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When Does a Municipal Solid Waste Landfill become an Elevated Temperature Landfill (ETLF)?

Innovative Science for a Sustainable Future

What is an Elevated Temperature Landfill?

The generation of heat in a municipal solid waste (MSW) landfill is normal as microorganisms break down waste[1, 2]. Elevated temperature landfills (ETLFs) are MSW landfills that exhibit temperatures above regulatory thresholds (131 or 145 °F) due to abnormal chemical reactions within the waste mass[3-6]. These reactions can cause changes in landfill gas composition, noxious odors, rapid and severe waste settlement, leachate seeps and outbreaks, and generate strong leachate, all of which add to operator costs for facility management.

ETLFs are NOT landfills that have experienced a fire. Landfill fires typically occur at or near the surface where oxygen is available, usually affect only a small area, and can be quickly managed.

ETLFs require different conditions and corrective actions than fires.

Common Indicators of an ETLF – Temperature and Gas Composition at the Well Head

Above 145 °F, methane generation slows. Above 162 °F, minimal landfill biological activity[2, 3].

131-145 °F suggests heat-generating chemical reactions may be occurring[2, 3].

90-131 °F indicates normal operating landfills[2, 3].

- Elevated gas temperatures (>131 °F)[6-10]
- Decreased methane (CH_4 <40%) along with increased concentrations of CO_2 (> 50%)[6-10]
- Increased carbon monoxide (CO), hydrogen (H_2), and ammonia (NH_3) gases[6, 10, 11]

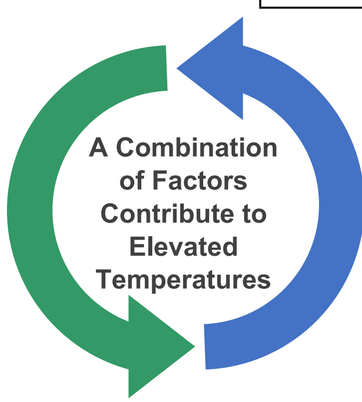
Contributing Factors

ETLFs likely result from a combination of reactive waste streams and landfill management practices. One common observation at ETLFs is that the affected area is wet, which suggests poor drainage through waste[3]. Moisture management is always an important consideration for landfill designers and operators.

Accepted Waste Streams

Examples of waste streams that are known or suspected of causing elevated temperatures in landfills:

- Ashes and dusts (e.g., waste-to-energy ash, baghouse dust)[12-15]
- Aluminum, iron, and steel production by-products and wastes (e.g., dross, slag)[6, 7, 10, 11, 13, 16-18]



Management Practices

Internal moisture content can be affected by:

- Solidification, liquids addition, or leachate recirculation
- Type and hydraulic properties of cover or alternative cover materials
- Management of special wastes (i.e., co-disposal or waste segregation)
- Removal of liquids from gas extraction wells

Heat and Odor Management Strategies

- Apply geomembrane cover
- Add additional gas extraction wells
- Excavate gaps in waste mass
- Install and operate closed-loop heat exchanger

If you suspect an ETLF, determine the information that needs to be gathered to develop an appropriate management and mitigation strategy.

Examples of Strategies to Manage and Mitigate ETLFs

Bridgeton Landfill ◆ Bridgeton, Missouri

Site Description[19]: Closed MSW landfill, operated 1976-2004, 52 acres, 320 ft deep, 8.7 million metric tons (MMT) waste in place

Dates of ETLF Status[20, 21]: 2011-present

Indicators: >200 °F gas 2009-2020; noxious odors; sudden differential waste settlement; strong leachate; CO in gas

Potential Contributing Factors: Unknown industrial wastes

Management & Mitigation Strategy: Exposed geomembrane cap installed, 2013-2014. Subsurface barrier with heat exchanger loop installed to limit reaction from spreading to a second section of the landfill, 2015-2016. Enhanced monitoring of gas wells and landfill elevations.

Countywide Landfill ◆ East Sparta, Ohio

Site Description[19]: Active MSW landfill, 175 acres, 184 ft deep, 22.0 MMT waste in place

Dates of ETLF Status[22, 23]: 2006-present

Indicators: 230 °F gas 2009; >300 °F waste 2009; sudden waste settlement; noxious odors; strong leachate; NH_3, H_2, and CO in gas

Potential Contributing Factors: Aluminum dross disposal and leachate recirculation over the co-disposal area

Management & Mitigation Strategy: Excavated a portion of the landfill to physically separate impacted and non-impacted areas. Installed geomembrance cap. Enhanced monitoring of gas wells and landfill elevations.

Waimanalo Gulch Landfill ◆ Oahu, Hawaii

Site Description[19]: Active MSW landfill, 101 acres, 135 ft deep, 8.9 MMT waste in place

Dates of ETLF Status[24]: 2005-2008

Indicators: 188 °F gas; H_2 and CO in gas

Potential Contributing Factors: Co-disposal of municipal waste incineration ash with municipal waste

Management & Mitigation Strategy: Installated gas collection system. Enhanced monitoring of gas extraction wells.

Noble Road Landfill ◆ Shiloh, Ohio

Site Description[19]: Active MSW landfill, 91 acres, 213 ft deep, 6.6 MMT waste in place

Dates of ETLF Status[25]: 2007-present

Indicators: >131 °F gas

Potential Contributing Factors: Reaction of steel slag, which was accepted and used as daily cover

Management & Mitigation Strategy: Installed new gas extraction wells. Enhanced monitoring and reporting for wells of interest.

Middle Point Landfill ◆ Middle Point, Tennessee

Site Description[19]: Active MSW landfill, 193 acres, 210 ft deep, 26.2 MMT waste in place

Dates of ETLF Status[26]: 2011-present

Indicators: >131 °F gas; noxious odors

Potential Contributing Factors: Aluminum dross disposal

Impacts: Management & Mitigation Strategy: Installed geomembrane cap. Installed new gas extraction wells. Enhanced monitoring and reporting for wells of interest.

Rumpke Landfill ◆ Cincinnati, Ohio

Site Description[19]: Active MSW landfill, 315 acres, 197 ft deep, 55.3 MMT waste in place

Dates of ETLF Status[27]: 2009-present

Indicators: >131 °F gas; sudden waste settlement; destroyed gas extraction wells; strong leachate; noxious odors

Potential Contributing Factors: Unknown industrial waste

Management & Mitigation Strategy: Installed geomembrane cap. Installed steel gas extraction wells. Enhanced monitoring and reporting for wells of interest.

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