the experimental area, in which biogas is obtained from Eichhornia and Amaranth plants, and the amount of biogas obtained from animal manure is the same. how many times it has been shown in practice that it is cheap and effective.

For the experiment, the Eichhornia plant was planted in the Khanabad urban sewage area, and the amaranth plant, which is native to North America, was cultivated in the Markhamat district. Its growth process and adaptation to the region were studied. and its properties were studied.

Results. According to the obtained results, using the dry mass of these plants to obtain biogas. It has been proven that cheap and economical biogas can be obtained. 4 varieties of amaranth plant have been localized and it is recommended to plant it in all districts of the region, considering its medicinal properties.

Summary. According to the obtained results, it was found that it is possible to establish an efficient method of obtaining biogas by using the dry mass of a high aquatic plant such as Eichhornia and the dry mass of the medicinal plant Amaranta.

Keywords: biogas, high water plant eichhornia, amaranth, fodder, biomass, granules.

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As a result of the increasing cost of natural gas-fired electricity, the need for biogas and its co-generators is becoming more and more felt. In addition, the energy obtained in the traditional way (based on fuel) causes the release of SO2 and other harmful gases into the atmosphere, which increase the greenhouse effect. All of this encourages us to solve the problem to a certain extent by building and operating new energy facilities - biogas plants and stations in our country.

Biogas production technology, such as methane gas release by digesting natural waste with the help of a certain group of bacteria, can be carried out in an arbitrary environment.

It is known that the cultivation of agricultural products is mainly carried out by private landowners and farms. If we look at the example of Andijan alone, the number of vegetable crops grown in greenhouses has sharply decreased in recent years, and the reason is clear: the use of natural gas for greenhouses has been limited. It is natural that the increase of greenhouses based on the

introduction of biogas production technology is the basis for restoring our lost opportunities. Biogas waste is a ready-made mineral fertilizer and can be an important tool in the development of agriculture. Biogas production technology is based on various substrates, the most common of which is cattle and chicken manure. Many foreign countries use corn silage as a biogas feedstock.

The ability of aquatic plants Eichhornia, Pistia, Azolla to clean municipal wastewater and positively solve environmental problems is known to everyone. During development, they accumulate solar energy as a result of photosynthesis in their blue mass. And their potential in the biogas industry is a promising field that is just emerging. In the Murmansk region, the production of biogas in the wet mass of Eichhornia by Sergey Kolovanov was equated with a global discovery, and the slogan "Chistim i obogreem Rossiyu s pomosyu Eichornyu" appeared. Indeed, its rapid growth, the ability to produce thousands of tons of green mass in a short period of time, makes Eichhornia a necessary potential for biogas.

Preliminary experiments have shown that biogas from Eichhornia is 10 times more efficient than animal manure, besides being less expensive. To a lesser extent, Pistia and Azolla, which provide biomass, are also cheap, almost free raw materials for the biogas industry. However, the fact that high-water plants like these die in winter complicates the matter. Because such raw material cannot be used in the winter season when gas is needed.

Taking into account the above, a group of scientists of the Andijan city innovation development center studied the features of the high water plant Eichhornia in the Andijan urban wastewater experimental areas.Eichhornia, one of the high water plants, is native to Brazil and is widely distributed in warm countries. It is also called "green plague" due to its rapid reproduction. It grows so fast that sometimes it starts to disrupt the movement of ships. However, it can develop at a temperature above +16 degrees (C) and die when the temperature drops, which means that it is inevitable that there will be no "green plague" for Uzbekistan. Our conditions for this plant are the same, it multiplies rapidly on hot days, cleans wastewater, and thus simultaneously becomes a raw material for feed and biogas.

Methods: One of the miraculous properties of eichhornia is the ability to clean all impurities in water by breaking them down. It can be multiplied in the municipal water-waste system softener devices, and maximum cleaning of the basin from bacteria and industrial waste.

