USE HEAT BIOTERMICHNOYI OF LOW FERMENTATION AGRICULTURAL WASTE ORGANIC

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The results of biotpower researches of biotechnological process of punching of organic agrowastes are resulted in the isolated reactor systems with forced аерацією, certainly prospects of subsequent development of the proper technologies and equipment for енергозабезпечення of agricultural production, mechnical and technological solution of equipment is offered.

Biotthermal punching, reactor systems, biotpower researches, mechnical and technological

Results bioenergy research biotechnological process agricultural composting of organic waste in isolated reactor systems with forced aeration. The prospects for further development of appropriate technologies and equipment for agricultural production of energy. A technical and technological solutions equipment.

Biotermichne composting reactor systems, bioenergy research, technical and technological solutions equipment.

One of the real ways of increasing the production of organic fertilizers is creating and implementing various technologies composting organic waste. Composting - a managed process of creating and maintaining optimal conditions for microbiological processes (humidity, temperature, structure, composition and the presence of nutrients) and minimizing the term recycling. The final product, compost contains stable organic compounds decomposition products, biomass dead microorganisms, some of green products and chemical interaction of these components [1, 5].

Composting is a dynamic biotech process that proceeds through life consortium of microorganisms of different groups. In the process of composting involves many types of bacteria - more than 2000 and at least 50 species of fungi. However, aerobic waste processing orhanomistkyh can receive low-grade heat that is appropriate and can be used for commercial purposes to reduce energy dependence and energy efficiency of small livestock farms [2, 3].

The purpose of research - the study of biotechnological process of composting organic waste in isolated reactor systems.

Materials and methods research. Research conducted by biotermichnoho composting of personal experimental composting process. This was used composting system like "pie with forced aeration", which is relatively simple and inexpensive. Indicators determined in accordance with the requirements of the JMA 74.3-37-268: 2005 [4].

Results. Based on research developed overall mass balance of fermentation (oxidation biotermichnoho) in bioenergy installation with forced aeration (Fig. 1).

1 kg of biomass contributed 2.490 air / cycle. 2.490 kg of air supplied to bioenergy installations, divided in the gas phase in 1.733 kg of nitrogen that enters the gas mixture of oxygen and 0.757 kg, which is directly involved in the process of composting.

1 kg of solid biomass loses 0.710 kg destruktovanoyi biomass, and is 0.290 kg of compost. During the composting process, taking input 3.490 kg / cycle is lost by evaporation CO2 1.042 kg and 0.425 kg of steam, for a total of 3,200 kg of gas emissions and organic compost is 0.290 kg.

Thus, during composting major heat losses out of steam and gas phase, indicating that the need to improve the design and methods of composting organic matter.

Using analytical and experimental data, taken overall energy balance of the process of fermentation (oxidation biotermichnoho) in bioenergy installation with forced aeration (Figure 2).

Initial data for the calculation of the energy balance of the process of fermentation (oxidation biotermichnoho) in bioenergy installation with forced aeration:

- Enerhovmist manure biomass (humidity 80%) - 0.42 MJ / kg;
- Enerhovmist filler (straw moisture content of 14%) - 16,19 MJ / kg;
- Enerhovmist kompostuvalnoyi mixture (70% humidity) - 5.65 MJ / kg;
- Exposure of fermentation - 7 days;
- Working volume of the fermentation chamber - 500 l;
- Temperature during fermentation of biomass - 55,0 ° C;
- Temperature - 0,0 ° C;
- Temperature gas emissions - 54,8 ° C;

- Initial water temperature - 12,0 ° C;

- The final water temperature - 40,0 ° C;

- The volume of water that is heated - 34.5 liters / day;

- Specific teplomistkist water - 4.19 kJ / (kg • deg.);

- Specific teplomistkist air (gas phase) - 1,005 kJ / (kg • deg.);

- Specific teplomistkist compost - 2.00 kJ / (kg • deg.);

- The amount of heat released from 1 kg of compost - 597 kJ.

- The amount of heat required to heat the compost at 1 ° C is calculated as follows:

(1)

where:

c - specific heat manure biomass of 1.73 kJ / (kg • K);

m - mass of one kilogram of compost kg;

- The difference of the final and initial temperature composting ° C

Since the specific heat of biomass is given in Kelvin temperature 71 ° C composting convert to Kelvin t = 345,15 ºK.

Q = 1,73 • 1 • 345,15 = 597 kJ,

Similarly, other indicators calculated that affect the process biotermichnoho composting.

Enerhovmist kompostuvalnoyi mixture (70% moisture) with 1 kg - 5.65 MJ / kg, we have input. During the composting process of heat loss from gas emissions at thermal radiation lost 1.12 MJ, the energy consumption of 0.35 mJ life of bacteria, the amount of heat released during the life of bacteria is 1.13 MJ.

Using biotermichnoho oxidation process 1 kg of biomass to bioenergy installation with forced aeration to heat water with a temperature of 55 ° C composting, daily 0.69 liters of water heated to 40 ° C.

