

Landfill Leachate Treatment Trials - Draft

Background

The leachate that arises from landfill sites contains components which preclude its direct discharge onto land or into rivers, or, in some instances, even into a sewage treatment works.

Many leachates contain toxic (xenobiotic) compounds and materials which have been washed from the landfill contents or have been generated and released by the physical chemical or biological processes at work inside the landfill.

Concentrations may vary significantly from site to site, dependent on the nature of the waste contained in the site and the age of the site. Toxic compounds, such as chlorinated hydrocarbons, may also be present in the organic fraction. In extreme cases, landfill leachates may contain COD (Chemical Oxygen Demand) levels as high as 10,000 ppm, and an ammonia content of 2000 ppm.

Fresh landfill leachate will contain a variable microbial content, both in terms of actual viable bacteria and in the distribution of microbial species. The landfill itself is usually an anaerobic environment so anaerobic and microaerotolerant microbes are likely to dominate fresh uncontaminated leachate. However, if the leachate has been in contact with soil or groundwater it can also pick up additional soil organisms and also possibly faecal organisms such as *E. coli*.

Objectives

To demonstrate the effectiveness of Ultrasonic technology for the removal of organic and biological contaminants from landfill leachate

To demonstrate the effectiveness of Electrochemical technology for the removal of organic and biological contaminants from landfill leachate

To demonstrate the effectiveness of combining these technologies: primary Ultrasonic treatment followed by Electrochemical post treatment.

Methods

The study will evaluate the treatment of landfill leachate using two techniques: Ultrasonic and Electrochemical.

Chemical Oxygen Demand (COD) will be applied to measure the total organic content of the leachate by complete oxidation using a strong oxidising agent.

Biological oxygen demand (BOD) will be applied to evaluate the biologically available nutrients in the leachate

Ultrasonic treatment will be applied using a "Cascade" pilot system manufactured by Hilsonic Ltd.

Electrochemical treatment will be applied using the "DEM" electrochemical reactor constructed by C-Tech Innovation Ltd.

Outline of Proposed Work Programme

A single volume of landfill leachate water will be collected from a landfill leachate site

The techniques will be applied separately and then in combination (Ultrasound followed by Electrochemistry)

Samples will be taken for COD and BOD measurements before, during and on completion of the treatments.

An assessment of microbiological kill achieved with ultrasound will also be carried out using a model system and will be compared to a previous assessment carried out on the electrochemical system.

Results

It is expected that the results will show a decrease of both COD and BOD levels with treatment time.

This will give a comparative measure of the relative effectiveness of the treatment methods in reducing the COD and BOD levels both in terms of rate of decrease and final levels achieved.

Because of the different nature of the treatment methods, a direct comparison will be made on the basis of the energy consumed per unit volume in lowering the contaminant levels in the leachate.

Ian Dalrymple
C-Tech Innovation Ltd