The innovative equipment for the maintenance of hens from domestic producer of TOV "VO Tekhna" is investigated its shortcomings and advantages are specified.

Automation of technological processes, twelve level cage battery, grid platform.

UDC 631,371: 620.92

STUDY energy efficiency rotary digesters

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An inspection of the main provisions of conclusions and analytical research on the study of energy expenditure to drive the rotary reactor for biogas depending on its filling ratios and dive.

Biomass digesters, biogas, mixing efficiency.

Formulation of the problem. Improving the energy efficiency of biogas plants is one of the main directions of improving the process of biogas production, and therefore justification methods for determining the specific power and energy parameters of operation of biogas plants requires constant improvement. The operation of biogas plants showed that promote contact with anaerobic bacteria biomass substrate is provided by the mixing of the substrate, but with intensive mixing must be avoided, as this can lead to poor anaerobic digestion at the expense of symbiosis atsetohennyh and methanogenic bacteria. In practice, the compromise achieved by slow rotation of agitators or

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within a short time. [1] At the same time, operating experience biogas reactors showed that almost impossible to remove bundles of biomass in a reactor in mineral and organic sediment floating biomass, indicating weaknesses in the operation of the mixing biomass [2, 3].

Analysis of recent research. As a result of research we have patented a number of technical solutions that largely eliminate the separation of biomass by providing biomass mixing layers using embedded rotating biogas reactors. Defined as the level of immersion in the rotating liquid methane tanks and rate of filling, depending on its geometric parameters and density of the liquid, which is immersed rotating digesters in securing its location in a suspended state. [4]

The power it takes to overcome the moment of resistance in the bearings depends on the level of organic biomass into digesters, its weight and performance of biogas and biomass [5, 6]. Power consumed by mixing biomass depends on characteristics of biomass (density, dry matter content, particle size of dry matter) and structural-kinematic characteristics digesters (angular velocity, the inner radius, length, geometric dimensions and placement of blades, mixers and walls inside the digesters) [7, 8].

The purpose of research. Check the main provisions of conclusions and analytical research on the study of energy expenditure to drive the rotating reactor to produce biogas, depending on the filling factor and dive.

Results. Experimental determination of the impact of technological and structural parameters and parameters of the substrate digesters to replace power consumption while stirring was conducted using a bioreactor model (internal radius R = 0,2 m working length L = 0,6 m), which was manufactured in Ukraine NUBiP (Fig. 1).

When conducting research digesters installed in the outer casing (Fig. 2), filled with substrate in accordance with the established range of values KZ fill factor of 0.8 to 1. The outer casing filled with water to a level consistent with that prescribed ratio range from 0.8 kzn dive 1. to drive motor rotational speed governed by means of frequency converter Hitachi 3G3JX A4075 EF, which allowed us to obtain a range of angular velocities digesters from 0.05 to 0.5 rad / s. The power consumption of drive motor determined with a digital meter DMK 30 and recorded using a special software for recording device (laptop processor based on Intel CoreI5).

