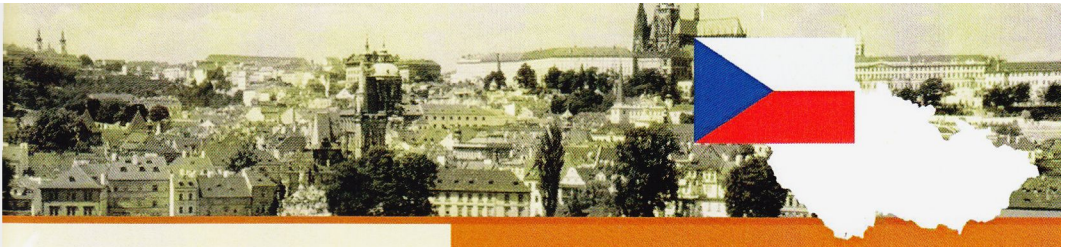

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VIII MEZINÁRODNÍ VĚDECKO-PRAKTICKÁ KONFERENCE

VĚDECKÝ PRŮMYSL EVROPSKÉHO KONTINENTU – 2012

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PRŮMYSLOVÁ EKOLOGIE A LÉKAŘSTVÍ PRÁCE

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TREATMENT WASTE WATER OF SUGAR INDUSTRY WITH USING OF METHANE FERMENTATION

The sugar industry is the one of the most important branches of agro-industrial complex of state. But sugar production connected with different ecological problems. One of them is the creation of waste water. The most dangerous is the concentrate waste water of III category. BOD_5 of them can range from 3200 to 7500 mg O_2/dm^3. Usually, for the sewage treatment use disposal fields on the sugar plants, but they didn't provide necessary separation efficiency. The beginning of the decay, descent pollution soil, underground water and air are connected with the regular throw down of waste water on disposal fields.

The methane fermentation is the best way in ecological and economical sides. Almost all of the organic matters can be used as substrate for this anaerobic method of treatment. The deep of treatment can be reached 95% with using methane fermentation. The application of the methane fermentation for treatment waste water is expedient. It gives an opportunity to decrease the concentration of pollution and to increase the effect of this process with using of biogas and biomass enriched biologically active substance.

The waste water of III category from sugar industry with COD 3789 mg O_2/dm^3 was subjected to process fermentation by the research worker of Biochemical and Ecological Control department of National University of Food Technology of Ukraine. The methane treatment of waste water was carried out with the temperature of 45 °C. It is the first significance of thermophile diapason of temperature. The dose of everyday loading of reactor with the periodical regime was 25 and 50% from total volume of cultural medium. The results of the investigation are shown in table 1.

Table 1

Separation efficiency and gas-generation during periodical fermentation wastewater depending on loading doses

Loading dose, %	COD_{ending} mg O_2/dm^3	Amount of biogas and CH_4 concentration				Deep of fermentation, %
		dm^3/dm^3 waste water	dm^3/g COD_{load}	dm^3/g COD_{ferm}	CH_4, %	
25	110	3,5	0,28	0,29	72	97,10
50	170	3,2	0,25	0,26	70	95,51

Time of the fermentation of third category waste water from sugar factory (25 and 50 % of loading dose) was 3 days. The data shows a direct correlation between time of fermentation and the concentration of pollutants in the effluent.

The most intensive process of contaminants transformation and gas-generation was observed in exponential and stationary growth phases (Fig. 1). A clear relationship between the process of synthesis and purification of biogas we can see from the figure 1. The largest production of biogas was observed at the maximum using of nutrients from waste water.

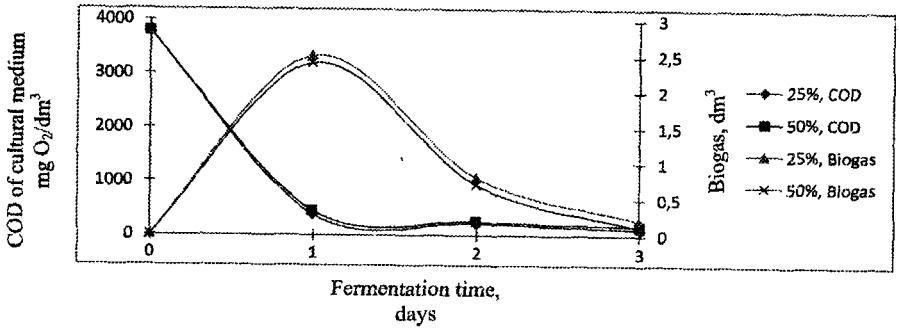

Fig.1. Biogas synthesis and COD reduction during periodic fermentation of sugar waste water

The intensity of treatment processes and gas-generation reduced with increasing of loading dose. That confirms the classical idea of microorganisms' activity in the conditions of increasing of pollution substances.

Cultivation terms and loading dose for the negative-filling-up mode fermentation was the same as for the periodic fermentation (Table 2).

Table 2

Separation efficiency and gas-generation during negative-filling-up fermentation of waste water depending from the loading dose

Loading dose, %	COD_{ending} mg O_2/dm^3	Amount of biogas and CH_4 concentration				Deep of fermentation, %
		dm^3/dm^3 waste water	dm^3/g COD_{load}	dm^3/g COD_{ferm}	CH_4, %	
25	80	3	0,3	0,29	70	97,89
50	120	2,9	0,22	0,2	69	96,83

The greater part of pollution is utilized during fermentation process, but significant quantity of them stays in the culture medium. The data shows that increasing of the dose loading leads to a decrease of the depth of fermentation. A system cannot transform some rather significant portion of organic matter at high doses of loading in allotted time.

It shows that the negatively-filling-up fermentation process provides more effective biotransformation of contaminants than periodic. Depth reaches 97.89% and significantly improves wastewater. For the final disposal of contaminated substances from wastewater used traditional aerobic fermentation.

Thus, using of integrate anaerobic-aerobic technology will help to solve the problem of treatment of concentrate waste water from sugar plants.

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