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Winning the Landfill Numbers Game

In a down economy, having tight control on the metrics is crucial to your landfill's success. BY NEAL BOLTON

Like an assembly line in a factory, the inbound wastestream defines the workload, the pace—even the personality of a landfill. And as our industry works to maintain economic balance in a time of falling tonnage and revenue, the ability to manage that wastestream has never been more important.

Toward that goal, companies that provide truck scales, onboard scales, and the associated software are also providing our industry with a valuable measurement tool—or, perhaps we should say, management tool. For after all, when we get down to it, we can't manage what we don't measure.

Modern weighing systems may be bringing new technology, but the concepts of practicality and ingenuity are certainly not new. Take for example, a company that's been around for over half a century—Rice Lake Weighing Systems. It not only produces the Survivor series of truck scales—described as "the toughest scales on earth"—but it also manufactures portable truck scales and onboard scales for straight trucks, tractor-trailers, and wheel loaders. And all of Rice Lake's scales are integrated into high-tech electronics because the company knows that accurately measuring the weight is only the first step in the process of managing a waste facility.

Some companies also bring to the table a broad range of expertise—often going beyond scales—to bring waste facilities more of what can be referred to as *value added.* PC Scale Tower is a company well known for providing robust scale management software. But its experience in the waste industry goes much deeper. PC Scale Tower also offers collection route management software for waste vehicles. In today's world of multitasking and specialty apps, it's good to know that the providers you're working with really know something about the waste industry.

Might sound kind of boring, huh, weighing trash on the way to the landfill? But it's a critical first step toward accomplishing many other tasks—tasks that fall within the four main categories of money, tonnage, operations, and compliance.

The Money

Your scale and software system should be able to convert tonnage information into dollars and cents quickly and accurately. So, whether it's inbound waste or outbound recyclables, you need to manage that tonnage effortlessly, in many cases automatically.

Carolina Software

A WasteWorks driver assistance station

Time is money, not only for you but for your customers as well, and they will appreciate the effort you put into streamlining their landfill experience. And no place is this effort more apparent than at the scale facility. Imagine a route truck pulling onto the scale, punching in a secret code...then, blip...out comes a receipt. In a matter of seconds, the load is weighed, photographed and recorded. The transaction and invoice have been sent downtown, and the truck is on its way.

Another option is to add Wi-Fi capabilities to your scale. This allows you to integrate the use of a handheld device with your scale system. In the right application, these can help eliminate vehicle stacking and reduce customer wait time.

Sure, it's possible, and many landfills now utilize such automated systems for their commercial customers. The first step toward increased efficiency is streamlining what you do and how you do it.

According to Jon Leeds, vice president of Carolina Software (WasteWorks), that company's WasteWIZARD system can be used on the express lane, unmanned and/or after hours. The strength of this unit—and others like it—comes from its ability to coordinate with many other input/output devices, including radio frequency identification (RFID), driver input keypad, barcode scanning, proximity readers, and controls for red/green light and gate controls. These driver-assisted terminals can also be linked to your digital cameras, ticket printers, and even to an intercom.

But don't worry—this may sound complicated, but like a great chef these savvy manufacturers will handle the ingredients. All you have to do is look over the menu and decide what looks good.

As you might imagine, there is a continual effort by software creators toward making scale software more user friendly, because the ability to track lots of data is irrelevant if it can't be easily retrieved and used productively. Useful output options include a wide variety of charts, tables, customizable reports, and, perhaps most important, the ability to interface or export to various accounting formats.

Some landfills—especially large landfills or those that are part of a network of many facilities—use fairly sophisticated accounting programs. Thus, the ability to translate raw scale data into the necessary format is vital. No problem—most scale software systems can be customized to match whatever accounting system you're using. Remember, the folks that created those scale programs are...programmers.

But what about those small, individual landfills that don't have, or even want, an elaborate accounting system—or who might be put off by the thought of learning and using a customized program? Again, it's no problem, because we're dealing with manufacturers who know that your primary goal is to run the scales efficiently...period.

For example, SMSTurbo, a scale software system produced by Creative Information Systems, offers the best of both worlds. According to Victor Parrish, vice president of sales, SMSTurbo is "preset to export to a wide range of accounting programs, such as QuickBooks, Peachtree, Timberline Office, and SAP. And many of our clients," he states, "use more than one." Some of the company's clients transfer scale data directly to QuickBooks to create invoices for individual customers. But those same landfills may also need to export other transaction data to larger customers in another format—say to their general ledgers.

When asked about SMSTurbo's flexibility to output to a broad array of formats, Victor quickly affirmed, "That is the goal."

Carolina Software

The WasteWalker handheld device

Tonnage

Bottom line: Landfills use scales to track inbound and outbound tonnage. Tonnage data is necessary for billing, regulatory and financial reporting, for calculating tax or user fees and for a myriad of operational benchmarks, including airspace consumption. And in that regard, scale systems must be accurate and reliable.

Scale accuracy has of course been—and continues to be—foundational, and certainly modern scale systems are accurate. But the real benefits of modern scales and software are delivered in the form of increased productivity. And although we're talking primarily about landfill scales, keep in mind: The same principles apply to transfer stations, recycling facilities, and, in the case of onboard scales, on individual trucks or wheel-loaders.

Consider this scenario: A large wheel-loader is used to topload a live-floor trailer at a small transfer station. Once loaded, the transfer truck leaves the loading pit and stops at the truck scale just prior to making the trip to the landfill. The weight shows the truck is 5,300 pounds below its maximum weight. This creates a quandary: Do you send it back to the pit for more trash, or save time and just send it on to the landfill? At this point, either option will increase your operating cost.

An even tougher question arises if the truck is overloaded. Sending it out could result in costly fines and increased liability, but sending it back to unload some waste can be difficult... and may require multiple trips across the scale to get it right.

An obvious solution is to install pit scales so that individual axle weights and the total weight are known before the truck reaches the main scale. This is usually a viable solution, but for some smaller facilities—or for those in transition—the cost of installing dedicated pit scales may be prohibitive or just too difficult. Jack Ewing of SI Onboard has an alternative. "In the right application, miniature axle scales can work very well," he notes, "and, when mounted aboveground, make for easier cleaning."

Another possible solution is simply to install onboard scales on the truck itself. This too would allow it to be loaded to the appropriate weight the first time, every time.

As a final option, the wheel-loader that's loading the truck could also be equipped with an onboard scale. Measuring and summing each bucket load can help ensure an accurate pre-estimate of the truck's payload. Onboard scales have been used on wheel-loaders in the mining and aggregate industry for many years.

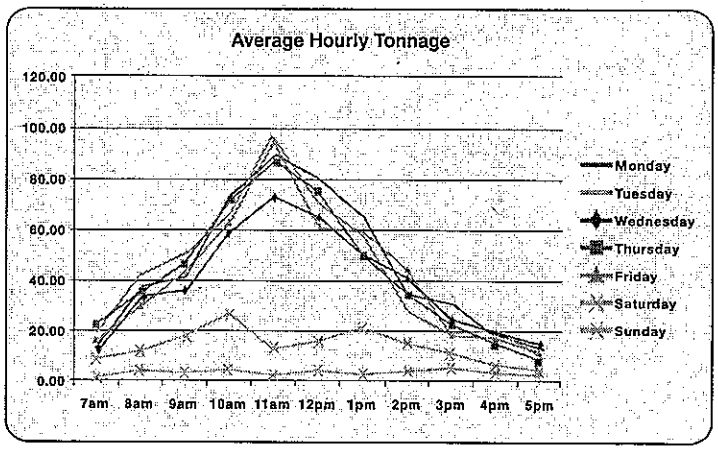

Figure 1

And, while neither of these onboard options can provide certified weights, and thus cannot replace your main deck scale, either can provide the accuracy necessary to optimize your payload, often to within 1%.

Onboard truck scales can also be used on route trucks to track the weight generated by individual customers or stops. According to Ewing, "Onboard scales are commonly put on packer bodies to help companies or municipalities audit their accounts for maximum efficiency." This type of information can help you more fairly match customer billing to customer generation rates. It can also provide information useful for streamlining other parts of your operation.

He also sees onboard scales, along with other types of sensors, used on transfer trucks to monitor driver performance.

In rural areas, where regional landfills are often combined with several satellite container sites, there is an increasing push to cut costs while maintaining a good level of service. That can mean closing some of those sites. But the question is, which ones?

We've worked on several of these types of projects, and the solution, aside from social and political issues, is always dependent on knowing how many tons are received at each site. With accurate tonnage information, it's relatively easy to run a few scenarios and then identify which ones make economic sense ... and which don't. The problem is, of course, these small facilities don't have scales—and because the trash from multiple sites is often combined into a single truckload, coming up with tonnage figures for each site is impossible. Impossible, that is, unless the truck has onboard scales. With onboard scales, the driver can record individual tonnage records regardless of how many service stops the truck makes.

Operational Issues

Along another economic track, your scale system can provide an in-depth look at your landfill's hourly workload during each day of the week. This type of information can often identify opportunities to reduce operating hours...or even eliminate certain days when tonnage levels can't justify opening the front gate.

Figure 1, which shows average tons per hour for every day of the week, identifies an opportunity to reduce both operating hours and operating days.

Tonnage patterns like these, which start low, peak in the middle of the day and then drop off the last few hours, are good candidates to be condensed into a shorter workday.

This facility, currently receiving trash from 7 a.m. to 5 p.m. might be able to open at 8 a.m. and close at 3 p.m., with relatively little impact to the inbound tonnage.

It also shows that being open on Sunday, with an average of only 37 tons per day, is probably not very efficient. Here again, closing Sunday would tend to shift most of those 37 tons to Saturday.

Of course, these kinds of decisions must also be weighed against social, political, and other factors. But without looking at your landfill's hourly and daily tonnage, you won't know what's possible.

Similarly, the productivity and cost of your landfill's frontline activities are nearly all related to the inbound tonnage rate: basic information provided by your scale system. The data is there, it's just a matter of extracting it in a useful format.

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One simple but revealing benchmark is tons of waste per machine hour. By dividing daily tonnage by daily machine hours, you can quickly generate a chart like Figure 2. When properly applied to the frontline operations of pushing and compacting waste, as in this example, such data can show how well your operation performs each day.

Every process has a sweet spot, where the cost of production is balanced with output, resulting in maximum efficiency and lowest cost.

For this scenario, let's assume that this optimum point occurs at 60 tons per hour for the compactor...and 190 tons per hour with the dozer.

Figure 2 shows considerable day-to-day variation from those optimum levels, which, in the world of production, equates to lower efficiency and higher cost.

