

Municipal Solid Waste Landfill Gas Collection

Modern landfills are constructed with a number of safeguards one of which is gas collection systems. As organic waste decomposes it generates gases, including methane which is a greenhouse gas. The EPA regulates the emissions of landfill gases (LFG) and requires the incineration of the gases before they can diffuse into the ground or atmosphere. Many landfills collect LFG and during incineration generate clean, inexpensive electricity.

Approximately 64 percent of all municipal solid waste (MSW) generated in the United States is currently being disposed of in landfills. Landfills are the second-largest single human source of methane emissions in the United States, accounting for nearly 23 percent of all methane sources. Landfill gas is generated during the natural process of bacterial decomposition of organic material contained in MSW landfills.



Possibly the biggest health and environmental concerns are related to the uncontrolled surface emissions of landfill gas into the air. For example, carbon dioxide and methane are greenhouse gases that contribute to global climate change. Methane is of particular concern because it is 21 times more effective

Recovery and combustion of landfill gas will reduce emissions of organic compounds that would otherwise be released from the landfill. Because of the benefits of collecting and controlling landfill gas, **the EPA, under authority of the Clean Air Act, requires all new and existing large MSW landfills to collect landfill gas and combust it.** Landfills are meeting these gas destruction standards using flares or energy recovery devices. In addition to gas destruction requirements, the EPA requires that gas collection systems be well-designed and well-operated. They require gas collection from all areas of the landfill, monthly monitoring at each collection well, and monitoring of surface methane emissions to ensure that the collection system is operating properly and to reduce fugitive emissions.

Landfill gas can be an asset when it is used as a source of energy to create electricity or heat. Landfill gas can often be used in place of conventional fossil fuels in certain applications. It is a reliable source of energy because it is generated 24 hours a day, 7 days a week. By using landfill gas to produce energy, landfills can significantly reduce their emissions of methane



Municipal Solid Waste Landfill Gas Collection

Currently more than 400 MSW landfills in the United States recover and combust landfill gas to generate heat or electricity, and more than 450 other MSW landfills flare the gas. EPA's air quality requirements and advances in landfill gas energy technologies have encouraged the combustion of landfill gas to benefit human health, safety, and the environment, as well as provide economic opportunities. The EPA promotes this through the Landfill Methane Outreach Program (LMOP).

EPA's Landfill Methane Outreach Program (LMOP) is a voluntary assistance and partnership program that promotes the use of landfill gas as a renewable energy resource. By preventing emissions of methane through the development of landfill gas energy projects, LMOP helps businesses, states, and communities protect the environment and build a sustainable future. LMOP helps communities and landfill owner/operators learn more about the benefits of using landfill gas as an alternative energy source and help them develop or participate in landfill gas energy projects. In addition, LMOP provides information, software tools, and marketing assistance, and access to technical experts to facilitate development of landfill gas energy projects.

Over the past few years we have made significant improvements to the way we manage solid waste, one of these improvements being bioreactor landfills. These types of landfills are engineered from the beginning to better control the anaerobic biodegradation process by circulating the leachate back through the garbage. Adding moisture not only helps to accelerate anaerobic biodegradation but it has also been discovered to improve the quality of the leachate. Bioreactors are built from the beginning with collection systems for collecting not only the leachate but also the LFG. This is a significant improvement over conventional landfills because LFG collection begins with the beginning of the bioreactor landfill

In April 2004, the EPA finalized a rule permitting the transformation of landfills into bioreactors. Landfill bioreactors produce much more gas than traditional landfills, about 10 times the amount and are at concentrations of up to 50%. Bioreactors with their advanced LFG collection systems are able to collect more than 90% of the methane gasses.

Another benefit of bioreactor landfills is that the life of the landfill is extended by as much as 25 years. This means that the same physical space of land that would traditionally have been filled up and capped can now be used for another 25 years longer before needing additional bioreactor landfill cells.

