EXPERIMENTAL AND PRODUCTION FACILITY FOR ANAEROBIC PROCESSING OF ORGANIC POULTRY WASTE

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Abstract. The article presents the technical characteristics of the plant for the anaerobic processing of organic poultry waste, gives a broad overview of the justification and assessment of the capabilities of the device for obtaining biogas from organic poultry waste, as well as the use of a biogas plant and alternative energy. sources. parameters of an anaerobic processing power plant for the production and fermentation process of organic poultry waste.

Keywords: waste, anaerobic, processing, biogas, alternative energy, organic fertilizer, biofertilizer, biomass, biosludge.

Introduction

In the world, much attention is paid to improving the economic performance of energy devices based on the generation of renewable energy in a relatively short time as a result of the processing of organic poultry waste in an oxygen-free environment. Conducting targeted scientific research, including the choice of operating modes of the device for anaerobic processing of pure organic waste of birds without adding additional products and ensuring its highly aggressive operation, as well as automatic process control, is a necessary condition for improving the ergonomic indicators of biofertilizer and introducing modern types of such installations and substantiation of its parameters while maintaining the composition of biogas while ensuring the aggressive operation of the plant [1,2,3].

Putting the issue. Since poultry waste is a complex component in the anaerobic process, it is not possible to use different technological processes or devices. In order to eliminate the shortcomings of the analyzed technologies and devices for anaerobic processing, a pilot plant for anaerobic processing of organic poultry waste was assembled. (Fig. 1).Solution method

Research method. When designing the proposed device to maintain the required level of the anaerobic process of organic poultry waste and ensure its operation in the dilution mode, the internal part was divided into several stages and the control of the device providing dilution was implemented [3] .The working volume of the device is 960 liters. The pre-treatment tank is equipped with a small compressor to absorb the harmful gases generated during the feeding period of free ammonia contained in organic poultry waste. [5,6,7].

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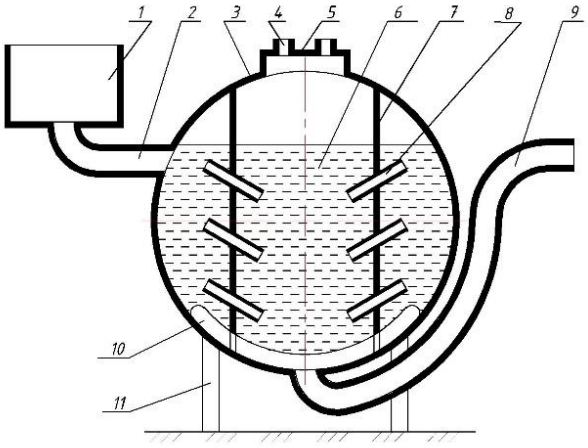

Fig.1. Experimental production plant for anaerobic processing of organic waste of birds.

1- batcher loading daily biomass; 2- eyeliner; 3– bioreactor; 4– thermostat; 5- tap for connection to the vacuum system; 6- biomass; 7- partition; 8– device for mixing biomass in a bioreactor; 9– drain pipe; 10- heating system; 11- base.

Based on the requirements of the anaerobic process, the pressure and dilution in the experimental test device were increased between the upper pressure limit (100 kPa) and dilution (5 kPa), respectively, and the number of daily mixing of the biomass in the bioreactor was (1; 2; 3; 6; 8; 10; 12 times) and without deviating from the technological requirement [5], the biomass mixing speed was changed by values (2; 3; 4; 5; 6; 7 km/h) and the content of biogas and organic waste generated in the process was controlled (Fig. .2). Before the experiments, the experimental test device was checked for tightness. To do this, the amount of internal rarefaction of the apparatus was reduced to 80 kPa and the change was observed within one day. After the daily changes were equal to zero, an air pressure of 150 kPa was applied to the experimental test installation and this pressure was monitored for one day, and after the change became zero, it was concluded that the device was ready for experiments. The main plant systems consist of: heat storage, biomass mixing system in the bioreactor, biogas absorption and dilution system, control and start-up systems, discharge. The plant for biogas production from organic waste of birds is equipped with a bioreactor, a gas tank, a vacuum compressor and a control device, as well as thermocouples and additional devices for controlling the temperature of the plant.

An experimental biogas plant was fabricated by bending a 3 mm thick steel sheet during assembly in the laboratory. During the assembly period of the device, it was checked for tightness during each welding process in order to comply with the rarefaction mode. [1,2]. The experimental production plant consists of 1 container for receiving organic waste; 2- boot device; 3-biomass grinder; 4-pumps; 5-bioreactor; 6 containers for biofertilizer; 7- separator; 8 gas generator; 9-gas filter; 10- gas meter; 11-panel rarefaction and mixing; 12- chopper; 13 - vacuum pump; 14-management of the rarefaction mode; 15- thermometer [9].

