Evidence

Landfill methane oxidation techniques

Project summary SC160005

This project provides evidence on selecting appropriate methane oxidation techniques over the whole life-cycle of a landfill.

When waste is disposed of in a landfill it biodegrades and produces a gas. This landfill gas is mainly made up of carbon dioxide and methane. Methane is a much more potent greenhouse gas than carbon dioxide and the climate change impact of landfilling is reduced by capturing the landfill gas and oxidising the methane to carbon dioxide.

Modern landfills that accept biodegradable waste actively capture landfill gas through vertical wells in the waste and a system of pipework at the surface. The collected landfill gas is usually used as a fuel to generate electricity. If the gas cannot be used as an energy source, it is burnt in a flare. Both the use of the landfill gas as a fuel and flaring the gas thermally oxidise the methane to carbon dioxide.

However, over time, the amount of methane being produced in the landfill declines and the use of the gas as a fuel in the conventional size of gas engines becomes more difficult. Eventually the point is reached where there is not enough fuel to run these engines. The burning of gas in conventional high temperature flares can usually continue after this point but further reductions in methane content and flow mean that these too become less effective. When, with declining landfill gas generation, these conventional methods for oxidising the methane are becoming ineffective, it is necessary to consider other oxidation techniques.

A literature review was undertaken and information gathered from a variety of sources to identify the different classes of technology and the conditions under which they would be effective for the oxidation of landfill methane.

The identified technologies are:

- heat and power generation on a large to micro scale
- thermal oxidation of methane in different types of flares
- biological methane oxidation techniques

The project report gives an overview of the methane oxidation techniques alongside a discussion of the factors affecting their use and information on their performance.

Flowcharts for each technology group are presented in the report. These flowcharts show where the technologies sit within the life-cycle of the landfill and identify decision points on technique selection and the factors that need to be considered for these decisions.

The main factors in the selection of a methane oxidation technology are:

- methane concentrations and flow rates
- whether the technique requires an active gas extraction system
- whether a landfill site has an electrical grid connection
- the performance of the technology; that is, its ability to oxidise methane and whether it is a tried and tested or emerging technology
- capital and operational costs
- monitoring and maintenance requirements
- emissions from the methane oxidation technology (noise, air quality, odour)

The flowcharts, taken together with the information on each technology, provide a framework within which evidence-based decisions can be made on the appropriate methane oxidation techniques at each stage of a landfill's life-cycle. This will enable landfill operators and regulators to ensure the continued oxidation of landfill methane and so will help to mitigate the climate change impact of landfill.

This summary relates to information from project SC160005, reported in detail in the following output:

Report: SC160005/R

Title: Landfill methane oxidation techniques

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