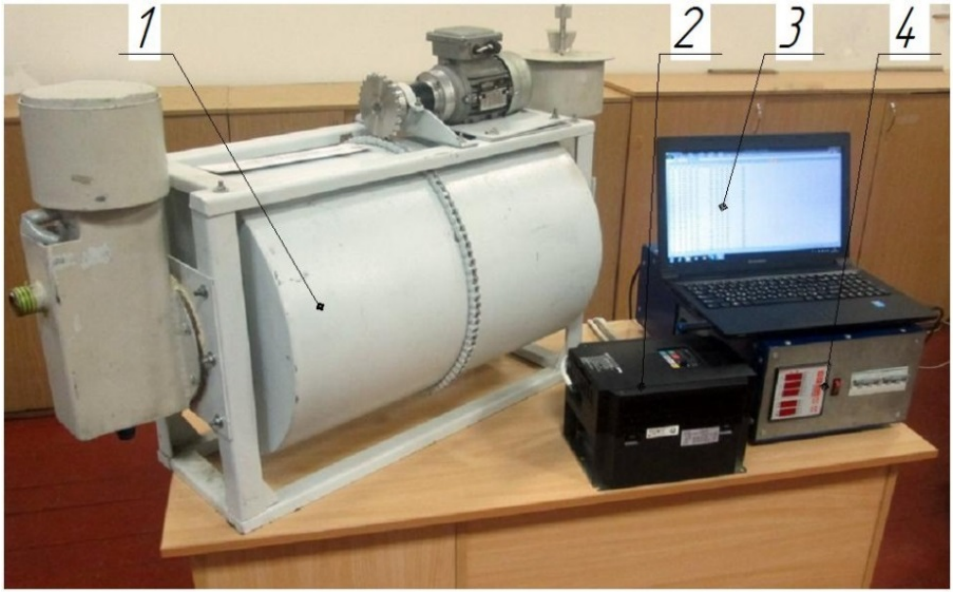

Fig. 1. Set of equipment for carrying out research for energy efficiency mixing substrate (outer casing not shown) 1 - rotating digesters, 2 - frequency converter, 3 - logger, 4 - digital measuring device.

Fig. 2. Rotating digesters installed in the outer casing.

The influence on the fill factor KZ Ndv power consumed by the drive motor enabled by using regression analysis results, gain coefficients corresponding empirical relationship (with a level of confidence probability (coefficient of determination) - $R^2 = 0,9664$):

$$N_{дв} = 2179,2k_з^3 - 5538,5k_з^2 + 4649,5k_з - 1278,1 \quad (1)$$

Where: Ndv - medium capacity engine rotation digesters installed as a result of case studies, W; KZ - coefficient of filling digesters substrate (biomass).

Determination of the coefficient of the regression equation (1) can get a graphical dependence (Fig. 3).

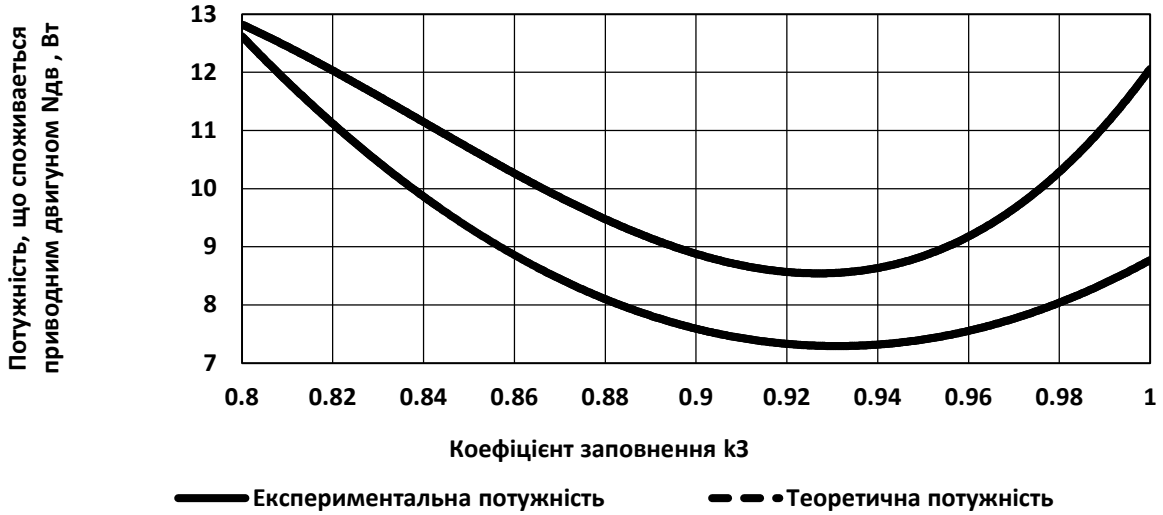

Fig. 3. Experimental and theoretical electric capacity depending Ndv to ensure rotation of bioreactor fill factor KZ (inner radius R = 0,2 m working length L = 0,6 m, the angular velocity ω = 0,11 rad / s) with a coefficient dive kzn = 1.

