RESEARCH OF INTENSITY OF MIXING SUBSTRATES IN BIOGAS PLANT

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Today more and more attention is drawn to non-traditional, in terms of sources of energy: solar radiation, tides and waves, etc. Some, such as wind, found widespread use in the past, but nowadays experiencing a rebirth. One of the "forgotten" forms of energy is biogas, which was used in ancient China, and now again "open". The term biogas indicate gas product obtained by anaerobic fermentation, ie without air, fermentation of organic matter of different origin. Either the peasant economy within a year is going to a significant amount of manure, plant stems, leaves and trees of various wastes. Usually after expansion they are used as organic fertilizer. However, it is unknown how many of biogas and heat released during fermentation.

Biogas - energy source, which is a mixture of methane (60 - 70%), carbon dioxide (30 – 40 %), small amounts of hydrogen sulfide, hydrogen, ammonia and nitric oxide (5 %). The composition of biogas can vary depending on the raw material (biomass), microorganisms involved in the process, additives and physical factors.

The coefficient of transformation of biomass into methane reaches 90%. Is the most profitable use of biogas for electricity (based on the overall efficiency of heat generated in the production of energy is 80 - 85%). Converted directly into electrical energy about 33% methane.

The aim - to elucidate the release of biogas and methane concentration in the intensity of mixing and stirring system design to ensure effective mode of biogas plant.

Materials and methods research. For experimental studies developed research laboratory setting, mounted in NUBiP of Ukraine "agronomic research station" design is shown in Fig. 1.

The installation consists of preparatory chamber is heated reactor and placed horizontally in the form of a cylinder, which allows better movement of the substrate, which in turn avoids the formation of so-called "peel", and thereby increase the biogas yield. The reactor is equipped with piping for supplying prepared substrate and removal of rebirth supply, heating system, equipment for mixing the substrate and equipment for the collection, pre-treatment and biogas accumulation. On the whole area of the reactor tubes placed heaters that provide the same temperature throughout the volume of the reactor. For mixing the substrate used fecal circulation pump with air tube placed in the reactor.

The installation consists of preparatory chamber 1, where the substrate is moved to reactor 2. The reactor 2 is in the process of fermentation using anaerobic bacteria, resulting in a biogas. After completion of the fermentation, it enters the container for bio 4.

