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Landfill: exploring aeration's potential to clean up sites

Aeration technologies designed to help landfill waste break down faster need to be refined in order to reduce pollution, greenhouse gas emissions and the long-term costs associated with landfill. This is according to a recent review of landfill aeration, which outlines some of the different systems currently available and highlights the need for better monitoring and sharing of data.

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Around two thirds of waste in Europe ends up in landfill sites[1]. The EU Landfill Directive aims to reduce the amount of waste going to landfill and to reduce the negative effects of landfill on the environment[2]. A key concern is the emission of gases ('Landfill gas, LFG'), which cause air pollution and contribute to climate change. Another is the 'leachate' that contaminates nearby land and water.

Over time, the landfill waste breaks down, releasing gases, including carbon dioxide (CO_2) and methane. Once a landfill is closed, it may take many years of expensive aftercare before a site becomes biologically stable, or 'safe'. A landfill site may be considered stable when over 90% of the biodegradable organic carbon has been degraded.

The researchers analysed previous studies of landfill aeration, whereby air is injected into landfill sites to help break down waste, whilst minimising the release of LFG and leachate, and reduce the amount of time and money spent on aftercare. According to one of the studies they considered, aeration has the potential to reduce costs associated with landfill aftercare by up to a quarter.

Landfill aeration methods are not yet well established and use different pressures, systems for injecting air and systems for disposing of off-gases. In Europe, projects are underway in Germany, Austria, Italy, Switzerland and the Netherlands and most are low pressure systems, where air is introduced through a system of gas wells and off-gas is either actively extracted, or trapped under a cover, and treated.

It is currently difficult to be sure of aeration's true potential. Although a large amount of aeration data has been collected by laboratory studies, more data from full-scale projects are needed. In a laboratory, factors, such as temperature and oxygen supply rate, can be carefully controlled. Once scaled up to partial or whole landfill sites, the system becomes much more difficult to control; temperatures climb above 40°C and the oxygen supply is variable.

In addition, few large-scale landfill aeration projects are closely monitored. However, data are starting to emerge, including from three German landfill sites subjected to an aeration and simultaneous off-gas extraction/treatment approach. These three sites are now considered to be biologically stable.

The researchers say local climatic conditions must be taken into account when selecting an aeration method for a particular site. They suggest that landfill aeration technology could be refined by monitoring aeration projects more rigorously and analysing the results more systematically, to enable a broader discussion of the data. Mandatory requirements for monitoring, they say, should include analysis of the off-gases and leachate to track the biological transformation of carbon.

1. http://ec.europa.eu/environment/waste/index.htm
2. http://ec.europa.eu/environment/waste/landfill_index.htm