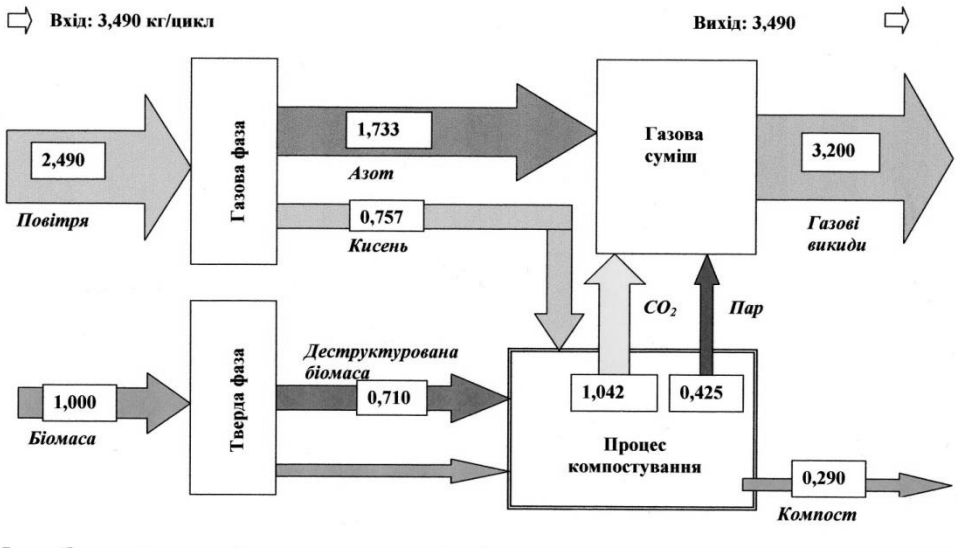

Fig. 1. The total mass balance of fermentation (oxidation biotermichnoho) in bioenergy installation with forced aeration.

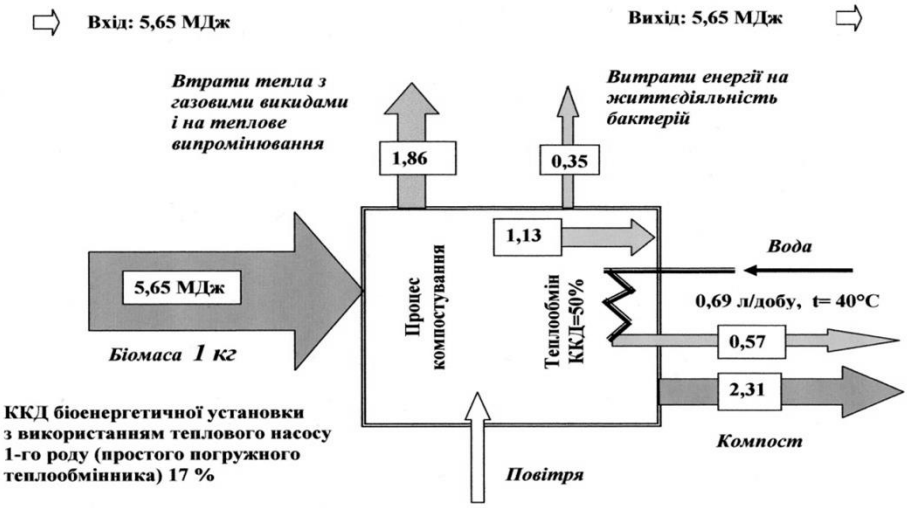

Fig. 2. The overall energy balance of the process of fermentation (oxidation biotermichnoho) in bioenergy installation with forced aeration

On the basis of scientific, technical and patent literature, and experimental results, we developed a structural scheme of universal solid microbial reactor, which can operate in either anaerobic and aerobic fermentation mode of solid waste.

The design of universal solid microbial reactor and its implementation are shown in Fig. 3.

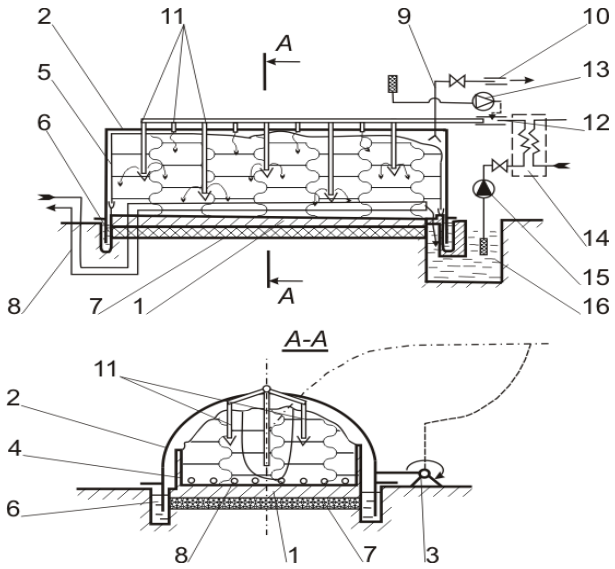

Fig. 3. Universal microbiological solid phase reactor (composting with forced aeration)

1 - horizontal platform; 2 - the case; 3 - hinge; 4 - longitudinal bulkhead;

5 - transverse bulkhead; 6 - hidrodozatvor; 7 - ground insulation;

8 - internal heat exchanger; 9 - drain pipe gas phase; 10 - flexible connection; 11 - feeding tube with a tip; 12 - coupling; 13 - air compressor; 14 - external heat exchanger; 15 - pump; 16 - capacity for liquids

Conclusions

1. composting multicomponent mixtures of biomass in addition to traditional systems clamps, should be used as solid aerobic microbiological reactors periodic action (devices for rapid fermentation biotermichnoyi) equipped with forced aeration systems and biofiltruvannya exhaust.

2. Efficiency of bioenergy plants by using the conventional heat exchanger to heat the water is at least 17%, indicating that the prospects of using heat pumps.