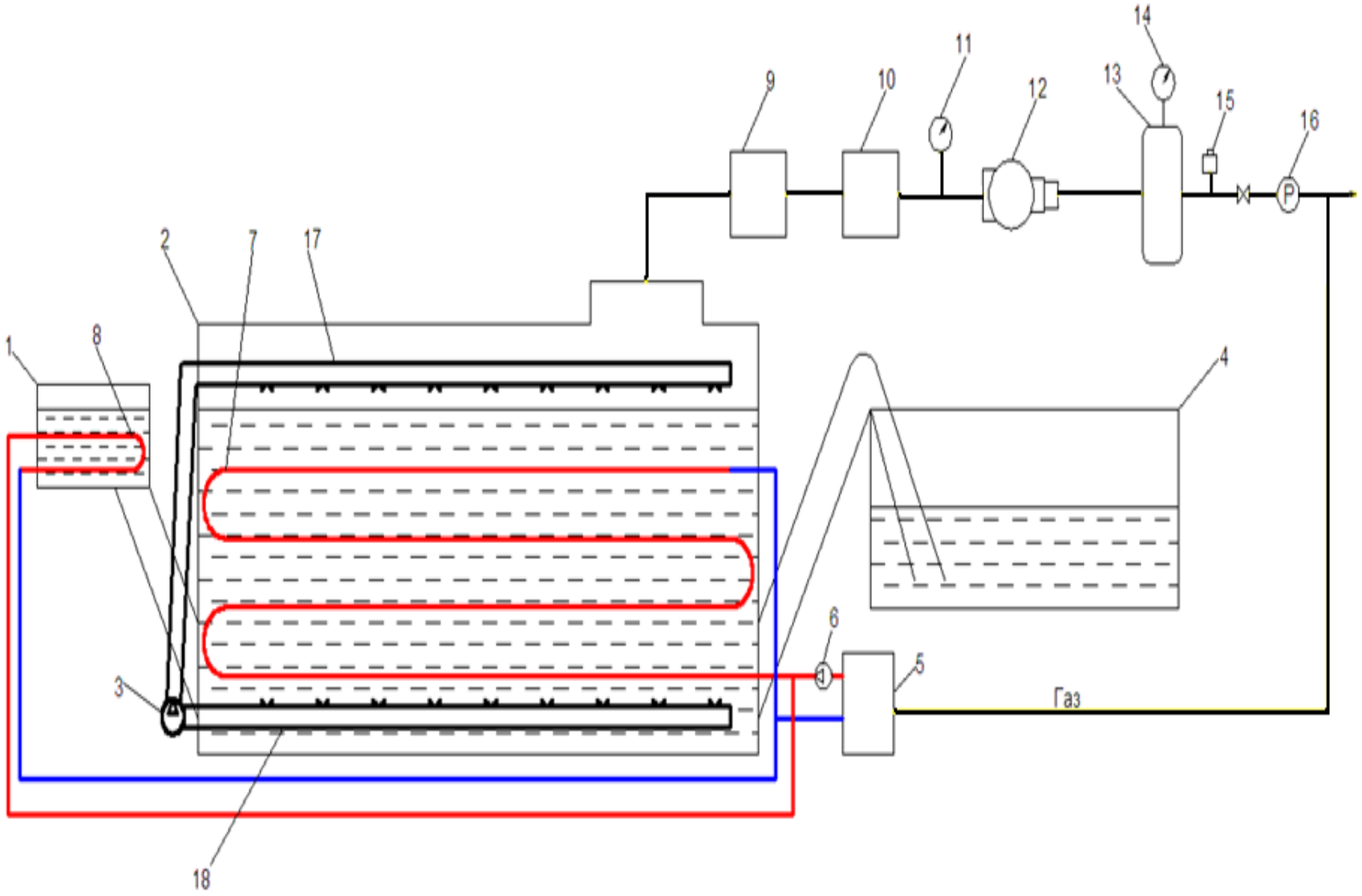

Fig.1. Scheme of biogas plant

To fermentation took place with the maximum sustainable yield of biogas and methane concentration, it is necessary to maintain a stable temperature of the selected temperature.

Maintaining a stable temperature is ensured by the heating system, which skaladayetsya with boiler 5, 6 pump that delivers teploahent for heating the reactor 7 and 8. preparatory chamber heating reactor tube 7 is carried out, which lies on the inner surface of reactor 2 at regular intervals, which provides uniform heating of the substrate. In the preparatory chamber 1 is placed tubular heating 8, enables the substrate heated to a temperature operating mode.

The mixing of the substrate in the reactor is through pump 3 engine which is connected to the network via a frequency controller company Lenze ETM L 4THA provided THE "Altera". At the bottom of reactor 2 is placed fence comb 18 through which the substrate suction pump 3. The pump 3 delivers pressurized spray comb on the substrate 17, which is located above the substrate. Spray comb 17 is made of a pipe, the length of which has openings that allow spray substrate, thereby preventing the formation of "peel".

Biogas formed accumulates at the top of reactor 2, where it enters the filter drier 9 and 10. When the pressure gauge given electric 11 turns on the compressor 12, which pumps gas gasholder 13. To control the gas pressure in the gas container 13 gauge set 14, and to prevent accidents - valve 15. for normal operation of gas equipment installed gas reducer 16.

For the experiment every time I load into the reactor 3 m3 of cattle at a temperature of 37 ° C. Mode mixing substrate shown in Table. 1.

1. Characteristics of the intensity of mixing substrate

№	Number stirred for one day	One time mixing, min	The speed of rotation of the impeller pump / min
1	12	15	705
2	12	15	352,5

3	24	10	705
4	24	10	352,5

Results. To determine the intensity of mixing of the substrate, studies depending on the speed of rotation of the impeller pump on the amount and timing of inclusion.

The research results are presented in Table. 2.