So, how do you get from the tonnage data in your scale system to this type of chart? It's not as difficult as you might think. Most scale programs can output transaction data into various spreadsheet formats—Microsoft's EXCEL is perhaps the most common. Once you've exported daily tonnage information to a spreadsheet, combine it with daily equipment hours, which can be pulled from daily fuel logs, service records, or time sheets.

Then simply divide each day's tonnage by the hours logged by individual machines and chart the results. Presto: daily production rates for your landfill. With a bit more work, you can actually relate equipment hours to cost... and end up with a daily or weekly operations performance budget. The point is that it all starts with the basic data your scale system is already tracking.

Regulatory Compliance

An ever-increasing number of regulatory compliance reports and thresholds are based on your inbound tonnage, and the need to track and report that tonnage in varying formats is a fact of life for most landfills.

Most states now require some form of annual reporting in regard to total tons of waste disposed, and many also require similar tonnage reports for materials diverted from the wastestream and recycled or put to some other beneficial use, such as alternative daily cover (ADC). Tracking the various types of information that must accompany different

materials can be difficult, not from the standpoint of software capabilities, but more in regard to minimizing user confusion. For example, at some landfills, inbound waste records must include the following information: tons, date and time, origin of waste, type of waste, type of recyclable, and customer or account number.

This sounds simple, but in some cases we've seen landfills tracking more than 40 categories of waste, including things like C&D mixed, C&D wood, C&D sheetrock, C&D metal, C&D rubble...well, you get the idea. And, while there are plenty of benefits to having detailed information regarding your wastestream, such detail can cause lots of confusion when your regular scale operator is on vacation and someone else has to fill in. One solution here is to have a library of photos—in the computer, in a binder, or posted on the wall—showing examples of various types of loads and their correct classification. When in doubt, the scale operator can match the load to the photo.

These are the types of problems that your scale software provider needs to hear about. More often than not, they can help you come up with solutions.

Here's another twist on that same type of issue: Having lots of waste classifications also provides an opportunity for some customers to, well...um...let's just say it: Some customers will lie about the type of material they have in their trucks in order to get a lower per-ton rate.

Seeing is believing. So in order to help scale operators believe the customer's description, they need to see what's in the load. To accomplish this, many scale systems are moving beyond mirrors on a pole and are now integrating overhead cameras into their operations. Cameras that can pan, zoom, and tilt... and, yes, these photos can be integrated into the transaction.

Finding the Right System

OK, while it's all good and well to have all of these side benefits available from a scale/software system, the real bottom line is having a scale system that provides fast, accurate weights day in and day out.

We get to speak with scores of landfill managers every year as part of our job conducting operational efficiency studies, and we're always alert for systems that are working well. One indicator of a great scale system is when we ask the manager, "What kind of scale and software programmer you running?" and the response is, "Gee, I'm not sure; we never think about it."

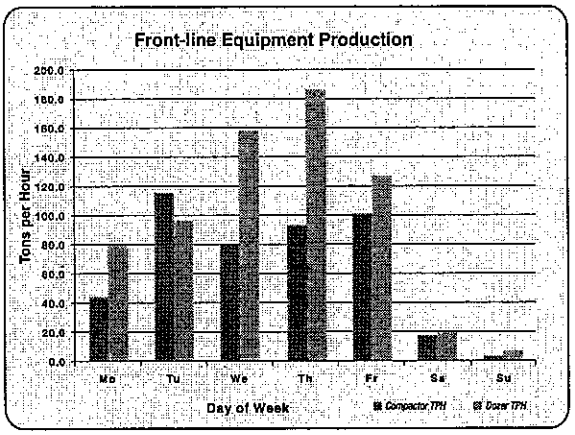


Figure 2

The right scale system—you know you have it when you just don't have to think about it. Of course, this doesn't mean that the system was selected haphazardly. Nor does it mean that updates and maintenance are ignored. Instead, like an outstanding employee, it simply means that when there's a job to be done, it's done right the first time, and you don't have to give it a second thought.

Again, if you are planning to upgrade your existing system, or installing your first, take time to learn about the various options available so you can select one that best fits your needs. One of those needs might be the ability to generate split tickets.

According to Scott Fisher, business development manager with Encore Financial & Operational Software, the ability to split tickets is just one of many important attributes to look for in a scale software program.

An increasing number of landfills are importing/exporting mixed loads—mixed in the sense of various types of commodities or multiple vendors/customers. For example, an inbound load of recyclables may include baled cardboard and office paper. Using a scale system with the ability to split tickets, the truck can be weighed, one type of commodity can be off-loaded and then the truck can be reweighed. When completed, the net weights can be assigned to the correct commodity or account.

"Also," Scott explains, "Flexibility is important." His clients appreciate the ability to custom-create a system meeting their specific needs. With the ability to include GPS-logged route information with automated scale systems, the landfill scales are now able to provide

not only landfill reports, but also help optimize the collection side of the operation as well.

Consider, for example, the benefits of linking individual route truck performance such as stop/start time for each account on the route with GPS, onboard scales (to record each customer's weight), and overall drive time/distance. This detailed information can be linked with the landfill's scale through an automated system using RFID or a touchscreen. Finally, all of this information can then be accessed remotely from any other computer.

OK, in order to provide consistent, accurate weights you obviously need to select a dependable, high-quality scale/software system—that's a no-brainer. But before you run out and purchase the slickest, quickest system you can find, take time to figure out what you want your system to actually do. In some cases that may also include figuring out the problems you want your scale system to solve.

If yours is a small landfill, one conducting few recycling activities and processing only a handful of cash and charge accounts, you might select a scale system that simply weighs vehicles, calculates the rate, and prints out a three-part receipt: one for the customer, one for the scale-house file, and an original that's sent to accounts payable.

If your needs are simple, then the system can be, too. But like Andy of Mayberry, such hometown simplicity is becoming far less common at today's multitasking landfill.

It's more likely that you'll select a robust system that is able to manage many different customer accounts that must be tracked by origin, waste type, commodity, and charge-out rates, while providing a broad menu of reports, billing, and interface capabilities. Here's a quick look at what these powerful, modern systems can provide.

As soon as vehicles enter your landfill's gate, they are picked up by your digital camera system. Using a control panel and joystick, your scale manager can track their progress as they approach the growing line of trucks waiting to cross the scales, panning the camera to assess the number of vehicles waiting in line or zooming in to look at a particular load. During those busy times of day when there are several pickups—some with dump trailers—waiting in the self-haul lane. These are mostly cash customers who need to be weighed in and out.

But for the regular commercial customers, the process is faster...and becoming more streamlined every day. First, by entering the commercial lane, these trucks, whose tare weights are recorded in the computer's system, can avoid having to wait in line with the cash customers.

Then, using various types of scanning devices, such as card readers or radio frequency identification devices (RFIDs), when a truck pulls onto the scales, your automated system will identify the truck, extract its relevant information from the computer's database (e.g., tare weight, billing rate, etc.), calculate the net weight of the load, and produce a scale ticket—and, with a green light, the truck is on its way. All of this can happen in seconds.

Compared with the manual ticket process, which could take two minutes, automated systems are faster and less costly. For these reasons, an ever-increasing number of landfills are automating this portion of their scale systems.

A system like this can be customized to meet your specific needs. Many landfills, such as the Frank R. Bowerman (FRB) Landfill, operated by Orange County's Waste and Recycling Department in California, combine digital cameras with their scale/software systems. Every transaction—from automated and manual lanes alike—may include the scale ticket, along with digital photos of the truck's license plate and maybe an overhead photo of the truck's load. They also have a video camera recording of all vehicles in the scale area.

The landfill's scale office looks like mission control, with computer screens, video cameras, and printers. When it comes to knowing what's coming into their landfill, these guys have it pegged.

So, does this mean Big Brother is watching? Well, yes...but in a positive and helpful way.

Once, when a truck hit the pipe guardrail near one of the Bowerman scales, the hauling company was contacted regarding making the repair. But the company rep adamantly denied that one of his trucks had even been to the landfill that day...let alone hit the guardrail. However, after viewing the video and watching his driver not only hit the rail but then lean out the window to survey the damage...well, you get the idea.

But automating your scale system, like any other change, may require a bit of a learning curve along with some ingenious problem solving. One of the early problems at the FRB Landfill was cross-lane reading. Occasionally, the monitor from one inbound lane would mistakenly read the transponder from a truck in another lane. The FRB solution: erect a short length of fence between each lane to limit the monitor's range.

What we see at landfills like FRB—and others across the industry—are things like automation, video cameras, data export, and other forms of technology customized to fit the requirements of individual facilities.

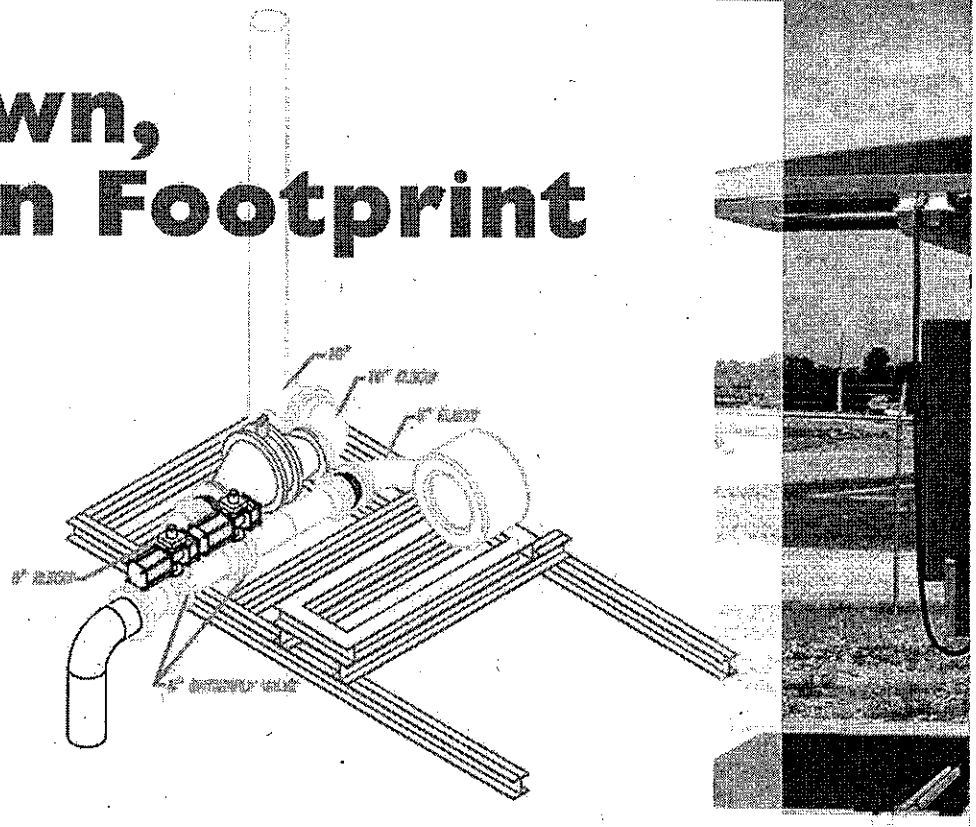
This landfill, like many others, is doing a great job of using technology to enhance what it is already doing well. So get on the train. Even though this is state of the art technology, it's proven technology. MSW

