UDC 631.1.004.18:636.22/28

SUBSTRATE MANAGEMENT IN BIOGAS PLANTS

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The need to introduce bioenergy plants has led to the solution of the problem of intensification of methane fermentation processes. Improving the efficiency of the anaerobic fermentation process can be carried out [1,2]:

- microbiological methods by intensifying the activity of microorganisms, in particular, the creation of highly active strains of microorganisms that are grown in special cultivators and introduced into the reactor;
- creation of stimulating additives;
- immobilization of microorganisms on various media; - introduction of coenzyme;
- intensification of the process of biogas production due to design and technological solutions.

The biogas complex is being built to obtain biogas from organic substrates. Its principle of operation is based on anaerobic fermentation. Biogas production occurs as a result of the processing of organic substrate by bacteria without access to oxygen. In this process, complex molecules are broken down into fatty acids, monosaccharides and amino acids. Alcohols and other lower compounds are formed from them by oxidation, which then pass into acetic acid. In the last stage, biochemical reactions lead to the formation of methane and carbon dioxide, which are the main components of biogas.

A biogas station is a complex of complex engineering structures, consisting of devices for the preparation of raw materials, the production of biogas and fertilizers, the purification and storage of biogas, the production of electricity and heat, and an automated control system. All over the world biogas plants have been used for a long time and efficiently [1-3].

Supply. Delivery is important only when processing cosubstrates from other companies. For calculation and accounting, quality control during delivery, it is necessary to carry out at least a visual input control of the substrate [2,3].

Storage. Warehouses of substrates serve, first of all, in order to provide the volume of substrates necessary for loading into the reactor for a period from several hours to two days. The type of warehouse depends on the substrates used [3]. The area required for the warehouse depends on the expected volumes of the substrate and the period of time that it should cover. A hygienic and non-hygienic substrate must not be mixed prior to hygienization.

Odor emissions from storage facilities should be minimized, not only due to legal requirements. This can be achieved, in particular, by placement in hangars, where, along with storage, acceptance and preparation of the substrate can be carried out. Here, the air can be purified in a targeted manner using suitable ventilation systems (e.g. washers and / or biofilters). In waste processing plants, these hangars are often

equipped with a reduced pressure system, in addition to ventilation, this helps to significantly reduce the emission of unpleasant odors. In addition to reducing emissions, hangars have other advantages, as they protect equipment, and repair and inspection work can be carried out regardless of weather conditions, hangars also contribute to meeting noise requirements.

Preparation. The type and amount of preparation of the substrate have an impact on the overall suitability of the substrates in terms of the content of impurities, so that they directly affect the use of the technological equipment of the plant [4]. In addition, the aid can have a positive effect on the course of the fermentation process and, consequently, on the use of the energy potential of the substrate used [2].

The need for sorting and separation of foreign substances depends on the origin and composition of the substrate. Foreign substances, which are most often stones, are separated mainly in a receiving container, from the bottom of which they need to be removed from time to time. Separators of heavy substances are also used, which are mounted directly in the substrate pipelines upstream of the supply system. Other foreign matter is removed manually when the substrate is delivered or loaded into the reactor. A large amount of foreign matter can be in biowaste [3]. If they are used as a cosubstrate, materials free of foreign matter should be selected whenever possible. Costly sorting using mechanical sorting plots or cabins similar to those used for sorting biowaste would in most cases exceed the farm's capacity. Conversely, garage fermenters are practically insensitive to coarse foreign matter, since the transport of the substrate is carried out mainly by wheel loaders and grabs, therefore contact with components sensitive to foreign substances, for example., pumps [4], valves and screw conveyors, excluded.

Conveying and feeding into the reactor.

For a stable fermentation process from the point of view of technological biology, the ideal case is a continuous flow of substrate through a biogas plant. In practice, such conditions can hardly be realized; therefore, as a rule, the substrate is fed into the reactor quasi-continuously. The substrate is served in several batches during the day. Therefore, all the units that are needed to transport the substrate do not have to run continuously. This plays a very important role in the design of the installation [5,6].

Equipment for transportation and feeding into the reactor mainly depends on the quality of the substrate. There are equipment for the substrate, which can and cannot be pumped by pumps [4].

When feeding the substrate into the reactor, its temperature should be taken into account [6]. With a large temperature difference between the substrate and inside the reactor (for example, when the substrate is fed into the reactor after hygienization or in winter), the biology of the process is strongly influenced, which can lead to a decrease in gas flow rate. In such cases, heat exchangers and heated receiving tanks are sometimes used as technical solutions.

For transporting substrates that can be pumped within the biogas plant, mainly motor-driven pumps are used [5]. They are controlled by time relays or technological computers, so that the entire process can be fully or partially automated.In many cases, the entire substrate transport system within the biogas plant is realized using one or

two pumps located in the pumping station. In this case, the laying of the necessary pipelines is carried out in such a way that all relevant technological processes (e.g. feeding into the reactor, complete emptying of tanks, actions in case of an accident, etc.) can be controlled using easily accessible or automatic dampers.

Substrates that can be stacked in wet digestion must be transported to the material feed area or to the liquid mixing area. The bulk of transportation is provided by conventional forklifts. And for automated loading, retractable bottoms, pushers and screw conveyors are used [3,4]. Retractable bottoms and pushers are able to transport almost all stacked substrates on a horizontal surface or with a slight incline. But they cannot be used for dispensing. They allow the use of very large receptacles. Auger conveyors can feed the stacked substrates in almost all directions. A prerequisite for this is the absence of large stones and the crushing of the substrate to such an extent that it can be caught by the auger and enter its turns. Automatic loading systems for stackable substrates are often part of the aggregates for feeding the substrate into the reactor of a biogas plant. In prior art garage-type solids digestion plants, stacked substrates are transported exclusively by wheel loaders or loaded directly by trucks with a floor lift.

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