

Research of infiltrates content of landfills of hard domestic wastes (HDW) (on the example of Lviv landfill)

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Abstract – work investigated composition of infiltrates of Lviv landfill HDW. An estimate is given of his influence on an environment and a microbiological analysis was conducted of the formed culture in infiltraty after pre-clean it by aeration .

Keywords – infiltrate, landfill of hard domestic wastes, maximum permissible concentration, microbiological culture.

I. Introduction

Cleaning problems of infiltrate of dump and landfill HDW appear on all period of planning, exploitation and planned closure of these facilities. At the design stage, as usual, is being implemented innovative cleaning technology collected by the drainage system infiltrates, performance of which corresponds to the calculation. In the period of exploitation priorities in choosing of cleaning system for infiltrates depend on the history of exploitation, condition of systems for collecting infiltrates and the type of object (dump or landfill). What applies to functioning of cleaning systems of infiltrates at the stage of closing landfills of HDW, it should be noted, that the cleaning system in the overwhelming majority of such objects absent at all, and quite often uncontrolled leak of infiltrates has led to the accumulation of significant volumes of them in cumulative ponds.

II. Danger of environmental pollution by infiltrates of Lviv landfill of HDW

Infiltrates of landfill are dangerous pollutants of the environment, in the zone of their influence practically all storage places of HDW in Ukraine. As for the ecological condition of the territory of Lviv landfill of HDW his condition is assessed as critical and even catastrophic, because of the volume of accumulated infiltrates. According to various estimates, their quantity is within 100-120 thousand m³.

Infiltrates of Lviv landfill of HDW is formed in a garbage body as a result of infiltration of atmospheric precipitation, exit of neogene and groundwater in the sides of the ravines, also because of the complex biochemical processes of decomposition of organic parts of the rubbish. The filtrate layer in the garbage body forms a saturation zone and is unloaded at the foot of the garbage body. [1].The filtrate flows through the drainage channels into the ponds – collectors. Infiltrate has a brown and dark brown color, unpleasant rotten smell, increased viscosity, caused primarily by high content of hovering substances.

Analysis of Lviv landfill of HDW about his impact on the environment testifies to that, that the landfill and especially its infiltrates, have a very negative impact on the environment, particularly on soil and groundwater. Based on the results of calculating the toxicity indices of infiltrate ingredients of Grybovychi landfill it is possible to do such conclusions. Since the absolute value of the index of toxicity of a single ingredient is determined by the value of its MAC in the soil, and its concentration in the infiltrate, then the smaller the toxicity index, the more safe is infiltrates. The hazard class of the of the infiltrate of Griboovitsky landfill – I, and a degree of danger – extremely dangerous [2]. The degree of exceeding of the maximum permissible concentrations (MAC) of pollutants in infiltrates is given in table 1.

TABLE 1
EXCEEDING OF MAC OF POLLUTANTS IN INFILTRATES OF LVIV LANDFILL HDW

Indicator	Excess of MAC for water objects, times		
	Pond-storage No. 1	Pond-storage No. 2	Pond-storage No. 3
Dry residue	21	17	14,8
Magnesium	4	4,6	6,2
Chlorides	12	11,6	8,8
Phosphates	213	84	62
Ammonium nitrogen	565,5	275	240
Nitrogen nitrate	2,6	2,5	2,3
Petroleum products	171	119,7	133,3
Biological oxygen consumption	419,3	315	233
Chemical oxygen consumption	300	279	293
Phenols	7330	5130	5940
Heavy metals			
Iron	3,5		
Plumbum	3,7	2,6	2,8
Nickel	1,7	1,3	1,4
Chrome	13,6	6,6	9,4
Cadmium	32	23	25

As can be seen from the presented material the biggest excess observed for ammonium nitrogen, BOC and COC.

III. Research results

For the revious cleaning of the accumulated infiltrates our attention was attracted by technology, which is realized in an aerobic environment in conditions of an aerated lagoon. We conducted research of aerobic purification of the infiltrate of Griboovitsky landfill on a laboratory installation, the working volume of which was 4 liters. Through laboratory aerator in the bottom part of

the flask air was served with discharge 1 l/min. The initial leachate parameters were: pH – 8,64; concentration of ammonium anions – 650 mg/l; a temperature was constant in limits – 13-15 °C. After a certain time period samples were taken, for which the above mentioned parameters were determined. By this study determined maximum degree of purification of infiltrates, which can be achieved in the process of aerobic biological oxidation under the conditions of the experiment's implementation.

We also conducted a microbiological analysis, formed in infiltrate biocenosis, what set wide range of microbiological aerobic culture (fig. 1, 2), which is different from the culture of activated sludge of municipal wastewater treatment plants.

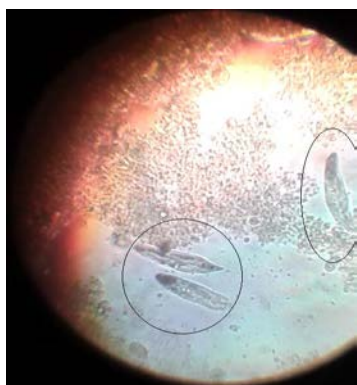


Fig.1 Microorganisms of the type *Stylynychia*, of subspecies *Hypotrichida*.

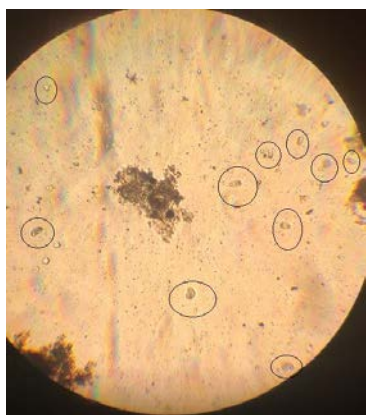


Fig.2 Microorganisms of the type *Hymenostomatida*, of subspecies *Peniculina*.

Also in the infiltrate were found a large number of cysts of helminths (fig. 3).



Fig.3 Photo of infiltrate under a microscope with a large number of cysts of helminths

Conclusion

A temperature condition in which the experiment was conducted (13-15 °C) is the most favorable for the development and formation of active sludge bacteria, which develops in infiltrate.

Research with more accurate identification of formed microbiological culture (peculiar active sludge infiltrate) after his previous cleaning is continued.

References

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