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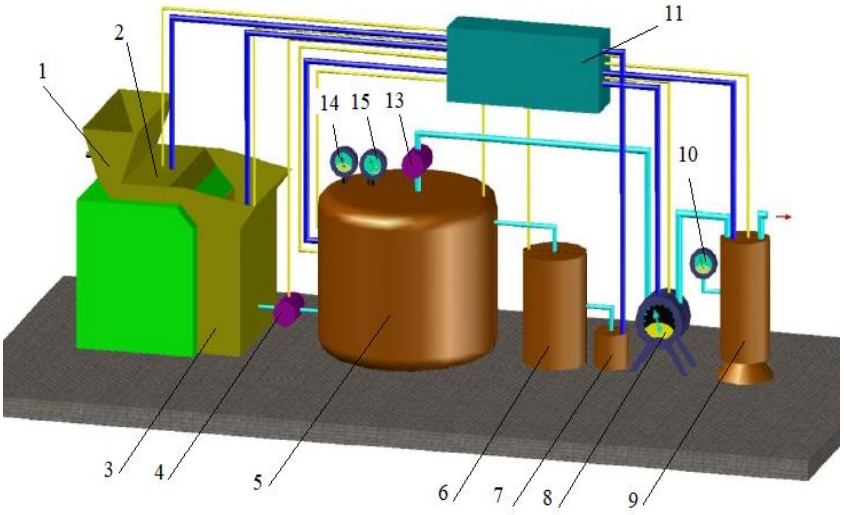

Fig.2. Scheme of an experimental plant for anaerobic processing of organic waste from birds
1-container for receiving organic waste; 2-boot device; 3-biomass grinder; 4- pump; 5-bioreactor; 6-container for biofertilizer; 7-separator; 8-gas generator; 9-gas filter; 10- gas meter; 11-panel rarefaction and mixing; 12-chopper; 13-vacuum pump; 14-management of the rarefaction mode; 15-thermometer.

Organic poultry waste entering the pilot plant is loaded into the primary preparation tank 1. The loaded biomass was crushed in a grinder to fractions from 3 to 2...2.5 mm and stored in a preparatory container for loading the biomass into the bioreactor. The poultry waste brought for experiments during the preparation process is stored in a preliminary preparation tank at the temperature regime of the experiment (54 ± 2 ^{0}C). Organic poultry waste after settling in a period of 1/3 of the time and is fed for loading. To get rid of malodorous gases that appear during the settling of biomass, control sensors are installed on the rarefaction pump, which will control the amount of these gases and maintain a certain degree of dilution of organic waste. At this time, the fetid gases generated during the fermentation of poultry waste are completely absorbed.

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Fig.3. The process of importing organic bird waste for experiments.

The pump for pumping the biomass prepared for loading into the bioreactor 5 is switched on by the time sensor and the finished biomass is loaded into the bioreactor. To ensure constant dilution in the bioreactor 5, the dilution pump is switched on by a "command" from the control panel 11. In this case, dilution (vacuum) will be provided in each node of the bioreactor. The biomass loaded into the bioreactor (any organic waste) begins to ferment in the anaerobic mode of the process when it reaches 120 hours. Due to the complex composition of the organic poultry waste introduced into the pilot test facility, due to the fact that biogas could not be obtained from pure poultry waste in long-term experiments, such waste was introduced into the anaerobic process with great care. Organic poultry waste placed in a bioreactor was brought from the waste collection point of the Yutum Parranda poultry farm, which contains 20 thousand birds of the Zafarabad MFU, Kibrai district, Tashkent region, for the first experiments, 245 kg of organic matter, along with bird feathers, having up to 58-60% humidity (Fig. 3). Poultry waste was accepted in plastic containers and brought separately in plastic bags. Excess organic poultry waste loaded into the bioreactor during the experiments was stored in a refrigerator. At the level of experimental requirements, the biomass was passed through a grinder and loaded into a pre-treatment tank in the bioreactor. The thermal regime of the bioreactor was started from the period of loading the biomass supplied to the bioreactor for introduction into the anaerobic process, and the temperature in the bioreactor was brought to the thermophilic thermal regime by ensuring the temperature regime between the biomass and the heat carrier pipes at a temperature not exceeding 10°C.

Results

The methods of collecting and keeping records of the produced biogas [6,7], measuring the amount of biogas and monitoring the process were used, as well as, in the implementation of the experiment, a volumetric meter brand VSV-01 with a measuring(interval) of 0-8 l, with an interval between each unit is 0.05 l and with a relative error of ±2%.

Using the method of collecting the obtained biogas in the gazgolder, periodically changing the gas burner and selecting and controlling the container for the determination of the composition of the gas sample of biogas, taken from the bioreactor, prepared and organized by "AO Neftegaz" Uzbekneftegaza, with analysis of results [8-14].

Conclusion It was established that under the rarefaction mode in the anaerobic process of 3 kPa, the number of mixing of the main biomass was 4 times/day. It was determined that with a mixing time of 7 minutes, the amount of biogas produced is 1.6 times higher compared to traditional installations, while it was found that the content of methane gas in the resulting biogas is 69.2% and carbon dioxide 28.6%, the amount of organic nitrogen 6.1%, phosphorus 1.97%, which is an invaluable bio-fertilizer and this high-quality organic fertilizer and the resulting biosludge is recommended to be applied directly to the fields (at the time of application, it is necessary to ensure that the fields correspond to the annual amount of organic waste), plants, in greenhouses or indoor flowers.

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