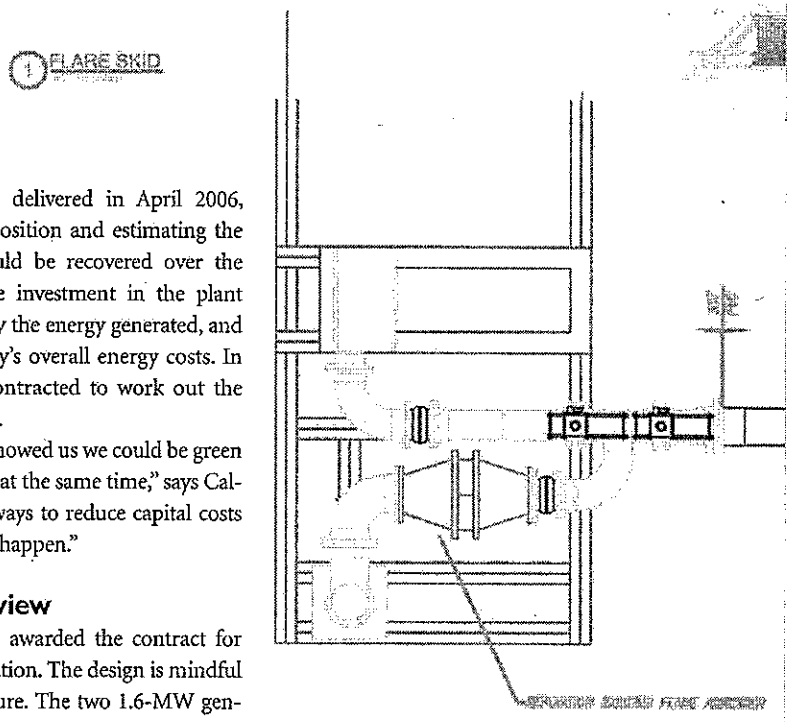
Neal Bolton is a consultant specializing in landfill operations.

Small Town, Big Green Footprint

A city administrator's obsession with the power of landfill gas

BY TED CHRISTENSEN SR., MARILYN MATTIONE, AND JEANNE BOJARSKI





In May 2006, the Noble Hill Landfill Renewable Energy Center fired up in Springfield, MO, generating 3.2 MW of power from landfill gas. The city administrator of the much smaller town of Lamar, MO, had taken note of the project. Now, when Lynn Calton looked at the flare burning methane at Prairie View Landfill in southwest Missouri he could think of only one thing: "Dollar bills going up in the air."

By the time the Springfield plant came online, Calton had already taken steps towards capturing those dollars. Ultimately, the clean energy generated from waste methane gas would more than halve the city's electric bill—and provide significant environmental benefits by replacing 3.2 MW of "dirty" energy generation (equal to consuming 357,833 barrels of oil).

Lamar is a member of the Missouri Joint Municipal Electric Utility Commission, a co-op that pools power generation resources for communities across the state. Calton had heard about the "green" Combined Heat and Power (CHP) plants the Energy Services Division of Shafer, Kline & Warren Inc. (SKW) had delivered for other commission members.

The city of Lamar retained SKW to evaluate the technical and economic feasibility of a landfill gas-to-energy project at Prairie View Landfill, the second largest in the state. In a good year, the facility receives 2,300 tons of waste per day. "We love trash," Calton says.

The study was delivered in April 2006, verifying gas composition and estimating the quantities that could be recovered over the next 50 years. The investment in the plant could be paid off by the energy generated, and still save on the city's overall energy costs. In 2007, SKW was contracted to work out the engineering details.

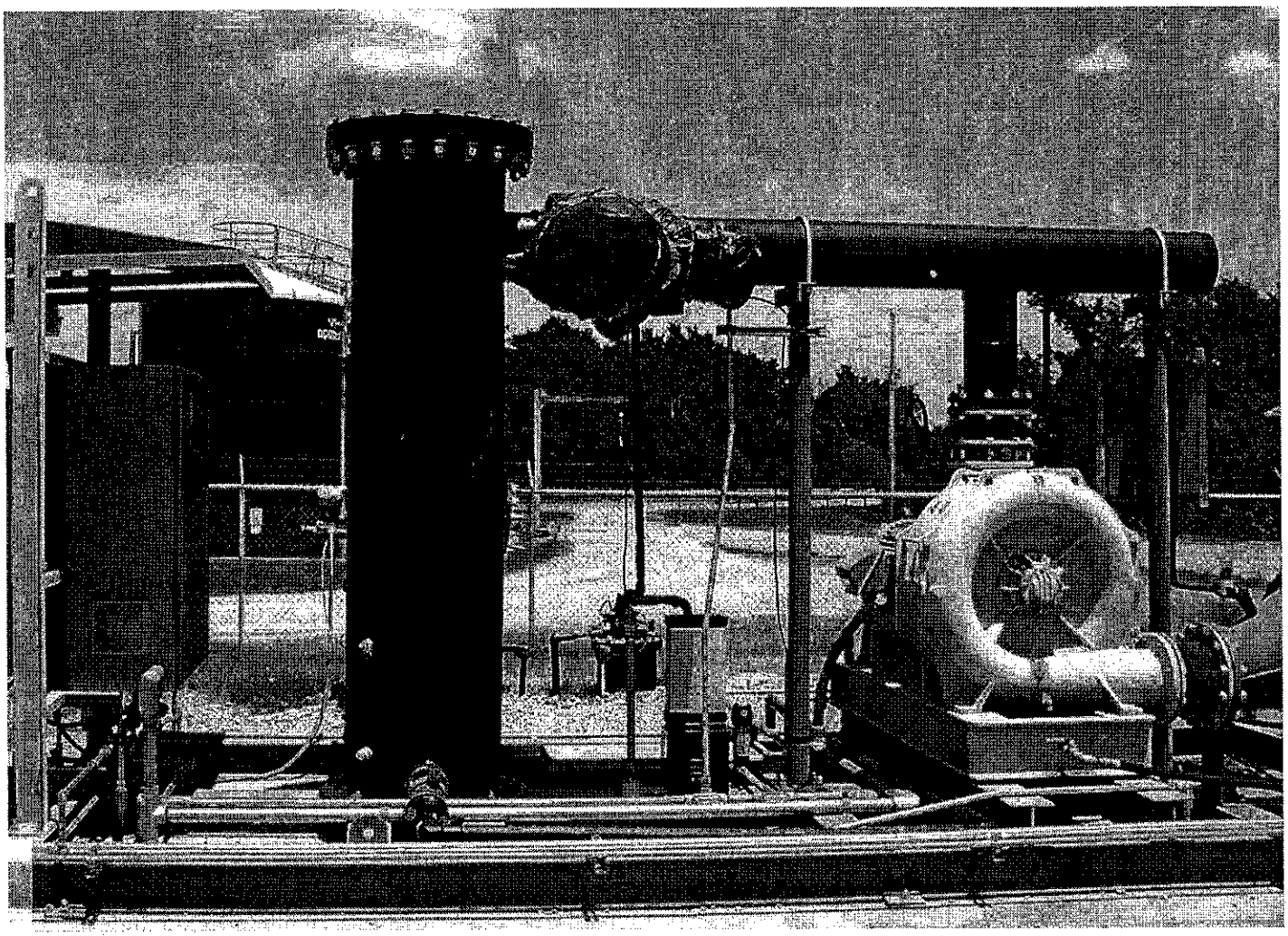
"They [SKW] showed us we could be green and generate green at the same time," says Calton. "They found ways to reduce capital costs in order to make it happen."

Project Overview

In 2009, SKW was awarded the contract for project implementation. The design is mindful of capital expenditure. The two 1.6-MW generators match initial gas availability, providing maximum power production at the lowest cost. Housing the plant in a prefabricated metal building versus block building saved $200,000. Integrating the existing flare to work with the gas-treatment skid saved $55,000 versus installing a new flare as is typical.

To produce usable fuel, raw methane from the landfill is filtered, compressed, and cooled on a treatment skid. SKW programmed a low-cost controller to totally automate the process.

The project team designed the plant to economically accommodate expansion to a planned 8 MW of generation capacity as landfill gas production rises. The city will be able to add three generators and more than double capacity at half the cost of Phase I. SKW also designed the 69-kV substation with switchgear



All Photos: City of Lamar, MO

Left: Schematic for the Lamar green power project
Above: Lamar landfill gas flare adapter

safeguards and the new transmission line that carries the electricity to the city-owned distribution substation.

To keep operating costs low, the Lamar plant was equipped with a supervisory control and data acquisition (SCADA) system that controls the plant automatically. Operations can be monitored (and controlled, if needed) from a remote workstation in Lamar. In addition, the control system automatically optimizes energy production based on gas availability, increasing profitability. The project captures 1300 standard cubic feet of landfill gas per minute and generates 3.2 MW, enough to power approximately 2,300 Lamar homes. There are currently 2,200 homes in the city.

Getting It Right the First Time

Landfill gas-to-energy plants are nothing new. There are at least 519 operational projects in 46 states producing 13 billion kWh of electricity a year. However, this project boasts features that are, if not unique, unusual:

- The project was financed solely by the city of Lamar, with no subsidies or grants.
- The city also owns the plant electrical substation and transmission line to its main substation, which was necessary for the economic viability of a self-financed project.
- SKW's design re-engineered the existing flare system to feed gas to the treatment skid, a first in landfill-gas collection technology. In addition, the provision of a control system that allows the facility to operate unmanned contributes to low, long-term operating costs.

Project Structure

The city of Lamar owns and operates its own electric utility, including the distribution system, several substations, and the electric generation facilities. So it was not a stretch for this enterprising town of 2,200 homes (along with several large industrial concerns) to build its own landfill power plant.

The facilities were financed by a city bond issue approved by the city council. The city also received a $500,000 federal loan.