2. The research output of biogas and methane at different intensity mixing substrate in the biogas plant

№	Parameter	t, day							
		1-13	14	16	18	22	26	30	33	35
1	V, м^3/ day	The start time biogas installations	2,8	4,0	5,8	6,0	6,1	6,1	6,0	4,9
	CH_4, %		40	60	62	65	65	64	62	60
2	V, м^3/ day		3,0	4,3	6,2	6,6	7,0	7,0	6,8	6,3
	CH_4, %		43	62	64	66	66	65	62	60
3	V, м^3/ day		2,8	4,1	5,9	6,1	6,3	6,3	6,2	5,2
	CH_4, %		42	66	70	70	70	70	70	68
4	V, м^3/ day		3,2	4,6	6,5	7,0	7,5	7,5	7,2	6,4
	CH_4, %		48	65	72	73	73	73	72	70

Research conducted at different intensity mixing substrate (four modes pump) in of biogas plant reactor showed that the best mode of the pump at 352.5 rev / min and a frequency of 24 times the inclusion / day for 10 minutes. This mode is maximum biogas yield with the highest concentration of methane in it. Fig. 2 shows the biogas yield, and Fig. 3 -kontsentratsiyu methane in it at different intensity mixing.

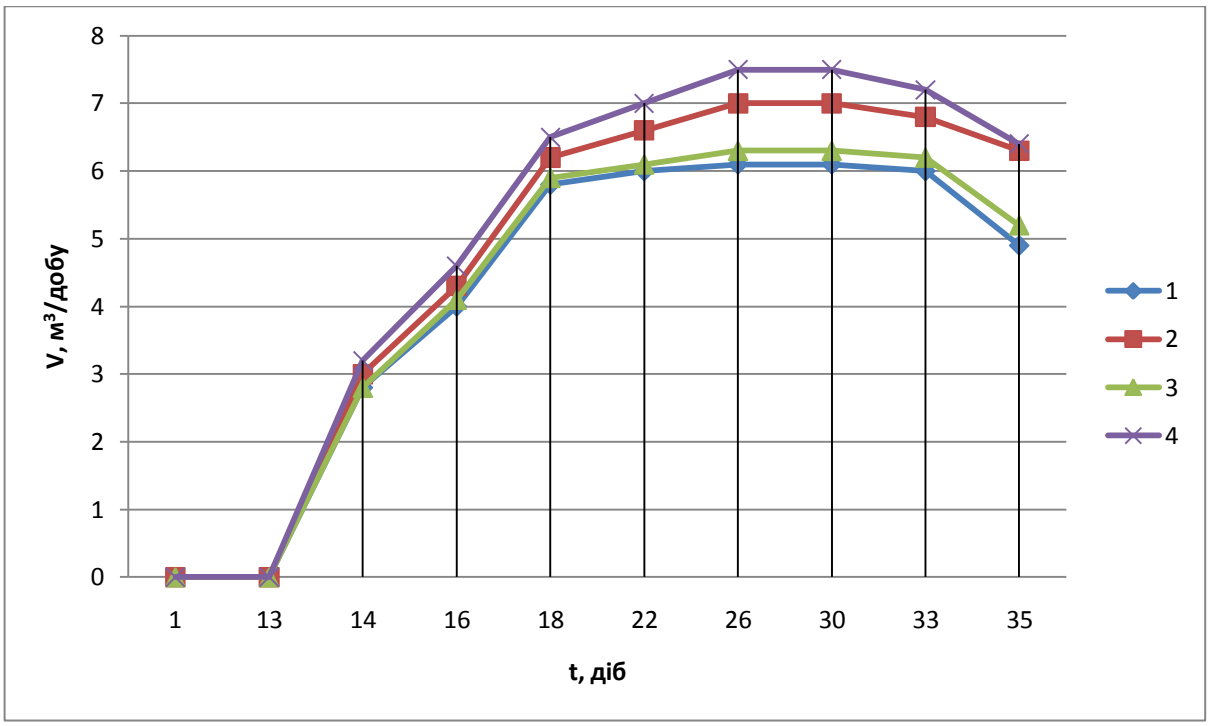

Fig. 2. Dependence of biogas output at different intensities mixing:

1 - rotational speed of the pump 705 r / min when the 12 times / day for 15 minutes; 2 - rotational speed of the pump 352.5 / min when the 12 times / day for 15 minutes; 3 - rotational speed of the pump 705 r / min when the 24 times / day for 10 min .; 4 - the frequency of the pump rotor 352.5 rev / min when the 24 times / day for 10 minutes

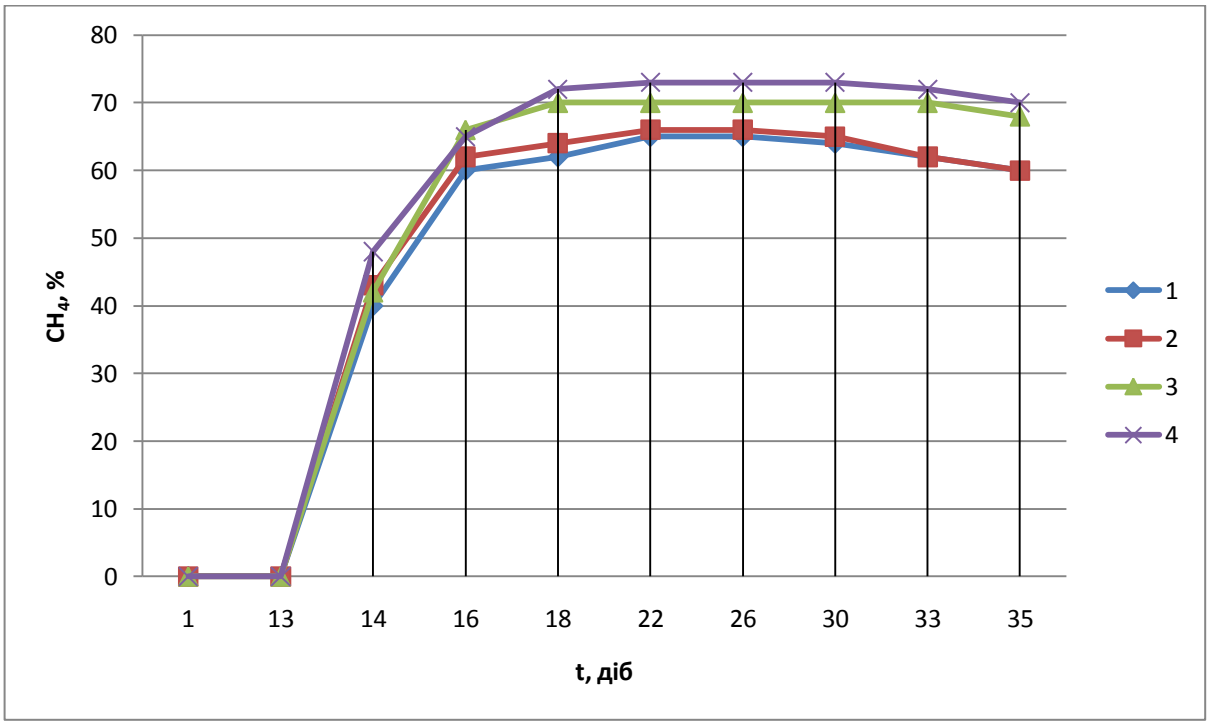

Fig. 3. The dependence of the concentration of methane in the biogas at different intensities mixing:

1 - rotational speed of the pump 705 r / min when the 12 times / day for 15 minutes; 2 - rotational speed of the pump 352.5 / min when the 12 times / day for 15 minutes; 3 - rotational speed of the pump 705 r / min when the 24 times / day for 10 min .; 4 - the frequency of the pump rotor 352.5 rev / min when the 24 times / day for 10 minutes

Conclusions

As a result of experimental studies established patterns of change out of biogas and methane concentration in the intensity of mixing of the substrate. Established in biogas plants using hydraulic system should be used mixing pump impeller rotation frequency 352.5 rev / min when the 24 times / day for 10 minutes.