

ISSUES OF WATER SUPPLY AND WATER DRAINAGE ON PRIVATE FARM IN KAZAKHSTAN

ПРОБЛЕМЫ ВОДОСНАБЖЕНИЯ И ВОДООТВЕДЕНИЯ НА ЧАСТНЫХ ЖИВОТНОВОДЧЕСКИХ ФЕРМАХ КАЗАХСТАНА

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Abstract: *Revised stock in the special equipment and facilities to prevent contamination of human and animal pathogens, reboot, soil, groundwater and plants with harmful substances and microorganisms. The proposed bioenergy plant provides automation of the process of biogas production and obtaining high-quality organic fertilizer.*

KEYWORDS: WATER SUPPLY, WASTEWATER, UTILIZATION, DRAIN, LIVESTOCK, BIOGAS, ENERGY, ECOLOGY

1. Introduction

Water supply and water drainage on private farm with livestock population up to 100 heads of cattle needs establishing production without wastes, on utilization of organic wastes and livestock drains. The conducted experimental researches on identification of the norms of water supply of the cattle in Almaty region have shown that daily water consumption is $q_{\text{pac}} = 33...34$ l/day, coefficients of hour and daily unevenness are $\alpha_t = 2,13$, $\alpha_{\text{day}} = 1,07$.

On water drainage norms we have obtained the following data:

Water drainage for the cattle for cattle is 44...45 l/day, formation of hard drainage (moisture 73...76%)-6,9..72m³/day. Coefficients of hour and daily unevenness are: $\lambda_x = 1,98$ $\lambda_{\text{day}} = 1,2$ $\lambda_{\text{gen}} = 2,3$. The regime and norms of water consumption of cattle have been studied, structural analysis of sediment has been done and physical and chemical features of livestock drain have been identified.

Chemical analyses of cattle drain have showed the following: chloride content –3,3...5,2 mg/l, iron is missing; magnesium-421...546 mg/l; quantity of calcium has fluctuated in wide range; ammonia nitrogen - 32,0...40,0 mg/m; BPC₅ – 3200...4300 mg/l; BPC_{complete} –4600...5660 mg/l; CPC-14700...15600 mg/l; weighed substances –17,9...18,7 g/l; common nitrogen- 1,3...1,4 g/l and hydrogen index PH- 8,06...8,07.

On bacterial analysis of cattle drain we have obtained following data: colony calculation- 1,2...2,01-10⁶ mln.; index number-more than 10 billiards; pathogenic flora is missing. General analysis shows that indices of VPC, HPC, phosphorus and potassium are slightly high. Before using such drain for irrigation it is necessary to make the required norm of concentration of elements of content of the drain by means of processing using method of anaerobic fermentation on special devices [1,2].

Processed drain *special equipment and installation* eliminates infection of people and animals with disease agents, soil, ground water and plants overloading with harmful substances and microorganisms.

2. Preconditions and means for resolving the problem

Biogas plant choosing and development of technological scheme of complex biogas system it is necessary:

- to chop manure and other organic wastes to the size of not more than 0,005 m and maintain content of moisture in the initial substance on the level 88-90%;
- during device launching the filling should be done within 5...30% of the whole loading volume. Fermentation process should be thermophil (50-55°). It includes two phases. In the first

phase up to 35°C the process takes place quickly, then in the second phase after 4-6 days temperature is increased up to working temperature to 1°C per day;

- daily loading dose of working chamber of bioreactor (methantanka) during heating period from 35 to 50° C should be accepted as 10% and in the set regime-18-30% from loading volume. Mixing of fermented substance should be done with the help of vacuum tower every 5-6 hours 3-4 times [3,4];

- for improving fermentation process of liquid drain, 0,1% of carbon oxide should be added;

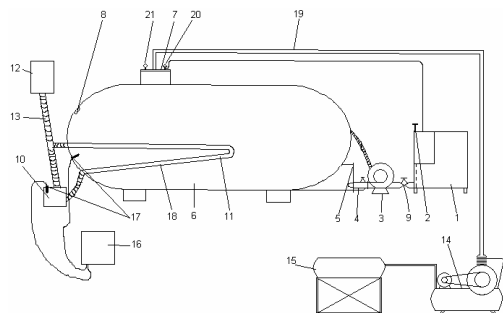
- systematic control the quantity of pathogenic microorganisms and viable helminth eggs in manure after fermentation.

Based on the requirements of the proposed technological process of fermentation of farm drain we have developed various schemes of bio energy devices.

Construction of experimental bio energy device is shown on picture.

Liquid organic wastes and manure drains on farm are taken to the reservoir of 1 preparation of fermented manure and are kept there until needed consistency; catalyser of sediment fermentation process is added. Reservoir of preparation is covered with damper 2 providing cycle loading of device with fermented material. Delivery of prepared manure drains is done with the help of re-circulation pump 3, equipped with homogenisator made as hydro monitor cone nozzles and is located on loading-overflow hatch 5, with consideration of the most effective use of stream energy. Bioreactor (methane device) 6 is situated horizontally with bottom decline 0,01-0,02° to the loading-overflow hatch [7,8].

To conduct montage, maintenance and repair-exploitation works the bioreactor is equipped with technologic hatch with diameter 0,6 m situated in its upper part. Filling level of bioreactor with drains and process of their barbotage are controlled with the help of vision window 8 situated up the calculation loading level. For providing continuous fermentation process in loading-overflow hatch the bolt 9 works for draining of the changing quantity of thrown sediment. To maintain optimal temperature for viability of mizophyl methane bacteria in bio-reactor the system of electric heating is used that consists of electrode water heater 10 type EVM, tubular heat exchanger 11 situated inside bio-reactor, extending tank 12 and pipe line armature 13. For throwing output biogas (methane) the system of pumping out and storage is foreseen including piston compressor 14 and receiver 15 with 1 m³ volume. Therefore the assumed bioenergy device provides automation of technological process of bio gas production and obtaining of qualitative organic fertilizer.



Pic. Principal scheme of experimental bio energy device

1-reservoir of drain preparation; 2- damper; 3- re-circulation pump; 4-hydromonitor device; 5- loading-overflow hatch; 6-bio-reactor; 7- technological hatch; 8- vision window; 9- bolt; 10 –electrode heater; 11- tubular heat exchange; 12- extending tank; 13- pipe line armature; 14- compressor; 15- receiver; 16-mangement box; 17- TSM sensors.



Pic. Fragment test biogas plant

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