The landfill owner, Allied Waste Services (now Republic Services), agreed to lease land for the plant to the city for $1 a year. The city pays the landfill 1 cent per kilowatt of electricity generated for the gas.

The Missouri Joint Municipal Electric Utility Commission's Public Energy Pool, or MoPEP, plays a significant role, since it is a wholesaler that can buy and sell energy in bulk. Previously, Lamar purchased the energy the city utility did not produce itself through MoPEP. Now, MoPEP "buys" its energy at cost and "sells" it back at the same price. MoPEP also guaranteed the city's loan.

Single-Source Project Design and Management

SKW evaluated, designed and provided professional services for the entire project, reducing its complexity and cost. The project team drew from a deep pool of experience in power generation facilities and controls. In addition, team members made field trips to the Springfield, Jefferson City, and Columbia Landfill Gas-to-Energy Plant installations in Missouri to familiarize themselves with current best practices. Below is a list of the services provided.

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Is Biodegradability a Desirable Attribute for Discarded Solid Waste? Perspectives from a National Landfill Greenhouse Gas Inventory Model

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Supporting Information

ABSTRACT: There is increasing interest in the use of biodegradable materials because they are believed to be "greener". In a landfill, these materials degrade anaerobically to form methane and carbon dioxide. The fraction of the methane that is collected can be utilized as an energy source and the fraction of the biogenic carbon that does not decompose is stored in the landfill. A landfill life-cycle model was developed to represent the behavior of MSW components and new materials disposed in a landfill representative of the U.S. average with respect to gas collection and utilization over a range of environmental conditions (i.e., arid, moderate wet, and bioreactor). The behavior of materials that biodegrade at relatively fast (food waste), medium (biodegradable polymer) and slow (newsprint and office paper) rates was studied. Poly(3-hydroxybutyrate-co-3-hydroxyoctanoate) (PHBO) was selected as illustrative for an emerging biodegradable polymer. Global warming potentials (GWP) of 26, 720, −1000, 990, and 1300 kg CO_2e wet Mg^{-1} were estimated for MSW, food waste, newsprint, office paper, and PHBO, respectively in a national average landfill. In a state-of-the-art landfill with gas collection and electricity generation, GWP's of −250, 330, −1400, −96, and −420 kg CO_2e wet Mg^{-1} were estimated for MSW, food waste, newsprint, office paper and PHBO, respectively. Additional simulations showed that for a hypothetical material, a slower biodegradation rate and a lower extent of biodegradation improve the environmental performance of a material in a landfill representative of national average conditions.

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) estimates that 135 million metric tons (1 t = 1 Mg) of municipal solid waste (MSW) were discarded in U.S. landfills in 2008.[1] While efforts to reduce waste generation and to manage waste by recycling and composting will continue, landfills remain a significant component of waste management infrastructure. It is therefore important to understand the impacts of landfill disposal on a material's environmental performance. There are currently 503 landfills in the U.S. at which the gas is converted to energy[2] and an estimated additional 545 landfills at which energy recovery is viable.[3] Nonetheless, as a result of gas generated prior to installation of gas collection systems, and fugitive emissions, landfills are estimated to be the second largest source of anthropogenic methane emissions in the U.S.[4] Recently, efforts have been made to develop biodegradable materials because they are assumed to be "greener" alternatives. Poly(lactic) acid (PLA), which is manufactured from agricultural products as opposed to petroleum, is one such material that has found use in disposable cups, cutlery, and other food service applications.[5] While material biodegradability will reduce the volume occupied in a landfill, an evaluation of the environmental performance of a new material must include the production, use, and disposal phases of the product life-cycle. In recent work, the effect of the rate of methane generation from individual MSW components was combined with a hypothetical schedule for landfill gas collection to illustrate the importance of incorporating waste component-specific decay rates in analyses of the fraction of generated methane that is collected.[6]

To the extent that environmental performance at the end-of-life is a factor in the development and selection of materials to be used in various products, manufacturers must have an understanding of the national disposal infrastructure as opposed to performance in a specific landfill. The objective of this study was to develop and parametrize a landfill life-cycle model to represent national average conditions. The model was parametrized to represent landfills with and without gas collection, and landfills that flare or use the collected gas beneficially. Landfills operated under a range of environmental conditions (i.e., arid, moderate, wet, and bioreactor) were considered and the model was used to study the behavior of materials that biodegrade at relatively fast (food waste), medium (biodegradable polymer) and slow (newsprint and office paper) rates. The goal of this study is to provide guidance to manufacturers on environmental performance during landfill disposal that reflects U.S. landfill infrastructure.

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Table 1. Properties for Mix of U.S. Landfill Facilities

landfill type	annual precipitation (cm)[a]	decay rate (yr^{-1})	percent of waste received[b]	no. of years gas is collected for energy generation[c]	percent of gas generated in 100 years
arid	<51	0.02[a]	20.0	100	82
moderate	51 < x < 102	0.038[a]	28.9	76	94
wet	>102	0.057[a]	41.1	59	98
bioreactor	N/A	0.12[d]	10.0	39	99.9

[a] From U.S. EPA, 2010.[4] [b] The mass of waste disposed in bioreactor landfills was assumed to be 10%. This mass was subtracted from the mass disposed in moderate and wet landfills in equal proportions, after which the fraction disposed in each category was corrected. The original mass disposal by category was adopted from U.S. EPA, 2010.[4] [c] Criteria to estimate this value are described in the text. [d] Judgment based on values reported in Barlaz et al., 2010[20] and Tolaymat et al., 2010.[21]

■ MODELING APPROACH

A landfill life-cycle model was developed to estimate greenhouse gas (GHG) emissions attributable to the disposal of biodegradable materials in landfills. The model was used to analyze the behavior of MSW and a range of illustrative materials that exhibit varying biodegradation rates to study the effect of biodegradability on environmental performance. Both point estimates and Monte Carlo analyses were conducted. For MSW, the waste composition was based on U.S. EPA, 2009.[1]

Landfill Model. An estimate of the global warming potential (GWP) attributable to the disposal of materials in a landfill requires consideration of landfill construction, operations, final cover placement, gas and leachate management, and long-term maintenance and monitoring (eq 1).

$$\begin{aligned}\text{totalGWP} = {} & \text{construction}CO_2 + \text{operations}CO_2 + \text{finalcover}\,CO_2 \\ & + \text{leachatemgmt}CO_2 + \text{longtermmonitoring}\,CO_2 \\ & + 25\times\text{fugitivemethane} - \text{electricityoffsets} \\ & - \left(\frac{44}{12}\right)\text{Cstored} \end{aligned} \quad (1)$$

Each of the terms in eq 1 are in mass units (kg). GHG emissions associated with all aspects of the landfill except gas management and carbon storage have been shown to be small relative to these parameters. As such, emissions for landfill construction (1.4 kg $CO_2e\,Mg^{-1}$), operations (3.9 kg $CO_2e\,Mg^{-1}$), final cover placement (1.2 kg $CO_2e\,Mg^{-1}$), leachate management (0.31 kg $CO_2e\,Mg^{-1}$) and long-term maintenance (0.06 kg $CO_2e\,Mg^{-1}$) were adopted from Camobreco, 1999.[7] The GHG emissions and sinks associated with gas management and the storage of biogenic carbon were developed in this study with carbon storage factors adopted from Staley and Barlaz, 2009.[8] Landfill gas generation was modeled using a first order decay model as in the EPA's LandGEM model.[9] The decay rate (k) is dependent on climate and landfill operation strategy (traditional vs bioreactor). Thus, the fraction of waste disposed in U.S. landfills was divided into three climate categories for traditional landfills (arid, moderate, wet) to reflect differences in k associated with moisture. Bioreactor landfills, in which leachate and sometimes other liquids are recirculated to increase k, were considered as a fourth category. The mass of total waste disposed into each landfill category was adopted from U.S. EPA, 2010.[4] Table 1 presents the parameters associated with each landfill category. The mass of waste disposed in bioreactor landfills was assumed to be 10% of the mass disposed in U.S. landfills and this mass was subtracted from the mass disposed in moderate and wet landfills as described in Table 1. In each of the three traditional landfill categories, there are landfills that (1) do not collect gas, (2) flare the gas, and (3) use the gas for energy. The percentage of waste in landfills with gas collection and the percentage of these landfills with energy recovery were calculated using EPA estimates for methane generation (12.4 million Mg), flared (3.3 million Mg), and combusted for energy (3.3 million Mg).[4] Based on the assumption that landfills collect 75% of the generated gas, the EPA GHG Inventory[4] estimates that 69% of landfilled waste was disposed in landfills with gas collection (flared or converted to energy) and 50% of that waste was disposed in landfills with energy recovery. It was assumed that all bioreactor landfills were included in the 69% of landfills that collect gas, which results in an estimate that 66% of waste in traditional landfills is disposed in landfills with gas collection. It is recognized that there is uncertainty in these estimates and the sensitivity of these assumptions is explored with the results.

In contrast to LandGEM,[9] in which MSW is treated as one substrate, the k and methane yield (L_0) of each MSW component was modeled separately to study the influence of biodegradability on methane generation and subsequent collection and emissions. Component-specific decay rates were calculated as described in De la Cruz and Barlaz, 2010.[6] Calculation of component-specific decay rates requires specification of a bulk MSW decay rate as given in Table 1.

For waste in landfills that utilize the methane beneficially, it was necessary to estimate the period over which there was sufficient gas to operate energy recovery equipment. First, it was assumed that all recovered methane is converted to electrical energy although in practice some gas is used directly in industrial boilers along with other beneficial uses. Second, it was assumed that landfills could only generate electricity while the gas flow rate was above 0.236 $m^3\,s^{-1}$ (500 $ft^3\,min^{-1}$) at 50% methane. For each landfill category, the length of time that the landfill gas flow was above this threshold was determined by modeling methane generation for a 2100 Mg day^{-1} landfill that accepted waste for 40 years at the decay rates given in Table 1. As the decay rate decreases, the length of time over which gas generation is above the 0.236 $m^3\,s^{-1}$ threshold increases and of course, this time would increase if the waste acceptance rate was higher. All calculations were based on a 100 year time horizon at which point a landfill would have produced most of its methane (Table 1). For landfills that utilize the gas for energy, the gas produced at a rate lower than the aforementioned threshold was assumed to be flared between the threshold year and year 100.

Landfill gas collection systems are installed in part based on the age of the landfill cell. This means that waste buried earlier in the cell's life will be under gas collection for less time than waste buried later in the cell's life. It is therefore necessary to temporally average the collection efficiency for each year of cell operation.

