ENTERPRISES ACTIVITY ECOLOGIZATION BY BIOCHEMICAL WASTEWATER TREATMENT

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One of the ways of enterprises activity ecologization is their wastewater treatment with the aim to decrease technogenic pressure on environment. Method of water treatment depends on its chemical content, conditions of its dumping to city drain system and so on. But the most natural and economically effective method of organic wastewater treatment is its biochemical aerobic or anaerobic treatment. Biological water treatment doesn't need special chemical reagents, complicated mechanisms and big investments. And methane fermentation of organic wastes allows not only to reduce the level of water pollution, but also to receive the biogas that may be used for treatment process realization and also for other purposes.

Different temperature conditions - from +20 to +60 ^{0}C - are used for biochemical treatment of industrial and municipal wastewater. Thermophilic conditions have such advantages as larger rate of process and destruction degree of organic pollution, better characteristics of treated water, disinfection of pathogenic bacteria. Possible imperfections of thermophilic process are additional energy need for wastes heating and a supernatant deficient amount. Thermophilic regime is less stabilized process of methane digestion because of liquid supersaturating by volatile acids at the first stage of cultivation, high sensitivity to temperature changes, possibility of ammonia toxicity because of its large percentage at raw wastes, problems of frothing and odor. Sometimes it is purposeful to use mesophilic and thermophilic regimes combination. But eventually choice of temperature regime depends on nature of wastewater chemical composition.

The aim of the present work was the research processes of treatment and biotransformation of organic pollution of concentrated oiled wastewater (OW) under mesophilic (37$\pm$2 ^{0}C) and thermophilic (45; 55$\pm$2^{0}C) conditions of periodic regime to determine the optimal temperature conditions of biochemical water treatment.

The laboratory model of methane tank was used for the research. It consisted of a tight reservoir, lines of wastes supply, treated water outlet, biogas and overflow active sludge. Biogas entered into the gasholder, from which the samples for methane percentage analysis were periodically taken. Active sludge amount was near 30% of a methane tank volume.

The following characteristics of final values of COD, biogas accumulations, dry residue and oil concentrations were received while research the periodic process of methane digestion of OW under varied temperature conditions (*Table 1*).

Table 1. Final values of main indexes of water contamination in result of periodic methane fermentation under varied temperature conditions

Indexes of contamination	*Value*			
	raw OW	*after fermentation*		
		37 ^{0}C	45 ^{0}C	55 ^{0}C
Fermentation period, day	-	8	4	6
COD, mg O_2/l	11 700	1940	3686	1746
Dry residue, mg/l	1200	1370	1460	950
Oils, g/l	6,5	1,88	4,1	2,5

The most decrease of COD takes place in 24 and 48 hours of treatment. Then the process is somewhat slowing down. It is connected with accumulation of metabolites at the cultural liquid that appear as a result of decomposition of oils and their derivatives. Utilization of these matters by active sludge microorganisms is complicated because of their intricate structure.

The maximum biogas accumulation relatively to the amount of fermented matters is various under different temperature conditions, the "peak" points of biogas accumulation also differ. The maximum amount of biogas accumulation - to 0,35 l/g of fermented matters - occurs at 55^{0}C on the fourth day of anaerobic digestion. The maximum amount of biogas - to 0,7 l/g of fermented matters - is generated at +37^{0}C at the seventh day of fermentation.

The lactic acid concentration as one of the products of metabolism increases at all temperature regimes while a biogas is generated, and then it becomes almost constant, that is confirms the end of the process of decomposition of wastewater organic matters under certain conditions of methane fermentation.

While comparing the final values of the main indexes of wastewater pollution after methane fermentation, it is clear, that the most complete removal of organic matters from wastewater in the shortest period is observed in thermophilic (+55^{0}C) process. This fact allows to decrease capital investments in local treatment stations and to decrease the energy expenditures on wastes heating during the methane tank exploitation. Under these conditions at temperature of +55^{0}C value of COD goes down to 1700-1800 mg O_2/l, and oils content - to 2,5 g/l, that makes possible the use of biochemical aerobic processes with the aim of the local deep after-treatment of OW with BOD value in the range of 250 to 300 mg O_2/l and COD in the range of 450 to 650 mg O_2/l.

So, the most rational scheme of local treatment of oiled wastewater is their previous processing with thermophilic

methane fermentation with the immobilized microorganisms groups for water treatment to the norms of the maximum permissible concentration for water dumping to city drain system.