Fact Sheet

Cover Up with Compost

"We see the potential to transform landfills from waste repositories to waste treatment systems."

A. Maurice Myers
Chairman and CEO of Waste Management

Natural decomposition processes in landfills emit "landfill gas." Approximately half of that landfill gas is methane, the second leading greenhouse gas emitted in the United States. Landfill methane emissions are of national concern because they are the largest source (approximately 33 percent) of anthropogenic methane emissions in the United States.

Using Compost as a Landfill Cover

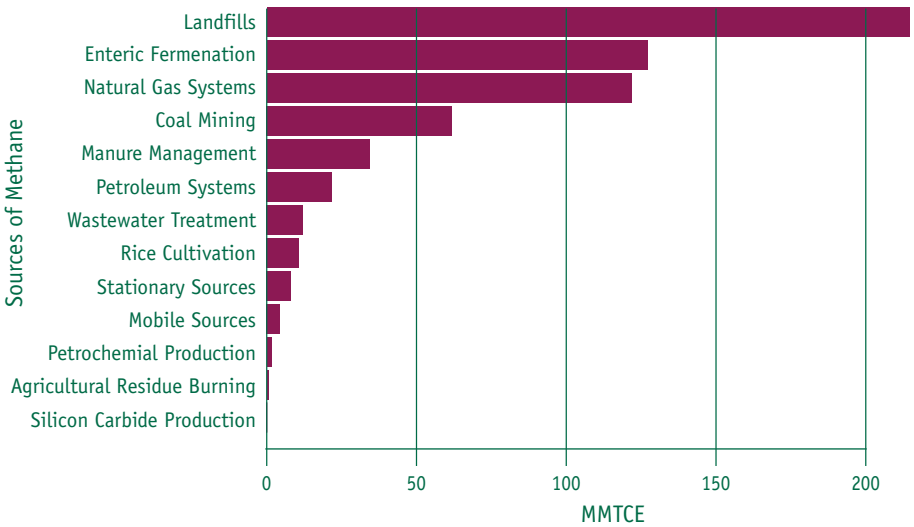
In 1998, Austrian scientists Marion Humer and Peter Lechner published the results of research indicating that landfill operators could reduce methane emissions by using compost as a landfill cover. Since then, EPA has worked with Waste Management, Inc. to test the concept in the United States.

Compost provides an excellent environment for the methanotrophic bacteria that oxidize methane. Under test site conditions, compost covers have been found to reduce methane emissions by as much as 100 percent. The covers offer the possibility of controlling these emissions in a cost-effective manner. This is particularly promising for small landfills, where landfill gas collection is not required and where the economics of landfill gas-to-energy projects are not attractive.

Waste Management Pilot Project

Waste Management, Inc. is testing the potential of using compost as a landfill cover at its Outer Loop Recycling and Disposal Facility in Louisville, Kentucky. To perform the research, Waste Management signed a cooperative research and development agreement (CRADA) with EPA in October 2000.

Sources of Methane Emissions



Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–1999 (April 2001).

Waste Management designed two test sites—one on a sloping landfill and one on flat ground—to be compared with a control plot. The cover of the two test sites consists of three layers: a six-inch thick layer of clay on the bottom; a four- to six-inch layer of tire chips, which serves as a potential methane distribution system; and 36 to 40 inches of yard waste compost on the top. The control plot is covered with a three-foot clay cover.

Phase I of the project involves monitoring landfill gas emissions from the plots and observing the effectiveness of the design for 18 months. The plots are designed to identi-

fy potential problems such as whether the cover can remain intact when exposed to stresses, e.g., sloped landfill surfaces or foul weather conditions. Another concern is what kind of vegetation, if any, will grow on the cover to help stabilize it to prevent erosion.

After monitoring the physical properties of the plot during Phase I, Waste Management expects to evaluate the economic benefits. The company also will redesign the cover if that proves necessary based on the results from Phase I.

Benefits

Using a mobile landfill gas meter and gas chromatography, Austrian researchers Humer and Lechner found that their system results in complete decomposition of the methane released from a 10-year-old landfill site more than 65 feet deep. They found that using a matured compost characterized by a high humic content, low ammonium and salt concentrations, and adequate pore volume yielded the best results. Their emission reductions exceed that of a landfill gas recovery system, generally thought to collect about 70 to 85 percent of the total landfill gas generated.

Engineering measures for gas-to-energy projects have a limited service life, but Humer and Lechner found that the effectiveness of compost in mitigating landfill methane emissions improves with time. As the outer compost layer of a landfill dries up, it creates a barrier that prevents temperature loss in the lower compost layer and improves conditions for methane oxidation.

Ancillary benefits may arise in the compost market from this technique if using compost as a landfill cover becomes a widespread practice. The use of compost as a landfill cover could dramatically increase the market for compost. If this practice were employed in small landfills expected to close over the next 10 years, the demand for compost would exceed the currently available supply. An increase in composting could reduce the quantity of organic waste disposed at municipal solid waste landfills, thereby reducing methane emissions and prolonging the life of landfills.

Challenges

Since this technique is still in the research stages, many facets of the practical application of compost as landfill cover have not been evaluated. For example, landfill owners considering this technique would need to ensure that their cover complies with Subtitle D regulations on cover performance and maintenance of the cover during the closure and post-closure periods. As specified in 40 CFR 258:6.0, in order to use an alternative cover, the landfill owner/operator will need specific approval of the state director.

Although research has found that methanotrophic bacteria are most active at temperatures ranging from 20 to 37 degrees Celsius and in ambient conditions with a moisture content of approximately 40 to 80 percent, questions still remain regarding optimal conditions in a non-experimental setting for the compost to reduce methane emissions. Further, quality of compost varies considerably and should be considered in the design of the cover. It appears that mature, grade A compost is best-suited as cover material. Waste Management's efforts should provide further information on the selection of compost as cover and how such a cover will react to varied weather conditions, temperatures, and the physical stresses of the landfill environment.

Additional Information

For information on the **CRADA,** see Waste Management's press release at http://www.wm.com/docs/1/press0081.html, and the company's bioreactor program page at http://www.wm.com/bio.html.

EPA's Climate and Waste Program increases awareness of climate change and its link to waste management in order to (1) make greenhouse gas emissions a factor in waste management decisions and (2) employ waste management as a mitigation action for reducing greenhouse gas emissions. For additional information on EPA's Climate and Waste Program, see www.epa.gov/mswclimate.

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