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Table 2. Material Properties for Food Waste, Newsprint, Office Paper, PHBO, and MSW

material	moisture content (%)	field decay rate (yr^{-1})[a]	methane yield (m^3 dry Mg^{-1})[b]	carbon storage factor (kg C dry Mg^{-1})[b]
food waste	70	0.144	300	80
newsprint	6	0.033	74.3	420
office paper	6	0.029	217	50
PHBO	0	0.072	341	356
MSW[c]	21	N/A[d]	67.2	125

[a] The field-scale decay rates for food waste, newsprint, and office paper were adopted from De la Cruz and Barlaz, 2010[6] and are based on a decay rate of 0.04 yr^{-1} for MSW. The decay rate for PHBO was estimated as described in the text, and also based on a decay rate of 0.04 yr^{-1} for MSW. [b] The methane yields and carbon storage factors for MSW, food waste, newsprint and office paper, were adopted from Staley and Barlaz, 2009.[8] The corresponding values for PHBO were estimated as described in the text. [c] Values were calculated as the weighted average of the component specific values for moisture content, methane yield and carbon storage factor. Component specific data and waste composition are given in SI Table S1. [d] A bulk MSW decay rate is not meaningful because methane generation curves for individual waste components were summed.

Gas collection schemes were based on the assumption that a typical cell life is 5 years and that no gas collection is in place for the first two years of cell operation (6 mo for bioreactors). Further, the collection efficiency prior to cell closure and intermediate cover installation is 50% (i.e., years 3–5, or 0.5–3 years for a bioreactor). After cell closure at the end of year 5, the collection efficiency is assumed to be 75%. It is further assumed that 10 years after final waste placement (i.e., 15 years after initial waste placement), a final cover is installed and the gas collection efficiency increases from 75% to 95%. This gas collection system installation schedule was used to calculate a temporally averaged gas collection efficiency which is the volume of gas collected divided by the volume of gas produced over 100 years as it applies to the 5 years of waste buried in a single landfill cell. All of the gas collection system default values can be varied in the model as described with the Results and Discussion.

Some fraction of the uncollected methane is oxidized to CO_2 as it passes through the landfill cover. Ten percent oxidation was assumed as recommended in the U.S. EPA's AP-42 database[10] and as used in the U.S. GHG inventory.[4] It is likely conservative as other studies estimate methane oxidation of 22–55%.[11] When electrical energy is recovered, it is assumed to offset coal and natural gas generation at 72.5% coal and 27.5% natural gas, which represents the adjusted proportion of each fuel on the national grid.[12] This leads to a CO_2 offset of 1.02 kg CO_2e kWh^{-1}. Methane was assumed to be converted to electricity using a heat rate of 11.6 MJ/kWh, which was developed from vendor literature. Finally, the mass of methane was multiplied by 25 to express as CO_2e using the 100 year warming potential.[13]

Modeling of Individual Waste Components. In addition to MSW, the analysis was conducted for four individual materials to illustrate the effects of decay rate and methane yield on GHG emissions from waste materials. The four materials were food waste, newsprint, office paper, and poly(3-hydroxybutyrate-co-3-hydroxyoctanoate) (PHBO) ($C_{13}H_{21}O_4$). The properties for each material are shown in Table 2. Several material properties for PHBO had to be developed including the methane yield, decay rate, and carbon storage factor (CSF). The theoretical methane yield for PHBO was calculated to be 755 mL g $PHBO^{-1}$ using the Buswell equation as cited in Parkin and Owen, 1986.[14] This value was adjusted using the average mineralization of 45.2% measured in a reactor study,[15] resulting in an effective ultimate yield of 341 mL g $PHBO^{-1}$. Equation 2 was used to estimate a decay rate for PHBO that is applicable at field-scale

Table 3. Decay Rate For MSW, PHBO, and the Ratio between them

	laboratory-scale MSW decay rate (yr^{-1})[b]	laboratory-scale PHBO decay rate (yr^{-1})[b]	k_{phbo}/k_{msw}
reactor 4[a]	10.9	20.9	1.92
reactor 5[a]	10.6	18.0	1.70
reactor 6[a]	10.1	18.6	1.85
average	10.5	19.2	1.83

[a] Reactor numbers as assigned in Federle et al., 2002.[15] [b] Calculated from data in Federle et al., 2002[15] as given in the SI (Figures S1–S8).

using laboratory-scale decay rates for MSW and PHBO.

$$k_{f,\text{phbo}} = k_{f,MSW}\frac{k_{1,\text{phbo}}}{k_{1,MSW}} \quad (2)$$

where, $k_{f,phbo}$ is the field-scale decay rate of PHBO, $k_{f,MSW}$ is the field-scale decay rate of MSW, $k_{1,phbo}$ is the laboratory-scale decay rate of PHBO, and $k_{1,MSW}$ is the laboratory-scale decay rate of MSW. The laboratory-scale decay rates for PHBO and MSW were estimated by regression analysis of the data in Federle et al., 2002.[15] For MSW, the regression was performed on the log of the difference between total methane production and each generation value (Figures S1–S4 of the Supporting Information (SI)). The decay rate for PHBO was determined by analyzing the mineralization rate. Since PHBO mineralization stabilized much sooner than total CH_4, the regression was only performed on the data up to day 77.9 at which time decay had essentially ceased (SI Figures S5–S8). It should be noted that this is an upper estimate for the decay rate of PHBO, since the PHBO was ground before testing and the other materials were shredded to about 2 × 5 cm.

Table 3 shows the laboratory decay rates for MSW, PHBO and the ratio between them. The ratio was used to estimate the decay rate of PHBO in actual landfill environments for each landfill category (Table 2). A CSF for PHBO was determined using its carbon content (647 kg C Mg^{-1}) and reported mineralization (45.2%), resulting in an average CSF of 356 kg C Mg $PHBO^{-1}$ with a range of 307 to 381 based on the reactor data.[15]

Sensitivity Analysis. Many of the input values in this model are uncertain. For example, it is difficult to estimate the fraction of waste disposed in landfills with gas collection (point estimate 69%), as well as the fraction of this waste that is in landfills with energy recovery (point estimate 50%). In contrast to these point estimates, data voluntarily submitted to the Landfill Methane Outreach Program (LMOP) database[2] suggest that 84% of waste

is disposed in landfills with gas collection, and 66% of this waste is in landfills with energy recovery. These numbers are likely higher because the LMOP database consists of landfills that voluntarily submit information. Larger landfills and landfills that have state-of-the-art gas collection systems are most likely to submit data and thus be overrepresented.

A 10 000 iteration Monte Carlo analysis was performed on several model inputs. The inputs included in the analysis and the values used for their respective triangular distributions are given in the Results and Discussion section.

Table 4. Temporally Averaged Landfill Gas Collection Efficiencies.[a]

	collection efficiency (%)	
waste age (yr)	traditional landfill	bioreactor landfill
1	0	25
2	45	55
3	60	60
4	65	65
5	70	70
6	75	75
7	75	75
8	75	75
9	75	75
10	75	75
11	75	75
12	79	79
13	83	83
14	87	87
15	91	91
≥16	95	95

[a] Value represents the behavior of an average mass of MSW in a landfill with gas collection. The calculation procedure is described in the Modeling Approach section. These values are based on an assumed schedule for the installation of a gas collection system, a landfill cell life of 5 years and the installation of final cover 15 years after a cell opens as described in the text.

■ RESULTS AND DISCUSSION

The calculated temporally averaged landfill gas collection efficiencies for waste disposed in traditional and bioreactor landfills that collect gas are shown in Table 4. The results in Table 4 reflect an average Mg of waste as opposed to the first Mg buried. Thus, even though it was assumed that no gas collection is installed at a traditional landfill for two years, waste disposed in year two comes under some collection within a year of burial; hence the gas collection efficiency for waste buried in year two is nonzero.

The GHG emissions associated with food waste, newsprint, office paper, PHBO, and MSW are shown in Figure 1a by landfill subprocess. Temporally averaged collection efficiencies, defined as total methane collection/total methane production were 51, 41, 56, 57, and 49% for MSW, food waste, newsprint, office paper and PHBO, respectively. These values are relatively low due to the estimate that 31% of waste is buried in landfills that do not collect gas. The collection efficiency varies as a function of decay rate as materials with a higher decay rate will produce more gas prior to the installation of gas collection while waste that degrades more slowly will have greater collection efficiencies since more of the gas will be produced after collection systems are in place. Methane oxidation was assumed to reduce fugitive emissions by 10% in the base case. Biogenic carbon storage is also a significant component of the carbon footprint (Figure 1a) while the energy offsets reduce the GWP from the fugitive methane emissions by 6−11%.

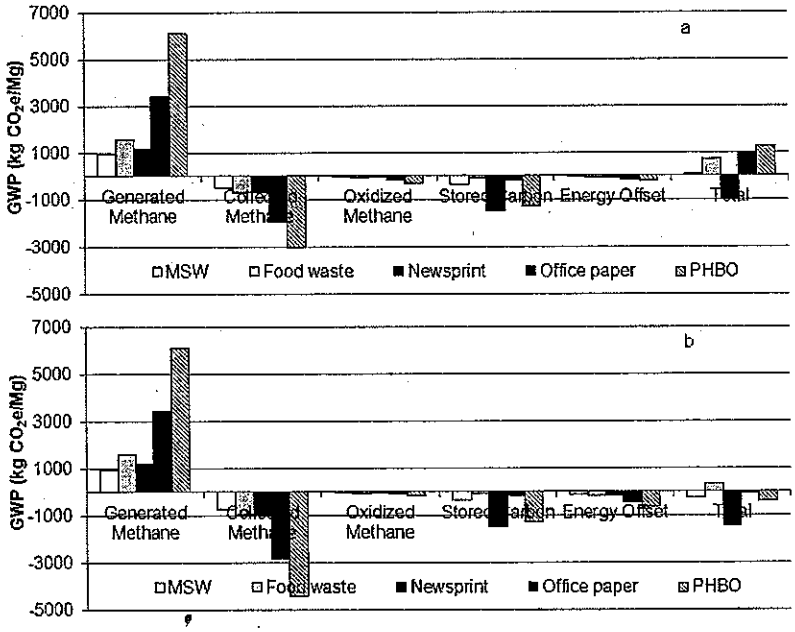

Figure 1. Greenhouse gas emissions for each waste component and average MSW by process and expressed per wet Mg. These data represent (a) a national average landfill and thus reflect landfills with and without gas collection and energy recovery and (b) a state-of-the-art landfill. Fossil CO_2e emissions from landfill construction, operations, closure, postclosure and leachate management lead to an additional 6.9 kg CO_2e Mg^{-1} that is included in the total for each of the waste streams.

