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STRATEGY FOR EVALUATION OF THE EFFICIENCY OF DIFFERENT TREATMENT METHODS OF LEACHATE WATER FROM LANDFILLS

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ABSTRACT

Leachate waters from landfills containing high concentrations of toxic pollutants are commonly directed to municipal treatment plants, where they create several problems. For example they may pollute the sludge so much that it can not be used for soil improvement. Today there are increasing demands on local treatment, which means that technical procedures need to be developed at site to decrease the concentrations of various pollutants.

Since leachate from landfills contain a very large number of different compounds any methodology used for estimation of the efficiency of a certain treatment procedure must be based on difference measurement on a restricted number of marker substances.

In this presentation the interest will be focused on organic marker pollutants with acute or long-term toxic effects on organisms. Acute toxic compounds are generally water soluble, while those giving long-term effects are non-polar and hence can be enriched in fat tissues. Accordingly, to get a reliable estimation of the toxicity of leachate water, all samples should be divided into two sub-samples for separate measurement of both polar and non-polar substances. In one of these sub-samples, used for measurements of polar compounds, phenolic compounds have been used as markers. In the other sub-sample, compounds as PCB congeners and brominated flame retardants were used as markers.

Phenolic compounds have been processed using supported liquid membrane (SLM) extraction combined on-line with an HPLC determination using diode array detection. For non-polar compounds leachate samples have firstly been filtered through a glass fiber filter and the eluate has then been processed using solid phase extraction (SPE) discs. Both glass fiber filters and SPE discs have then been extracted by supercritical carbon dioxide (SFE) and the resulting extracts have finally been analyzed using GC with electron capture- or MS detection. Due to the low concentrations (down to low ppt level) of some of the non-polar compounds, for example PCBs, sample volumes of 1 liter have been used for the work-up procedure.

The efficiency of different treatment methods for organic pollutants, investigated in pilot plant as well as in full-scale systems, will be discussed. Treatment methods, to be considered, are biological treatment, chemical treatment using ozone or Fenton´s reagent, and the use of different geo-filters (peat and carbon ash) based on physico-chemical processes.