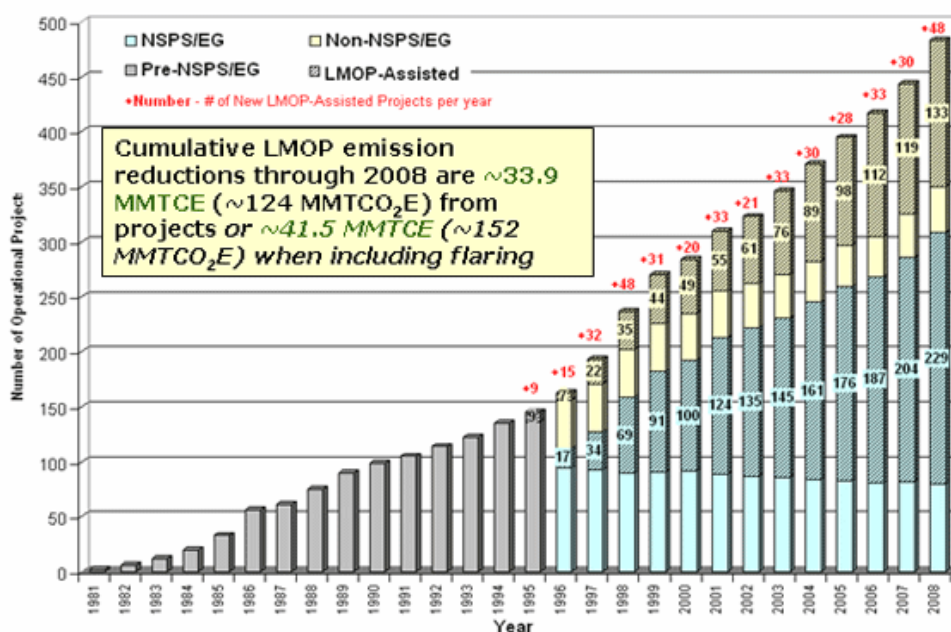
Utilizing LFG for energy from MSW anaerobic biodegradation creates a greater value proposition over composting. With composting the organic material is artificially processed to accelerate aerobic biodegradation resulting in compost material which makes a great rich soil. What is off gassed is CO₂ which is released into the atmosphere as a GHG. Some would

Municipal Solid Waste Landfill Gas Collection

argue that this would be a zero sum game but it really depends on the material and if there are next life organics to use that CO₂. Based on the geographical location of the composting facility will determine available markets for its compost. In many cases today, there are not enough markets available to utilize the compost material with most compost ending up as soil cover in landfills. The additional value proposition of creating CH₄ vs CO₂ has much more value and results in a better environmental solution.

The chart below shows the increase in facilities converting LFG to energy from 1991-2008.

Growth in Landfill Gas Utilization Project Development



For more information about EPA's Landfill Methane Outreach Program (LMOP), visit the website at <http://www.epa.gov/lmop>.

Interesting Facts:

- The EPA reports that in 1988 there were 8,000 active landfills in the US. In 2000 there were 3,091 active landfills in the US. It further declined to 1,756 in 2006 and that same year, the EPA estimated that by the year 2008, only 1,234 landfills would be available.



Municipal Solid Waste Landfill Gas Collection

- As of April 2009, there are approximately 480 operational LFG energy projects in the United States. In addition, about 130 projects are currently under construction or are exploring development options and opportunities. These are landfills that convert the LFG to clean, inexpensive energy.
- LFG is classified as a medium-Btu gas with a heating value of 350 to 600 Btu per cubic foot, approximately one-half that of natural gas.
- To light a 100 watt light bulb for 1 hour would require 33.88 ENSO bottles to be converted into methane gases. If you were to use a florescent bulb for the same amount of light you could use a 25 watt bulb and you would only need 9 bottles for 1 hour.
- In 2006, approximately 31 billion single serve water bottles were not recycled and ended up in landfills. These bottles if they were biodegradable could result in approximately 1 million hours of light for a 100 watt light bulb or 4 million hours of light for the florescent bulb.
- Gov. Jon S. Corzine's Energy Master Plan touts landfill methane gas as one of the key renewable energy sources that the state hopes will combine to supply 30 percent of New Jersey's electricity by 2020.

Reference:

Below are some websites to learn more about landfills, methane and clean LFG energy production:

<http://www.epa.gov/lmop/index.htm>

<http://www.methanetomarkets.org>

<http://www.swana.org>

<http://www.epa.gov/air/caa>

<http://www.epa.gov/methane>

http://wasteage.com/mag/waste_bioreactors_beyond

http://www.huffingtonpost.com/2008/10/27/new-jersey-landfills-capt_n_138076.html

*All data used in this document was taken from the EPA and Methane to Markets websites.