As a result of the research, the following properties of the water plant Eichhornia were determined:

1. It multiplies very quickly in water, one bush of it has been observed to reach 1000 in 50 days. 50 bushes for 1 ha during the summer. takes up space.
2. It can purify water from oil products by 97.9%, ammonium by 75.5%, and phenol compounds by 98.3%.
3. It kills harmful bacteria in the water, making the water safe for bathing and even drinking.
4. Occupying the level of a deodorizer, Eichhornia almost eliminates the stench.
5. In the conditions of Uzbekistan, between May and October, 2000 tons of nutritious green mass for animals can be obtained from Eichhornia grass, which is thrown into 1 ha of water. This mass is also a feed, a product for obtaining biogas, and a fertilizer. Fuel is obtained from the dry root.
6. Eichhornia disease bacteria develop rapidly in a waste water pool full of harmful substances, and when it feeds by breaking down all the substances, its body, leaves and even roots are in a healthy, harmless state.

Experience:

As a result of the research, a new biogas technology was created from the dry mass of eichhornia, and biogas was obtained for the first time in laboratory conditions.

The conclusion from the experience of growing Eichhornia at the Andijan sewage plant is that the waters of this system are

effective nutrients for Eichhornia, and it was found that the optimal conditions for its development and reproduction are in the summer months. There are options to save this plant during the winter:

- Eichhornia that bloomed in summer were found to drop seeds into this environment, which ensured the emergence of young eichhornia in the spring.
- The existing reedbeds in the watershed prevent Eichhornia from disappearing completely, with roots surviving among the reeds expected to give some degree of budding in the spring.

In the process of development, Eichhornia accumulates solar energy in its blue mass as a result of photosynthesis and converts it into chemical mass. This mass is the raw material for biofuel and bio-oil. In terms of bioefficiency, no other plant can compete with Eichhornia. Eichhornia processing industry is to obtain biogas from it and future heat and electricity from biogas. 28 cubic meters of such biogas replaces 16.8 cubic meters of natural gas and 18.4 liters of diesel fuel or 20.8 liters of oil.

The conditions created in our country are increasing the number of livestock and poultry farms. Although the manure from them is considered as raw material for biogas, however, this waste is more necessary for soil fertility. Due to this, there is a lack of raw materials for biogas, and as a result, the biogas industry is not considered promising in our country. The high cost of corn silage means that it cannot be used as a raw material for biogas. Another obstacle in this regard is the lack of development of biogas production technology. Due to lack of deep understanding of the scientific basis of this process, it is considered as an ineffective field.

For example, the high acidity of poultry waste kills methane-releasing bacteria, and methane release does not produce the expected results.

For this purpose, it is necessary to organize a two-stage process, in the first chamber, the process of oil and acid separation from the substrate is organized with the help of hydrolysis and acid-secreting bacteria, and in the second chamber, methane-secreting bacteria can be multiplied and the expected product can be obtained. Thirdly, it is necessary to develop the composition of the substrate and the temperature regime. Another problem is that metal construction biogas plants are quite expensive, for example, "Almalik Metall" organization sells a 10 m3 metal biogas plant for 97 mln. is evaluating soum. Such devices are valuable for the population, and there is a high possibility to create a new design of cheap, simple biogas devices.

TRY ITR: A new biogas-producing technology was created from the dry mass of eichhornia, and biogas was obtained for the first time in laboratory conditions.

The process of obtaining biogas is very complicated, and its amount depends on the composition of the substrate, the necessary additives, the temperature regime, the pressure maintained in the reactor, etc. In addition, the cavitation flow of biomass in the reactor is also a cause of efficiency.