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Table 5. Inputs and Triangular Distribution Parameters Used in the Monte Carlo Analysis

input	current	minimum[a]	maximum[a]
waste discarded in landfills with gas collection (%)	69	60	84[b]
waste in landfills with gas collection that recover energy (%)	50	40	66[b]
time until final cover is in place after initial waste placement (yr)	15	12	20
gas collection efficiency under final cover (%)	95	85	98
oxidation rate (%)	10	10	40[c]
landfill decay rate (yr^{-1})			
arid	0.02	0.015[d]	0.025[d]
moderate	0.038	0.029[d]	0.048[d]
wet	0.057	0.043[d]	0.071[d]
bioreactor	0.12	0.09[d]	0.15[d]

[a] Values based on judgment unless otherwise stated. [b] Maximum value based on voluntary reports in LMOP database.[2] [c] A published review suggests a mean of 36% oxidation.[11] [d] The decay rates were varied by ±25%.

The results in Figure 1a contrast considerably with the results for a landfill that represents the state-of-the-art as opposed to a national average. Results for a scenario closer to a state-of-the-art landfill are presented in Figure 1b where it is assumed that all landfills have gas collection systems and convert the methane to electrical energy. The methane collection schedule, cell life and oxidation rates remain as for Figure 1a. As expected, collected methane and the energy offsets increase; with energy offsets reducing the CO_2e from the fugitive methane emissions by 25–78%.

The CO_2e signature of PHBO is inferior to that of other materials in national average landfills, but not in state-of-the-art landfills. This inferiority in the base case may be counterintuitive as the methane yields of food waste and PHBO are comparable on a dry basis, and the PHBO decay rate is lower than that of food waste (Table 2). However, the results (Figure 1) are expressed on a wet basis and the methane yields are 90, 70, 200, and 340 m^3 wet Mg^{-1} for food waste, newsprint, office paper and PHBO, respectively. Thus, the higher methane yield for PHBO on a wet basis increases CO_2e for a national average landfill. For a state-of-the-art landfill, the CO_2e signature for PHBO is second only to newsprint because its decay rate is about half that of food waste, so more of the gas generated from PHBO can be collected. It also has the second highest CSF of any material analyzed, which leads it to have net negative CO_2e.

Results are presented by landfill category (arid, moderate, wet, bioreactor) in SI Figures S9–S12. In general, the volume of collected methane increases as the decay rates decrease so the environmental performance of waste generated in arid regions, which was estimated as 20% of the national total, is highest. The GHG performance of bioreactor landfills is superior to that of moderate and wet landfills due to the assumption that all bioreactors collect gas. One limitation to the modeling approach is that a constant methane oxidation factor is assumed which suggests that the mass of oxidized methane increases as fugitive emissions increase. In reality, the fraction of the uncollected methane that is oxidized will decrease as fugitive emissions increase because oxygen availability is a limiting factor in methane oxidation and a lower methane flux translates to the potential to meet a higher fraction of the stoichiometric oxygen demand.[16]

A Monte Carlo analysis was performed by varying the parameters presented in Table 5. The cumulative distribution functions (CDFs) for the GHG emissions associated with each waste component and MSW developed from the Monte Carlo analysis

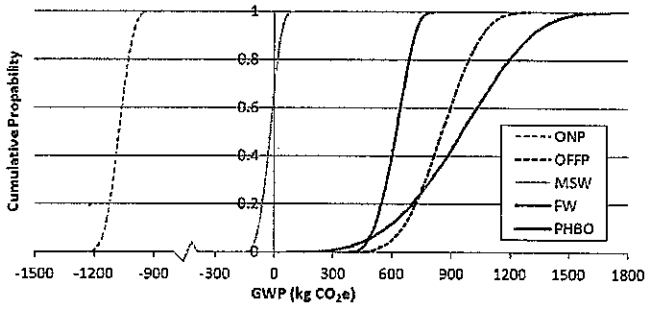

Figure 2. Cumulative distribution functions for each material. Ranges used for each uncertain input are given in Table 5. ONP = old newsprint, MSW = municipal solid waste, FW = food waste, OFFP = office paper.

are presented in Figure 2. Summary statistics for each CDF are shown in Table S2. PHBO has the greatest range among the waste streams (1600 kg CO_2e) because it has the highest methane yield which translates to more opportunity for changes in collection, beneficial use, and oxidation to affect the final results. Similarly, office paper has the second highest methane yield and the second greatest range (930 kg CO_2e). Spearman rank correlations were determined between major inputs and the net CO_2e associated with MSW disposal (Table 6). The oxidation rate shows the greatest correlation, which is partially due to its large range. Further research into the bounds of this range, and a modeling approach that incorporates changes in methane oxidation as a function of the controlling variables (soil moisture content, temperature, porosity and methane flux) could reduce the uncertainty. While work on these issues is ongoing, it appears premature to incorporate in this snapshot of the U.S. landfill infrastructure. The fraction of waste disposed in landfills that collect gas is the second most sensitive variable while the sensitivity of landfill decay rates varies based on the amount of waste in each landfill category. Here too, uncertainty exists and when the decay rates were varied by ±50%, as opposed to ±25%, the Spearman rank correlation coefficients increase from 0.066 to 0.078, 0.075 to 0.14, 0.081 to 0.18 and 0.041 to 0.066 for arid, moderate, wet, and bioreactor decay rates, respectively.

Decay Rate Analysis. The significance of the decay rate and methane yield is further illustrated by a parametric analysis. A hypothetical biogenic polymer consisting of 50% carbon in an oxidation state of a carbohydrate was analyzed at four degrees of mineralization, with decay rates varying from 0.001 to 1.0 yr^{-1}.

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Table 6. Spearman Rank Correlation Coefficients between Uncertain Inputs and the Net CO_2e Associated With MSW Disposal

input	Spearman Correlation
oxidation rate	−0.749
percentage of waste discarded in landfills that collect gas	−0.577
gas collection efficiency under final cover	−0.166
time until final cover is in place after final waste placement	0.117
wet landfill decay rate	0.081
moderate landfill decay rate	0.075
percentage of waste discarded in landfills with collection that recover energy	−0.066
arid landfill decay rate	0.066
bioreactor decay rate	0.041

Table 7. Material Properties for Hypothetical Biogenic Polymer

percent mineralization	L_0 (m^3 CH_4 Mg^{-1})[a]	CSF (kg C Mg^{-1})[a]
100	465	0
66	307	170
33	153	335
0	0	500

[a] Values were calculated for a hypothetical polymer that contains 50% organic carbon and is in the oxidation state of a carbohydrate, meaning that 50% of the reactive carbon will be converted to methane and 50% to carbon dioxide.

The 0% mineralization case simulates a recalcitrant biogenic material. The methane yields and CSFs for this hypothetical polymer are given in Table 7. The results indicate that decreased material decay rates and decreased mineralization lead to decreased CO_2e (Figure 3). These results suggest that for a national average landfill, in which not all gas is collected and converted to energy, optimal performance would be achieved for biogenic materials that are recalcitrant under anaerobic conditions.

Environmental Implications. The described approach provides a framework for a producer to consider the GHG performance of a material during the disposal phase. The input parameters could be adjusted to reflect regions or countries with alternate practices on landfill gas. In addition, the analysis could be extended to reflect for example, that an estimated 18.9% of U.S. nonrecovered MSW is disposed by waste-to-energy (WTE) combustion.[1] Analyses of WTE have been presented previously.[17−19] Similarly, for a product such as a biodegradable bag that is used strictly for yard waste, a scenario in which a significant percentage of the product is managed by composting or anaerobic digestion could be developed. So too, the behavior of a material where some fraction is discarded as litter could be considered. The scenario presented here is applicable to a biodegradable material that is managed with MSW, the majority of which is disposed in landfills in the U.S. The results show that a rapidly degradable material increases CO_2e relative to a more slowly degradable or recalcitrant material.

Ultimately, material development and selection should consider emissions associated with material production, potential differences in the use phase that could be attributed to the material, and end-of-life management. If emissions for the production of a biodegradable material are comparable or higher than emissions associated with manufacturing a material from petroleum-based feedstocks, and disposal emissions are higher for the biodegradable material as illustrated here, then it is hard to rationalize a suggestion that the biodegradable material is the preferable alternative, assuming of course, the availability of petroleum-based feedstocks.

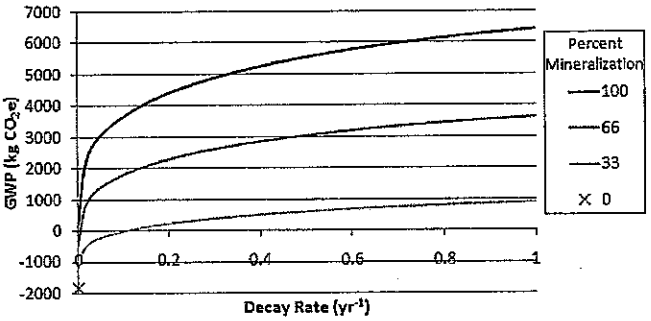

Figure 3. The effect of decay rate on the GWP associated with a hypothetical carbohydrate-based biogenic polymer with varying levels of mineralization.

■ ASSOCIATED CONTENT

Supporting Information. Waste composition, summary statistics for Monte Carlo analysis, methane production data from PHBO biodegradation study, derivation of mineralization factor (PHBO) and decay rates (MSW and PHBO) based on reactor data, and CO_2e for landfills in each category (arid, moderate, wet, bioreactor). This material is available free of charge via the Internet at http://pubs.acs.org.

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In the End, There's **Compost**

End uses for municipal greenwaste are growing. BY SUE EISENFELD

Although humans have been pondering the meaning of life since the beginning of time, municipal managers generally agree that the meaning of compost is a lot simpler: waste diversion. Numerous states have banned yardwaste from landfills, and many are looking to reduce greenhouse gases and meet air-quality goals. Approximately 3,500 US cities and counties operate greenwaste composting facilities, predominantly turning their materials into a soil amendment for the local community's gardening needs.

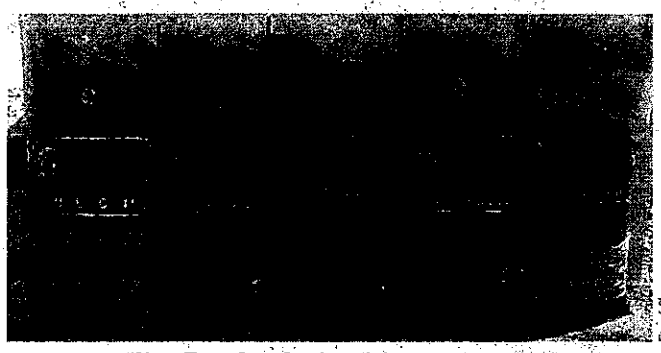
But the opportunities for greenwaste compost to become something more than a backyard gardener's tool are burgeoning. Ron Alexander, of R. Alexander Associates Inc. in Apex, NC, a consultant who specializes in developing markets and distribution avenues for compost programs, believes that now is the perfect time to expand compost's reach.

