Combined anode and cathode process to treat landfill leachate

Waste disposed in landfill sites degrades over time and produces a liquid waste stream called landfill leachate, which cannot be directly discharged to water courses as it contains many hazardous pollutants. The consortium will develop an automated, modular, mobile leachate treatment system. The treatment will be carried out directly in an advanced oxidation process that uses reactions at both the anode and the cathode of a new form of electrolytic cell that we will develop. The automated, mobile system will offer a flexibility of operation that is currently not available.

**PROJECT NUMBER:** 262335  
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Coordinated by Fraunhofer IGB

**FUNDING**

CleanLeachate is funded under the 7th Framework Programme of the European Union in the programme Research for the Benefit of SMEs.
Waste disposed of in landfill sites degrades over time and produces a liquid waste stream called landfill leachate. It cannot be directly discharged to water courses as it contains many hazardous pollutants and therefore must be retained for treatment.

**OBJECTIVES**

This project will lead to the development of an automated, modular, mobile leachate treatment system. The treatment will be carried out directly in an advanced oxidation process that uses reactions at both the anode and the cathode of a new form of electrolytic cell that we are developing. Whilst current treatment methods can be expensive to install and maintain, may involve the use of chemicals and require permanent positioning at the landfill site, our apparatus will allow new treatment strategies to be used by the landfill operators.

Cost savings will be made due to the reduced treatment time of our system, using reactions at the anode and cathode rather than the anode only. Additional savings can be made by the use of renewable energy to power the process. Electricity is the only resource required, hence wind or photovoltaic generation of power would allow operating costs to be minimised. With over 150,000 landfill sites across Europe, there is already a large market available.

It is expected that leachate treatment will become a bigger industry as environmental directives, aimed at improving the quality of EU water, are implemented. Landfill leachate producers will not be the only waste stream producers that could benefit from our apparatus. Other industries such as food production, pharmaceuticals, petro-chemicals will also be able to see financial and environmental benefits of treating their waste streams using technology developed in the CleanLeachate project.

**PROJECT PROGRESS AND FIRST RESULTS**

Since the beginning of the project we have formed a team of researchers and scientific and marketing representatives of the partner companies which established a multi-national network for mutual benefit. In the first work packages RTD performers sought and merged the expertise of the SME-partners in their respective fields with the latest technology research resulting from a detailed literature search and constructive technical discussions in the consortium.

**CONTRIBUTIONS**

- Extensive experience of designing electrolytic systems (partner EUT)
- Construction of structural elements of the apparatus (partner ASIO)
- Fabrication of different anodes (partner magneto)
- Experts in the management and monitoring of both active and closed landfill sites (partner Enitial)
- Standards and trends in process automation (partner CRIC)
- Research on electrode reactions with target pollutants from landfill leachate samples (partner Fraunhofer)

The consortium absorbed the scientific and market background and developed a universally agreed research, development and market strategy for the CleanLeachate project. In this first part of the project electrochemical reactions in landfill leachate treatment were quantified for different electrode materials.

**SOCIO-ECONOMIC IMPACT**

Through the adoption of the CleanLeachate apparatus there could be a significant societal benefit through the reduction of pollution from road transportation of raw leachate and through the improved treatment of leachate prior to discharge into sewage works. Some toxic organic compounds that are currently found in landfill leachate are inhibitory to the biological processes at water treatment works. The treatment of leachate by the CleanLeachate method prior to release to the water treatment works will remove these components.

SME companies will benefit financially from the CleanLeachate System and derived electrolytic wastewater treatment processes.