The commissioning of a large biogas plant consists of the following steps:

- Biomass (waste and green or dry mass) is periodically loaded into the reactor using a pumping station.
- It is ensured that the reactor is hermetically closed, that oxygen does not enter it.
- The reactor is wrapped with a heat-retaining cover and heated by a heating furnace or an electric tent to maintain the specified temperature.
- The construction material of the reactor should be made of reinforced concrete and cast iron with a special coating. Composite materials are sometimes used in small devices.
- Beneficial bacteria live in the reactor and produce biogas by consuming biomass. Creating living conditions for bacteria consists in feeding them.
- 35-38 in the reactor°Cthe temperature should be maintained.
- The substrate should be periodically mixed. This process is carried out by

special mixers with manual mixing in small devices. In large-scale installations, a nozzle installed in the lower part of the reactor interior is mixed by reintroducing methane gas from the pipes.

The Result:

The obtained biogas is stored in a pressure-resistant device called Gasgolder. The biogas in it is directed to two purposes - to mix the mass in the reactor and transfer it to the consumer - heating boiler and cogenerator to obtain electricity.

Ensuring the operation of the biogas plant as a two-stage reactor increases efficiency. Such a device prevents the death of methane-releasing bacteria by preventing the acidity level from rising. This substrate is particularly effective in the case of poultry waste and alcohol porridge, which is practically ineffective in a single-belt device.

The addition of various additives, microelements, stimulants to biomass increases the biogas output by 20 to 40%, and the reconstruction of the biogas plant can increase this figure even more. These possibilities are also important to increase the level of methane in biogas, which requires a separate scientific approach. An industrial model of this device was created at the center.

Now another new technology has been introduced. Biogas extraction from amaranth plant silage, which is expected to yield 2 times more biogas than corn silage, was tested. Amaranth, which is considered a new cultural plant for Uzbekistan, was grown this year in several regions of the country, 270 t/ha. amount of green mass was tested in practice. Currently, this plant is hundreds of ha. it is planned to plant in the field and create a new stock of raw materials for biogas from it.

The amaranth plant, native to South America, was propagated, and its mass was tested to be used as a stimulant in the biogas production process, and a positive result was obtained.

Currently, these experiments are being further tested in an industrial model of a biogas plant, and amaranth silage is expected to be recommended as the main raw material for the future biogas industry. Because, preliminary research, amaranth silage is expected to be 1.5 times more effective than expensive silage, and 3 times more effective than cattle manure. Amaranth silage is almost free, it is a waste product after harvesting the valuable amaranth grain.

The results of scientific research entered the science system as a new direction - studying the possibilities of obtaining biogas from amaranth green mass, or using it as a stimulant in this process. Amaranth supplementation has been shown to increase the amount of methane in offgas by 10 or more times. Amaranth porridge (jom) is a valuable substance that has been found to increase gas production. 19 varieties of amaranth were planted in Surkhodarya, Namangan, Andijan regions of Uzbekistan, and effective varieties were selected. Varieties such as Kharkovskiy-1 and Lera have been found to yield 200 tons of silage per hectare, and this possibility is considered the cheapest, most effective raw material base for biogas in the near future.

The process of creating a new type of industrial model of a biogas plant and organizing production of biogas from the dry mass of Eichhornia in it was carried out in the following order:

- An industrial model of a biogas plant with a capacity of 22 m3 has been created. Its reactor consists of two chambers, and oil separation by hydrolysis and the creation of acid from it are carried out in the first chamber.
- The methane separation process is carried out in the second chamber.
- The created biogas industrial sample consists of a complex consisting of parts such as reactor, gasholder, vacuum pump, substrate metal pool, grinder, control cabinet.
- The complex vacuum compressor performs two tasks, firstly, the gasholder air is drawn and this allows the methane tank to absorb the substrate, and secondly, the gas in the reactor performs the function of the gasholder.

