Landfills

A landfill is where garbage is deposited and then buried. Modern landfills are built in suitable geological areas away from restricted areas that include faults, wetlands, and flood plains. The goal is to avoid any hydraulic (water-related) connection between the wastes and the surrounding environment, particularly groundwater.

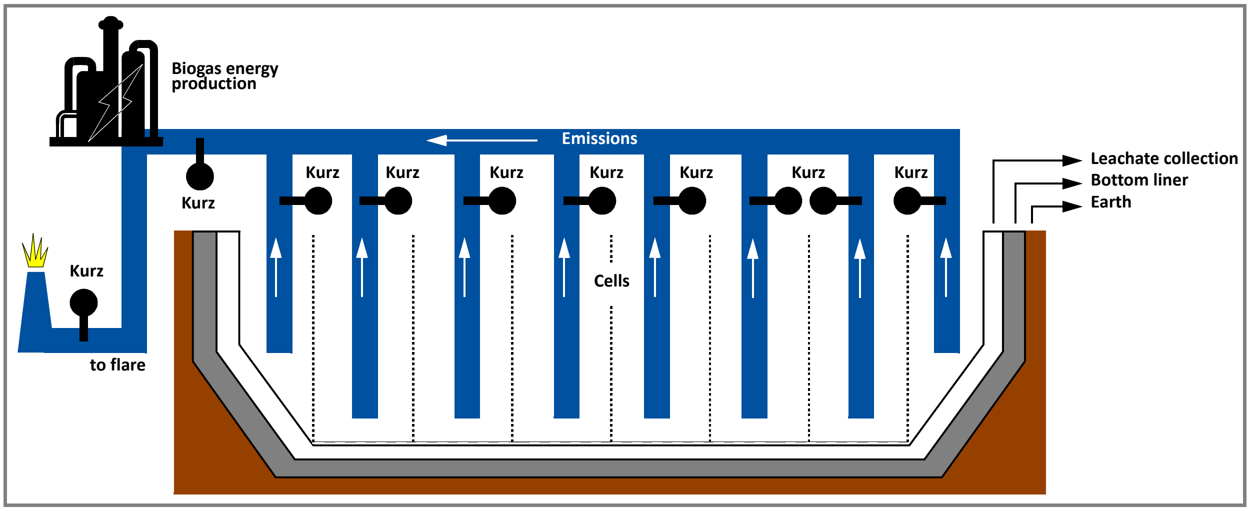
A general estimate of landfill waste is paper content (26%), food scraps (18%), plastic (16%), rubber, leather, and other textiles (9%), yard waste, metals, and wood (7%), and glass (6%). However, actual landfill content varies based on the speed of decomposition and how well materials compact. The method used for compacting and covering landfill waste isolates the garbage from water and air, creating an anaerobic environment ideal for methanogenic bacteria. As the bacteria breaks down the organic waste, it generates landfill gas:

- Methane (approximately 40%-60%)
- Carbon dioxide (approximately 40%-60%)
- Nitrogen, oxygen, water vapor, hydrogen sulphide, and other non-methane organic compounds (NMOCs) (less than 1%)

Landfill gas falls into five basic monitoring categories: soil gas, near surface gas, emissions, ambient air, and facility air. Surface and ambient air monitoring are accomplished by grab samples or portable organic vapor analyzer-flame ionization detectors. Soil gas, emissions, and facility air are environments suited for thermal mass flow devices.

Landfill sites are commonly divided into smaller sections (cells) so that only certain portions of the landfill are exposed. While a landfill cell is accepting garbage, daily operations include compacting (to increase density and stability) and covering the waste with soil. The landfill operator gradually closes and opens cells until the landfill reaches capacity.

Kurz Instruments, Inc.
2411 Garden Road
Monterey, CA 93940
800-424-7356 / 831-646-5911
www.kurzinstruments.com



Simplified Landfill

Starting with the Clean Air Act in 1996, the U.S. Environmental Protection Agency (EPA) began to require that many large landfills install gas collection and control systems. In 2004, landfill gas was identified as a renewable energy source. The Energy Policy Act of 2005 allocated a tax credit toward energy derived from landfill gas (LFG) and municipal solid waste (MSW) resources. This act also included landfill gas with traditional renewable energy sources such as wind and solar in setting purchasing mandates for the federal government.

The EPA also promotes its Landfill Methane Outreach Program (LMOP). This is a voluntary assistance program designed to reduce the methane emissions from landfills by encouraging landfill operators to develop environmentally and economically beneficial landfill gas-to-energy projects. These projects are popular because they control energy costs and reduce greenhouse gas emissions.

Soil gas monitoring and collection systems are typically configured using a series of monitoring wells connected to the leachate collection system surrounding the site perimeter and at perforated pipes set at levels within each cell. The system includes vacuums and pumps that draw the decomposition gases into a unified collection system. The gas typically has low flow rates, high moisture content, and the potential for hydrogen sulfide. The gas can also be collected and used to generate electricity. The EPA estimates that among U.S. landfills:

- 31% vent the gas into the atmosphere
- 34% capture and burn the gas
- 35% collect the gas for energy use

The wide range of environmental and biological systems within a landfill (and the complex nature of its content) makes gas production within the landfill difficult to predict and control. Additionally, many landfill operators are faced with the difficult tasks of reliably measuring methane emissions and developing a general model for estimating them. However, landfill operators are required to monitor and report any gas emissions sent to flares, incinerators, boilers, and engines.

Specific landfill installations have included flow meters used in the following environments:

- Measuring emissions
- Air monitoring spot checks across cells
- Measuring gas conversion utilized in electricity generation
- Supporting fuel cell management
- Post-combustion emissions