"Because of global climate change," he says, "there are more and more opportunities to use compost to bioengineer soils. We're experiencing more and more drought stress in certain areas like the West and Southeast, and bigger storm events as well. Compost can be used to improve soils that currently hold too little water or that cannot absorb it fast enough—it can help soil hold and percolate more water, preventing erosion and helping to manage excess stormwater."

Compost can be applied on farms, ballfields, and public parks, and as mulch around trees. It can be used in rain gardens to filter stormwater runoff, to control sediment at construction sites, to facilitate plant regrowth, prevent erosion, and to improve water quality. Greenwaste raw material can be used for harvesting fuel when combined with foodwaste, with the remaining digestate composted at the end. Studies have shown compost to be effective in remediating hydrocarbon pollution, and a new technology that collects steam vapor from compost to create heat and hot water is currently in agricultural use but could be used for municipal applications as well.

What's the key to expanding the market and thus the range of end uses? Dan Noble, executive director of the Association of Compost Producers in California, says that municipal solid waste managers often still see compost as merely a disposal alternative. They need to see it as end users do: as a product.

Municipal greenwaste compost is often plagued with contamination issues, he explains, which is the result of residents throwing trash and other items in their greenwaste bins, setting up a hierarchy that sometimes prefers "clean green" compost from private landscaping companies. If more municipal managers begin valuing compost as the black gold commodity that it is—a first use rather than an end use, perhaps—the greater the success and range of markets and applications they will eventually find.

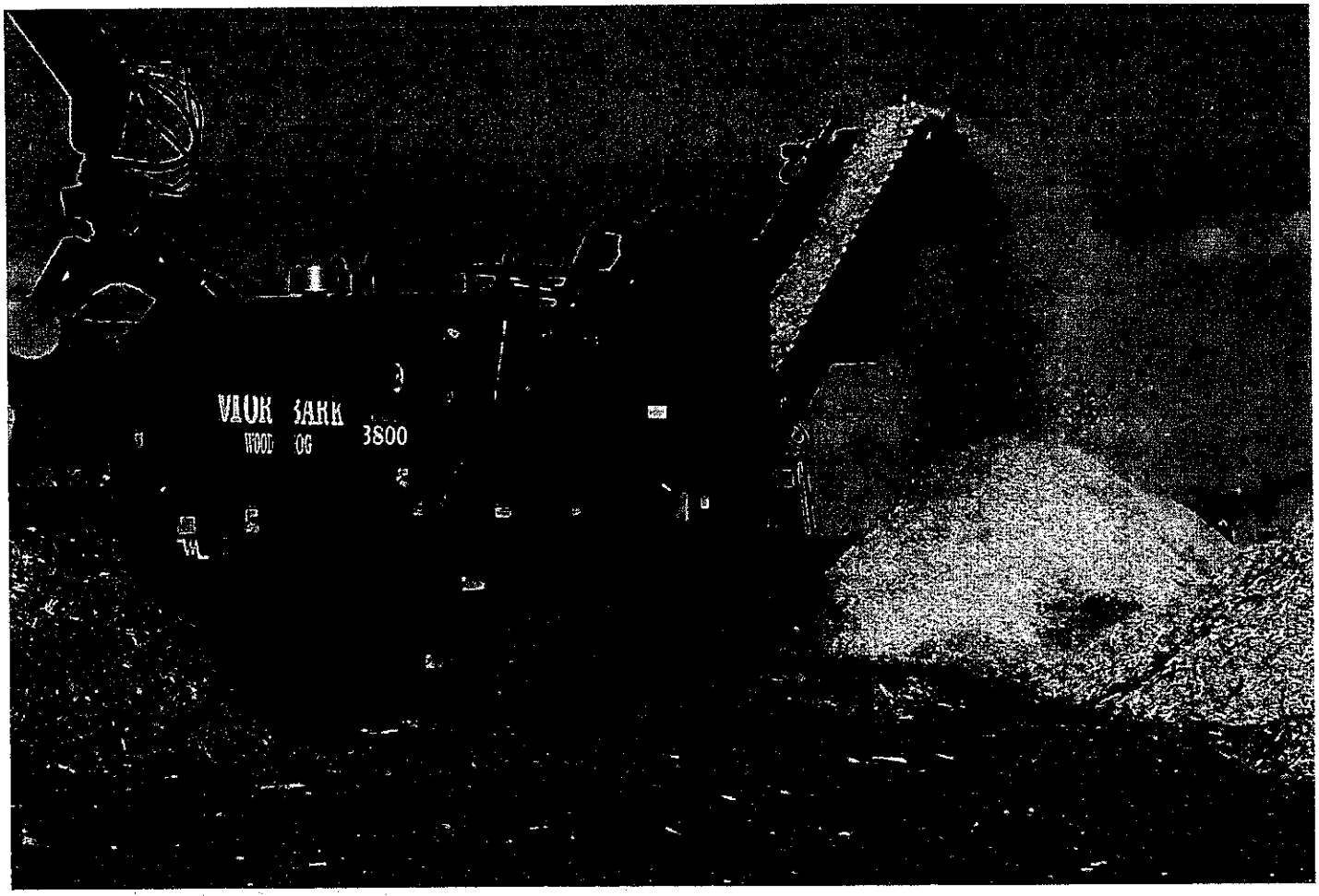


"Plano Texas Pure Products," the compost and soil product line from the city of Plano, TX

The Facts of Compost

What anyone already using compost knows is this: The black crumbly humus created from the controlled decomposition of organic matter by microorganisms has some amazing properties. Through its ability to improve the properties of soil physically, chemically, and biologically, its uses can be versatile:

- Compost can enhance the physical structure of soil, reducing bulk density and porosity and increase its gas and water permeability, thus making it ideal for plantings and for reducing erosion and preventing runoff.
- Compost can provide drought resistance.
- Compost can modify soil's pH.
- Compost can help soil retain nutrients as well as provide additional nutrients and soil biota.
- Compost can suppress plant disease.
- Compost can bind contaminants such as heavy metals, hydrocarbons, and pesticides, thus reducing their leachability into waterways and absorption by plant matter.



Hardark

Grinding prepares woody material for composting.

The two basic methods of producing compost are *aerobic* (occurring in the presence of oxygen) and *anaerobic* (occurring in the absence of oxygen). According to Ron Alexander, aerobic techniques are by far the number-one method for making yardwaste compost in North America, either with outdoor windrows (rows of long piles) or aerated static piles. (A third aerobic technique, in-vessel composting, is generally too expensive to process yardwaste and is often used only for food or biosolids composting.)

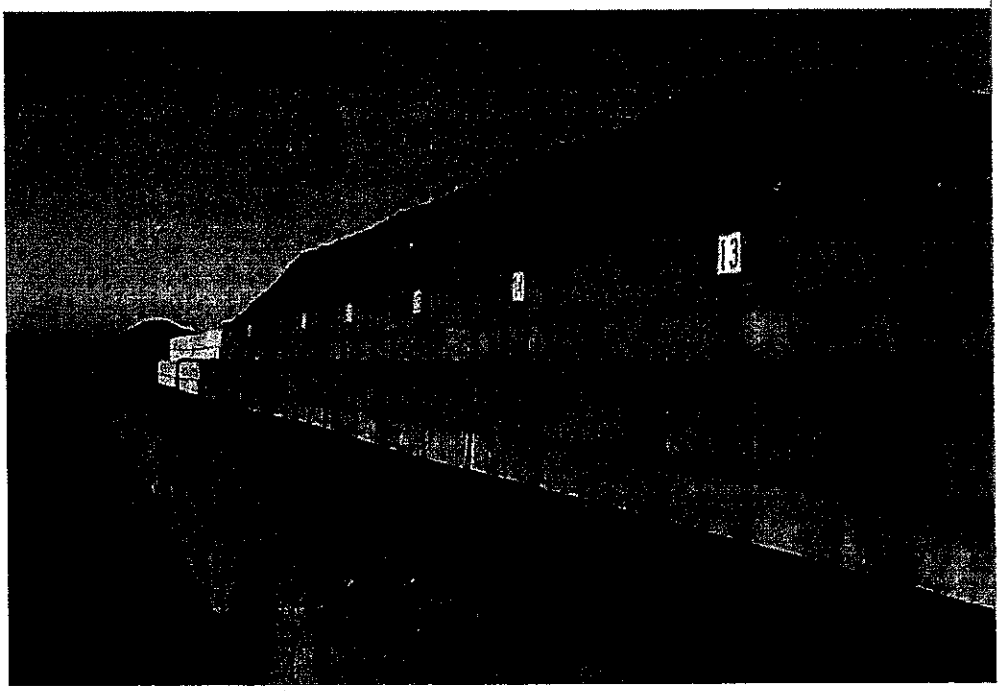
Turned windrows are aerated naturally or mechanically. The ideal pile height, which is between 4 and 8 feet, allows for a pile large enough to generate sufficient heat and maintain temperatures, yet small enough to allow oxygen to flow to the windrow's core. The ideal pile width is between 14 and 16 feet.

In aerated static pile composting, waste is mixed together in one large pile instead of rows and is not turned. To aerate the pile, layers of loosely piled bulking agents (e.g., wood chips) are added so that air can pass from the bottom to the top of the pile. The piles also can be placed over a network of pipes that deliver air into or draw air out of the pile.

Anaerobic digestion technologies, on the other hand, are still developing in the United States, and yardwaste digestion in this manner is not currently operational here. Low-solids anaerobic digestion is still generally used for manure, biosolids, and/or wastewater solids. The only large-scale high-solids digester on the horizon in North America is in Canada and will process yard- and foodwaste, collecting biofuel as renewable energy and then composting the remains.

Who's Doing What and How They're Doing It

Featured here are the compost life stories of five municipal programs. Highlighting the end uses, from more traditional to high tech, these



Harvest Power

Yard- and foodwaste materials are piled high in Harvest Power's covered aerated static pile.

the city of St. Peters, MO, enumerates all the ways the city utilizes its own yardwaste compost makes compost sound like a municipal magic bullet: wetland construction, erosion and sediment control, top dressing, rain gardens (bioretention ponds), revegetation for levee and road construction projects, land reclamation, and more. "The city uses 40% to 50% of what we make for city property or city projects, and the rest is sold to contractors or individuals," he says.