- Ground Eichhornia, essential waste, amaranth green mass and a proportion of hydrolyzing, acidifying and methanizing bacteria group from the laboratory device were thrown into the homogenizer.
- Our 1.5 m3 reactor was used as a bacteria incubator for the group of bacteria thrown into the reactor.
- An anaerobic environment (anaerobic environment) was created in the reactor.
- Mixing of the substrate in the homogenizer was carried out by re-directing the methane gas taken into the tubes with special holes installed at the bottom of it with the help of a compressor.
- When the biomass enters the methane tank, it undergoes an intensive process of methane conversion and gas accumulation due to the unique characteristic of Eichhornia, the methane-converting symbiont of bacteria.
- Up to 50% of biomass (dry mass of Eichhornia), partially manure, green mass of AMARANT plant, except for a special group of bacteria, were thrown into the reactor as a stimulant.
- Spontaneous heating of the mixture was observed during this process. The process temperature was continuously monitored. In addition, an additional heating device was created, which helps when the reactor temperature drops.
- Anaerobic digestion in the methane tank usually results in 10 days and the process of gas separation begins.
- The pressure of the separated gas in the reactor is being measured continuously and the process of connecting it to the gas holder through the compressor is established.
- A counter (scotch) is installed to measure the amount of gas taken, and the amount of gas released continues to be calculated.

This experimental research is scientifically innovative and fundamentally different from existing technologies in the following aspects:

- For the first time in Russia, biogas was obtained from the green mass of Eichhornia, but this approach does not ensure a continuous process throughout the year, because the green mass of Eichhornia dies in cold weather. In our study, the dry mass of Eichhornia is used as a substrate, which allows a continuous process throughout the year.
- Amaranth green mass was used as a stimulant in order to increase the efficiency of the fermentation process in the anaerobic environment in the reactor, as a result, the time of initial gas separation was shortened, the amount of gas obtained increased,
- The design of the reactor, created as an industrial model, is completely different from existing devices.It has two chambers, the first chamber acts as a substrate hydrolysis and acidification chamber. The second chamber serves to convert the product of the first chamber into methane.
- Radical changes in reactor design and use provide a dramatic increase in efficiency.
- With the participation of entrepreneurs, a mini cogenerator based on a TIKO machine engine was created and tested for biogas. If this opportunity is widely implemented, it will be possible to get the cheapest biogas, electricity and thermal energy.

Currently, a mechanism for obtaining electricity and thermal energy from biogas obtained from Eichhornia has been created and tested in practice.

Summary: The economic basis of the research results is as follows:

1. In laboratory conditions, 14 liters of biogas per day was obtained from 1 kg of green mass of Eichhornia or Pistia at a temperature of 360C for 30 days. Calculations show that more than 500,000 m3 of biogas per year can be obtained from one hectare of water. This is a

product equivalent to 400,000 m3 of natural gas. If Eichhornia is grown in the 20-hectare water basin of the Andijan wastewater system alone, it will be possible to obtain 1 million cubic meters of biogas per year, in addition to wastewater treatment. This allows to cover the population or production deficit to a certain extent.

2.UzbEnergiya consumes 0.36m3 of natural gas to obtain 1kW of electricity. A cogenerator can provide as much electrical energy and as much thermal energy based on 0.29 m3 of natural gas. In addition, 20-25% of the electricity supplied by UzbEnergiya to Andijan is lost due to road resistance and other reasons. So, based on the development of biogas production technology, an opportunity to obtain cheap electricity will be created.

3. Biogas technology requires a large amount of raw materials. For example, the planned biogas plant in Asaka district will require 1,000 tons of raw materials per month. The cost of cattle manure and corn silage is h taking into account the use of almost free substrate based on Eichhornia and Amaranth, the cost of biogas will decrease dramatically.

4. The finished compost from the biogas plant is a mineral fertilizer, which brings great benefits to agriculture and dramatically increases soil fertility.

In conclusion, it can be said that the development of the biogas industry in the environment of Uzbekistan is a promising direction. It is ecologically and economically effective to use high-water plants and amaranth silage instead of animal and poultry manure, corn silage, which are rare and expensive in our country.

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