Euroopa Liit
Euroopa Sotsiaalfond

Eesti tuleviku heaks

Toetab TÜ ja TTÜ doktorikool
"Funktsionaalsed materjalid ja tehnoloogiad" (FMTDK)

ESF projekt 1.2.0401.09-0079

LANDFILL LEACHATE UNDER COMBINED OXIDATION TREATMENT

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The first contemporary landfill in Estonia, Vaatsa Landfill, has been operated since 2001. Leachate collected from the landfill site is highly contaminated, toxic and recalcitrant stream. At the present time, the leachate from Vaatsa Landfill is treated biologically, the treatment scheme consists of the activated sludge (AS) reactor followed by an aerated lagoon. With the increasing age of the landfill, the characteristics of the leachate have changed. This has influenced the treatment efficiency and the biologically treated leachate does not meet the standards established in Estonia for the wastewater discharged to the nature mainly due to the high residual values of chemical oxygen demand (COD). The search within recent years for better solutions in landfill leachate treatment has led to different combinations of treatment processes. It is known that contemporary chemical oxidation methods (ozonation and its combinations with UV-radiation, hydrogen peroxide or catalysts) enable not only the destruction of hazardous compounds but also the increase in efficiency of biological processes [1].

The aim of the present study was to find proper combination of biological and chemical oxidation that enables the improvement in Vaatsa landfill leachate purification. The following processes have been experimentally studied: conventional aerobic bio-oxidation (ABO), coagulation, ozonation and combinations of aerobic bio-oxidation with ozonation. In the experiments the raw landfill leachate and also biologically treated leachate from the landfill purification plant and from the laboratory AS reactor were used.

In Figure 1 the results of the performed experiments are presented as the removal efficiencies of COD. In conclusion it can be said, that the efficiencies of ABO in the on-site and in the laboratory AS reactor were low. Also the coagulation and then the ozonation of precoagulated leachate didn't give sufficient purification effect. It was established that post-ozonation of biologically treated wastewater resulted in a reduction of COD of about 13 (treated in the on-site reactor) and 24% (treated in the lab AS reactor). The biodegradability of the wastewater increased (0,006→0,11) during the post-ozonation process but not significantly in terms of enhancing the ABO purification processes.

It was proved that due to the low efficiency of post-ozonation, the use of the treatment scheme – ABO and following ozonation as a polishing process is not a serious prospect. But the increase in biodegradability enables the application of a combined process-aerobic bio-oxidation with ozonation of recycling biologically treated wastewater.

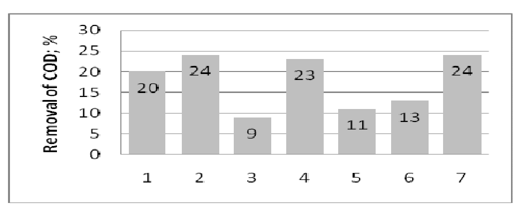

Fig.1. COD removal efficiencies of Vaatsa landfill leachate during different purification processes. 1-ABO on-site; 2-ABO in the laboratory AS reactor; 3-Ozonation of untreated landfill leachate (d=1,97gO_3/gCOD); 4-Coagulation of untreated landfill leachate (5ml sodium hydroxychloride/1l); 5-Ozonation of precoagulated leachate (d=1,35gO_3/gCOD); 6-Post-ozonation of biologically treated (on –site AS reactor) leachate (d=1,09 gO_3/gCOD); 7- Post-ozonation of biologically treated (lab AS reactor) leachate (d=2,92 gO_3/gCOD)

References
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