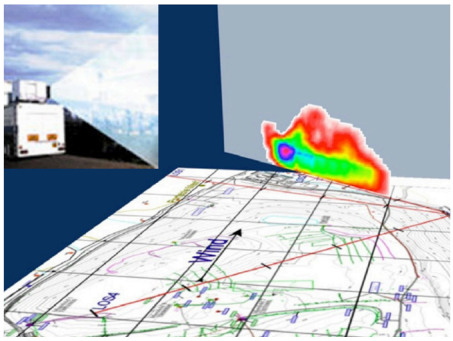
NPL
National Physical Laboratory

Landfill monitoring

Landfill gas is an inevitable by-product of anaerobic decomposition of organic waste, and the primary constituent methane is a potentially valuable energy source and a potent greenhouse gas. However, the gas may also contain toxic chemicals and gases such as carbon dioxide and traces of volatile organic compounds (VOCs) which can produce odour or be harmful to health. If not monitored and managed, gas can migrate through the soil and escape outside the site boundaries.

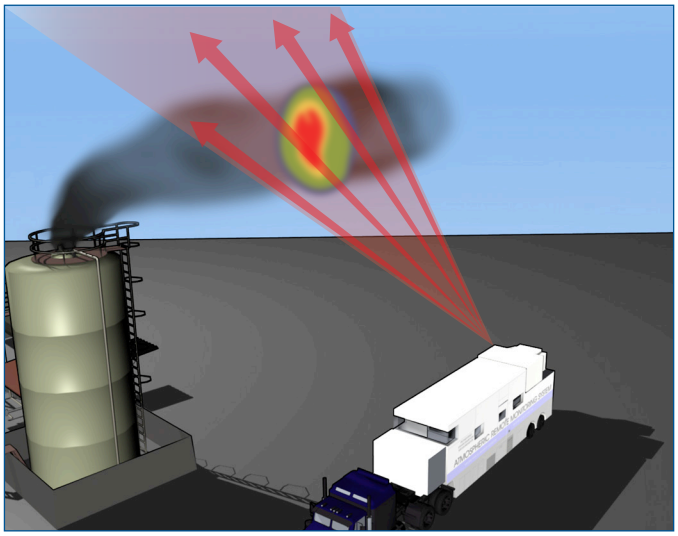
NPL's experienced staff can design monitoring campaigns; provide expertise and advice on optimum sampling techniques; and provide comprehensive data analysis, reporting and interpretation. We also have specialised services, such as DIAL (below), which provides a 'visual map' showing the location and concentration of landfill methane emissions.



On site surveys

The Landfill Directive sets out a clear obligation to safely manage and minimise landfill gas emissions. Where possible, the gas should also be used rather than flared. Techniques to survey landfill sites for methane emissions can:

- Demonstrate responsible business practises in pollutant control
- Detect fugitive emissions to improve or facilitate methane collection
- Inform operational or infrastructure changes at the site



DIAL Landfill Gas Surveys

The NPL Differential Absorption Lidar (DIAL) is a sophisticated remote sensing system that provides rapid, accurate measurements of airborne atmospheric pollutants at a range up to 1km. DIAL is particularly useful for measurements of emissions from tanks, flares and diffuse sources such as landfill sites.

The system is a completely self-contained mobile laboratory monitoring meteorological parameters and gas concentrations. Taken together, DIAL provides a 3D visual map showing the location and concentration of landfill methane emissions and the mass emission rate for the methane loss to atmosphere. In many studies DIAL has been shown to be the most comprehensive and cost effective approach to monitoring methane emissions from landfills (DEFRA report: Measurements of Methane Emissions and Surface Methane Oxidation at Landfills: WR1125; 2012)

Off site analysis

The chemical composition of landfill gas is variable, but mature landfill gas is composed of two distinct fractions:

- The bulk fraction is a mixture of methane, carbon dioxide, hydrogen, nitrogen and oxygen.
- The trace fraction is a wide range of volatile and semi-volatile organic compounds that are measured in terms of parts per million (ppm) or parts per billion (ppb). Over five hundred trace components have been identified in landfill gas.

Volatile organic compounds (VOCs) and hazardous air pollutants (HAPs), if not managed, can react with sunlight to produce ground level ozone.

Sampling and analysis of VOCs

NPL offers a complete service, accredited by UKAS to ISO 17025, for the sampling and analysis of complex VOC mixture ranging from source emissions to ambient concentrations. Sample collection and analysis techniques include passivated canisters, pumped or passive sorbent tubes, soil probes, automated thermal desorption (ATD), gas chromatography (GC) and mass spectrometry.

Aspergillus fumigatus bioaerosol monitoring

Bioaerosols are airborne particles (usually less than 20µm in diameter) consisting of, or originating from microorganisms. NPL has developed a faster and more efficient method for monitoring the emissions of Aspergillus fumigatus from landfill and composting sites, based on cyclone air sampling and qPCR: a molecular biology technique which amplifies and simultaneously quantifies a targeted DNA molecule.

The key advantages of this monitoring service over traditional microbiological methods are shorter sampling and analysis times; high sensitivity; and a better detection range. The technique is species specific and detects total spore count (viable and non viable spores). This helps to differentiate background spore levels from site specific emissions.

Contact details	Further information
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