Analysis graph (Fig. 3) to extremes leads to the conclusion that the minimum energy Ndv = 8.4 W supplied from biomass digesters fill factor KZ = 0.93, which corresponds conducted model experiments and theoretical research. The discrepancy between the schedule of power obtained theoretical and experimental way, can be explained by the fact that the efficiency bearing in reality lower than stated in their characterization by the manufacturer. Also has some effect heterogeneity of the biomass, resulting in additional power consumption ripple during rotation metanteka and increases the average value of the rotation power digesters.

Also, a study of the impact and fill factor KZ kzn immersion in mixing power density Nn biomass in a reactor that allowed, through regression analysis results, gain coefficients corresponding empirical relationship:

$$n_{П} = 806,5312 - 1588,2848k_{з} + 313,9577k_{зн} + 971,9074k_{з}^{2} - \\ -579,0525k_{з}k_{зн} + 114,5044k_{зн}^{2}, \quad (2)$$

Where: Nn - mixing power density biomass into digesters, W / m3; KZ - coefficient of filling digesters substrate (biomass); kzn - factor dive digesters.

Determination of the coefficient of the regression equation (2) can get a graphical dependence (Fig. 4).

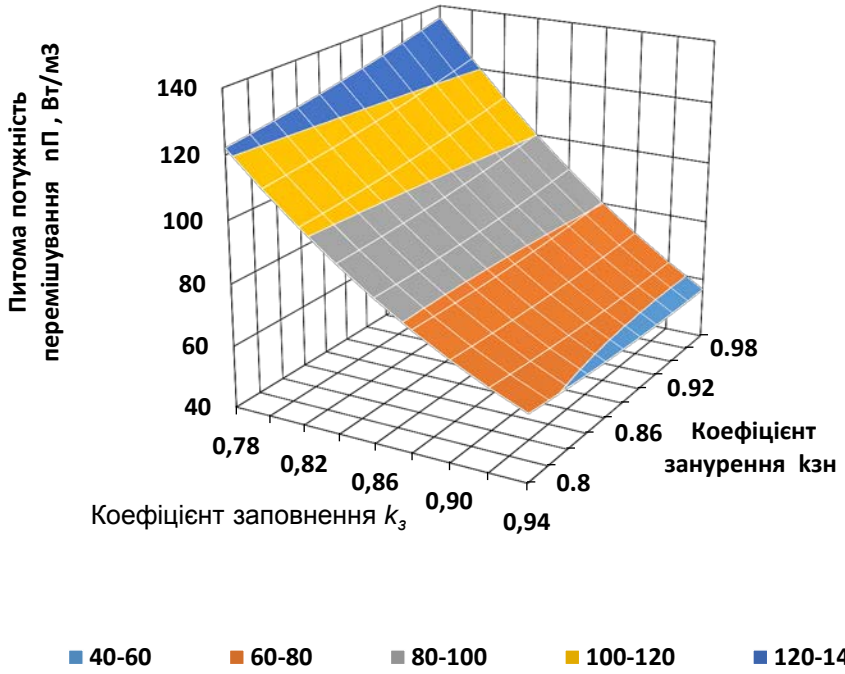

Fig. 4. Dependence of power density Nn mixing of biomass in a reactor and fill factor KZ dive kzn (inner radius R = 0,2 m working length L = 0,6 m, the angular velocity ω = 0,11 rad / s).

Analysis graph (Fig. 4), we conclude that the fill factor values at KZ = 0.93 = kzopt provided minimal specific energy consumption for stirring the substrate (rotation digesters). Thus, there is a total immersion in liquid methane tanks, that ratio dipping kzn = 1.

Conclusion. The result of the study can be argued that filled the magnitude of 92% to 94 rotating reactor for biogas requires minimum power to drive when it is immersed in the liquid in value from 97 to 100%. Thus, the power density Nn drive mechanism in the calculation of the amount of biomass in the reactor lie within ... 99.85 101.23 W / m3

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Conducted proverka major provisions and conclusions of research Analytical Rationale for power machinery costs drive vraschayuschyhsya for obtaining biogas reactors in dependence from koэffytsyentov s zapolnenyya and pohruzhenyya ..

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