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The use of Chloride concentrations for estimating dilution in aerobic leachate treatment systems

Cl represents about 0.2% of the in situ mass of refuse, and typical Cl concentrations in leachate in Norway varies from 90-3000 mg/l, while measurements from UK shows variation between 500-5000 mg/l. Cl is considered as a conservative (non-reactive) anion and is often used as a tracer in water transport experiments and studies. Extensive leachate treatment systems based on holding dams, aeration ponds, phytotreatment and filtration experience show Cl reduction in the range of 30-55%, of which the aerobic step constitutes more than 90%. Typical sizes of the aeration pond of leachate treatment systems in Norway is 2000-4000 m^3, with a corresponding mean hydraulic retention time of 20-40 days, and a mean hydraulic loading rate (HLR) of 40-80 mm d^{-1} (Mæhlum and Haarstad, 1997). If the reduction of Cl in treatment systems is caused by dilution, this has to be corrected for when calculating the reduction of pollutants. The hydrological budget, including precipitation, evapotranspiration, surface runoff and groundwater transport, can not explain the high reduction rates of Cl in most cases. If, on the other hand, Cl is removed from the aqueous phase, correction due to dilution is not necessary. The objective here is to simulate aerobic treatment to investigate if the field reduction rates can be duplicated in the laboratory, and to see if there are some physical or chemical factors that significantly influence this reduction.

The experiment used 3 real leachates and 8 artificial leachate samples with varying concentrations of Cl, organic C, Tot-N and Fe in addition to 3 control samples. Leachate samples were collected from two landfills with municipal solid waste (MSW). The oxygen consumption in the leachate samples was considerably lower than in the artificial samples, probably due to inhibitory compounds in the leachate. Mean Cl reduction was 22% for the leachate samples, 46% in the artificial samples and 10% in the controls. Only TOC concentration had significant influence on the oxygen consumption in the respirometer, both when measured in the artificial samples ($p< 0.036$) and for all samples ($p<0.013$). Oxygen consumption was the only significant factor ($p< 0.0079$) for Cl reduction. Centrifugation showed no significant effect on Cl reduction. The reduction of Fe was low in the experiment, but was

strongly influenced by centrifugation. Also the reduction of TOC and N was influenced by centrifugation. The reduction of Cl in aerobic treatment may be dependent on the formation of particles.