

Research Possibility of the Previous Cleanig of Filtrates at Lviv landfill by an Aeration Method

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Abstract – From this work are defined risk of filtrates from solid waste landfills. The experimental study the effectiveness of the cleaning process filtrate landfill solid waste by aeration.

Key words – solid waste landfill, filtrates, activated sludge, aeration, ammonium nitrogen.

I. Introduction

The total volume of the accumulated wastes according to previous calculations presents about 8,4 millions tone [1]. Municipal domestic waste in the 90's. Were presented by such components (wt. fate%): food waste – 45; wood – 4; black metal – 4,5; coloured metal to 0,3; textile – 7; building garbage, stones, glazed pottery, glass – 5; leather, rubber, shoes –4; plastic and plastic products – 5; other – 5. With time the structure of wastes changed, there is a tendency to doubling the amount of plastic waste.

Significantly decreases the amount of food waste (30-35%), part of packing materials increased, especially polyethylene and plastic (to 30% by weight and 50% by volume, from them plastics by weight - 13% by volume - up to 30%). Negative environmental impact is largely caused by filtrates, which characterized by a high content of toxic organic and inorganic substances, which in hundreds of times higher than the maximum allowable.

II. Description of the problem

Large emptiness of domestic garbage, presence in his composition different components by solubility and the absence of artificial protection for garbage body from the flow of atmospheric precipitations and groundwater from the nearby hills leads to the formation of filtrate – specific waste water, which is one of the main sources of pollution of superficial and groundwater. Filtrate also formed during waste rash with humidity over 55% during their dehydration, and also at biochemical anaerobic decomposition with landfill gas formation [2].

A major ecological problem is the formation of landfills of ammonium compounds in filtrate due to biochemical

degradation processes of protein substances and deamination of amino acids, which included in a number of basic indicators in assessing degree of purification of sewage [3]. The total number of filtrates Lviv landfill constitutes 25 000 m³.

Therefore, the elimination of a large number of formed filtrate is an actual problem. In view of European experience one of the most effective ways is the aerobic method of purification using activated sludge.

III. Methods and results

Utilization of filtrates from solid waste is possible by mixing them with household waste and subsequent cleaning on urban wastewater treatment plants. But this is not possible without their purification caused by a high concentration of ammonia nitrogen (289 HDK_{h.p.} and 1156 HDK_{r.h.}) in them.

The previous cleaning of filtrates was the aim of our researches. For research was mounted installation (Fig.1) in the laboratory.



Fig. 1. Photo of the experimental setup:
1 – compressor, 2 – rheometer, 3 – flask, 4 – aerators

WoDO of the experimental setting consisted in the following: by using the compressor 1, through rheometer 2 into the flask 3 through aerators 4 air was given, where took place aeration process of mixture filtrate of dump from hard domestic wastes and activesilt of municipal sewage treatment plants. Input numbers and concentration in flask 3 are presented in Table 1.

TABLE 1

OUTPUT DATA	
Volume of filtrate, l	4,00
Volume of activated sludge, l	0,01
Air expense, l / min	2,50
Concentration of dissolved oxygen (DO), mg / l	1,87
Concentration of nitrogen ammoniacal (NH ₄ -N), mg / l	578
pH	8,64

An expense of air during research was stable.

Concentration of DO and pH was measured by the portable devices of brand *sensio6* та *sensio2* accordingly.

The concentration of ammonia nitrogen was measured photometrically by using Nessler reagent.

Results obtained during 10 days of aerations of the investigated mixture of filtrate and sludge are presented in Fig. 2-4.

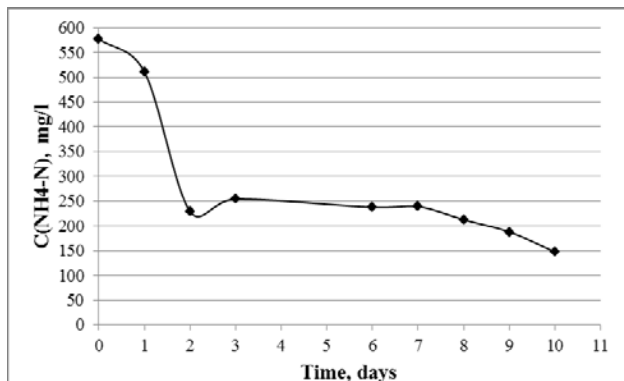


Fig. 2. Change of NH₄-N concentration during the study

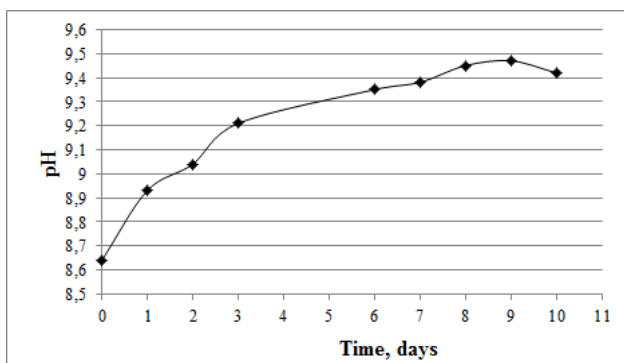


Fig. 3. Changing of pH during the study

Analyzing the results presented in Fig. 2 it is possible to talk about high enough efficiency of aeration, as the concentration of ammonia nitrogen decreased to 147.81 mg/l, which is 74 maximum allowable concentration (MAC) for water household use and 296 MAC which is intended for industrial fishing.

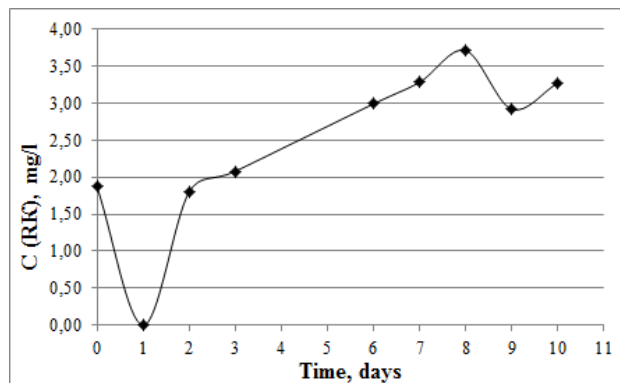


Fig. 4. Change of DO concentration during the study

Conclusion

As a result of the experiment and got results we can talk about the feasibility of the previous purification of solid waste landfills filtrate aeration.

Considering of the final (output) concentration of ammonia nitrogen, which is the main polluter of these streams, after 10-day's aeration, we can state quite good efficiency of such method.

However, for more long-term results that will give an opportunity to do more exact conclusions, experiments proceed on this research.

By analyzing the got results it is possible to talk about high enough efficiency of the investigative process and possibility for utilization of four lakes of filtrate of dump of hard domestic wastes.

References

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