The city's been making and using its own compost at its Earth Centre since 1991, when Missouri banned yardwaste from landfills. While it started with static windrows, the city found it had to time the turning of the windrows based on the wind direction to avoid wafting odors over to a nearby shopping area. In 2010, the city made the switch to aerated static piles, using a biofilter to control odors. The cost of the new system, which combines yardwaste with caked biosolids from the city's wastewater treatment plant, is offset by not having to apply the liquids on agricultural lands any longer, which was also odorous, and expensive.

The city provides curbside pickup and allows residents and contractors to drop off, collectively amassing about 40,000 cubic yards of greenwaste per year, which is stockpiled on a 12-acre site. The ground yardwaste is combined with 10,000 cubic yards of 15% de-watered biosolids in a Rotomix compost mixer, the materials are measured by weight to a carbon: nitrogen ratio of 30:1, porosity of 2.9%, and a moisture content of 38%. The mixed materials are placed into eight Engineered Compost System (ECS) computerized aerated static pile composting bunkers.

Positive air or negative air is controlled by pressure sensors in the ductwork and four temperature sensors located in each bunker. These sensors send data back to a computer that controls the supply and exhaust air fan speed to ensure proper temperature and duration to meet EPA regulations, with all the data recorded electronically every hour into an Excel spreadsheet. The compost is processed at 131°F or greater for three days or longer and 120°F for 15 days or longer, then moved to an open bunker for an additional 10 to 15 days of curing. After a total of 25 to 30 days, the compost is removed and placed in a stockpile for six to nine months and then screened to one-half-inch with a Wildcat 516 trommel screener. Twenty-thousand cubic yards of grade-A finished compost results, which is certified by the US Composting Council. It makes its way to residents and about 10 or 15 local contractors.

One of those contractors is Soil-tek, of Lake St. Louis, MO, which uses it as part of its erosion and sediment control and stormwater pollution prevention services. The company uses compost-overs, which are large, irregular sized pieces of yard waste, for erosion control on construction sites, as well as finished screened compost as filtration material.

Soil-tek uses Filtrexx FilterSoxx in place of silt fence, as perimeter boundaries, as ditch checks, for inlet protection, around concrete washouts, and to de-water construction sites. These systems can also be used on slopes to de-power flowing water. The company fills Filtrexx's proprietary mesh sacks with compost using a hydraulically powered auger, the Filtrexx FX machine. It then applies these compost-filled units to 50 or 60 sites a year at the request of municipalities doing sewer work, private companies working on construction, the Missouri Department of Transportation's roadside projects, and other clients interested in sediment control—adding up to 200,000 or 250,000 feet of compost FilterSoxx per year.

"This is the stuff your grandma used," Rob Caruthers, president of Soil-tek explains, reminding people that compost is not a high-tech, dangerous, or new material. "We as a society got away from using compost in the 1960s when we decided we could do everything we wanted with petrochemicals. Now we're back to being green."

Fuel

What's coming to the Metro Vancouver, BC, area is, some would say, revolutionary: an anaerobic yard- and foodwaste digester, known as a high-solids anaerobic digestion (HSAD) facility, that will produce up to 2 MW of power and heat per year.

Twenty-four municipalities that are part of Metro Vancouver, a regional planning commission, deliver their yard- and foodwaste to the Richmond, BC–based Fraser Richmond Soil & Fibre plant, a subsidiary of Harvest Power of Waltham, MA. When the digester opens in 2012, the plant will collect biogas to generate electricity and heat.

Fraser Richmond Soil & Fibre, selected from 23 bidders to operate the digester, currently operates a covered aerated static pile (CASP) facility on the site and sells its compost and compost-based soil blends to local landscapers, farmers, municipal parks and maintenance departments, golf courses, and homeowners. Digestate remaining after energy extraction in the new digester will be composted in the piles as well.

Many of the cities, corporations, townships, and districts have been collecting yard trimmings curbside from single-family homes since at least 1989, and the vast majority of them have been bringing materials to this site for composting since it opened in 1993. Some operate additional facilities as well, such as the city of Vancouver, which offers static-pile windrow composting of drop-off yard waste.

In the last few years, seven of these communities began co-collecting food scraps and delivering to the facility as part of their yardwaste collection routes, and others have plans to do so as well. Currently, Metro Vancouver contracts with Fraser Richmond to process up to 50,000 metric tons (55,000 tons) of residential organic waste per year.

According to Andrew Marr, a senior engineer with Metro Vancouver, municipalities that are close enough to haul directly will pay less than half the cost per metric ton than disposing of it. Suzanne Bycraft, manager of fleet and environmental programs in the city of Richmond, which collects 10,000 tons per day curbside, is a case in point—she says the city is saving $550,000 per year on tipping fees. Those that have to transfer and transport will pay roughly 60% of the cost per metric ton overall compared to disposal at a landfill.

This type of anaerobic digestor can process scoopable feedstocks, rather than slurries, that do not have to be chopped or ground and do not require water. The first step of the process is to load collected materials—from pizza crusts to twigs—into hydrolysis percolators so that the organic matter can be biochemically degraded into organic acids. During a two-week period, most of the acids drain into tanks. A portion of the acids are then pumped into the methane digester, which contains bacterial cultures that consume the organic content of the acids and produce biogas, which is pumped to an energy production center. Whatever's left in the percolators is transferred to the covered aerated static piles to provide moisture for composting.

At the compost pile, curbside-collected materials are piled as high as 25 feet. When about 2,000 cubic yards have been collected, a 6- to 12-inch organic cover layer is applied to prevent odors. A network of perforated pipes and a blower pulling air through the pile maintain aerobic conditions. The compost generally takes about eight weeks to cook and is then screened for contaminants and cured in windrow-like piles.

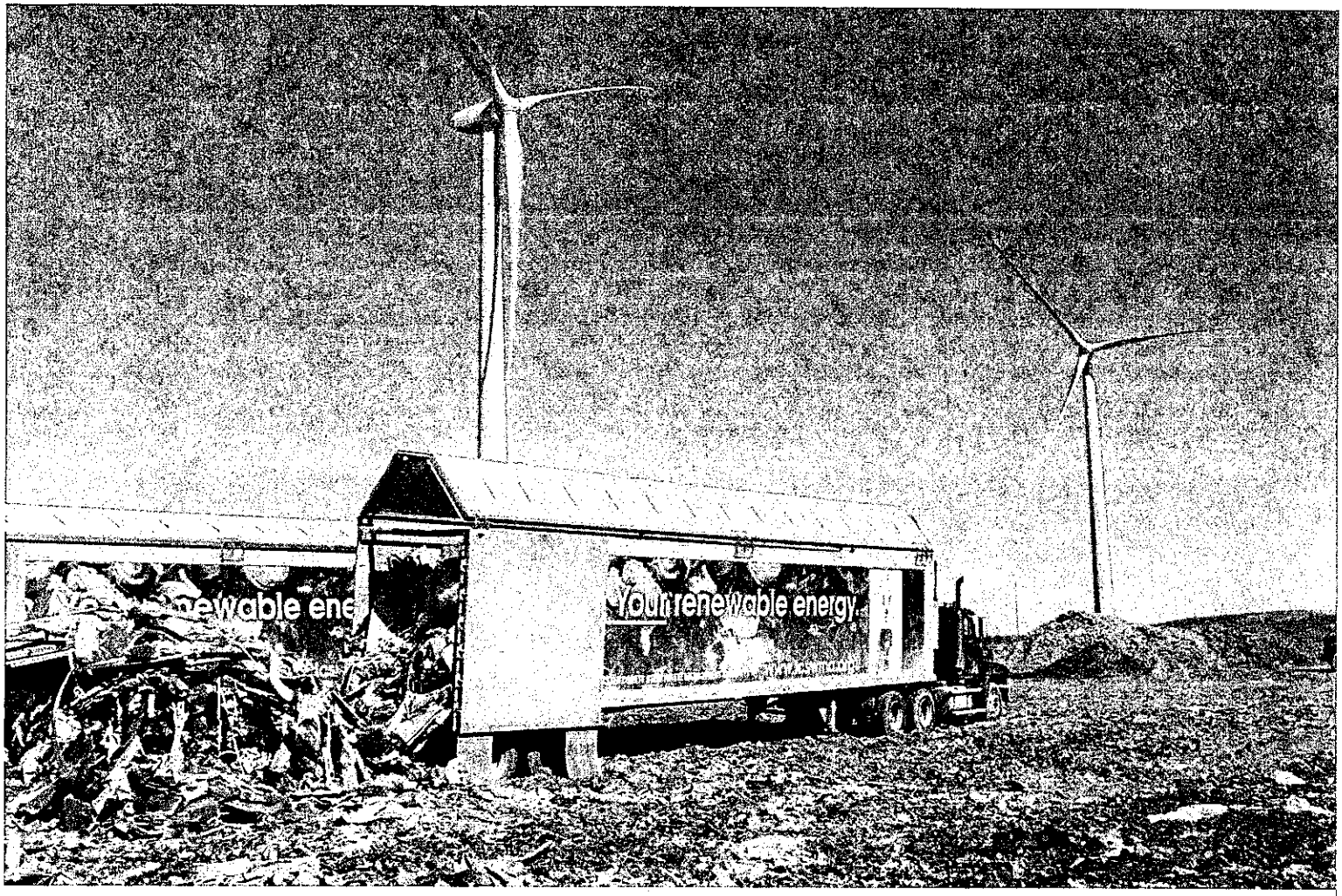
"Fraser Richmond's compost is the number-one most popular thing at special events," Bycraft says of the end product, which occasionally takes the form of a pile of free compost donated to communities.

The whole operation comes out of Metro Vancouver's Zero Waste Challenge and a goal to recycle 70% of the region's waste by 2015 and 80% by 2020—up from 55% now. Some of the individual communities also have their own goals, such as the city of Vancouver's plans to become the "greenest" city in the world by 2020. "This initiative is definitely pushing our programs in that direction," says Bob McLennan, an engineer in the solid waste branch.

Wolf Material Handling Systems at Elk River, MN, offers complete engineered material handling systems and equipment for the biomass industry, supplying systems for chipping, screening, storing, reclaiming, re-chipping, and feeding digesters. Wolf has expertise in handling a wide variety of feedstocks, including woodwaste, cotton stalks, almond hulls, orchard pruning, grape vines, and construction debris. Wolf understands the unique challenges required to handle biomass and takes complete design and supply responsibility of the material handling system. The company's custom systems are tailored to meet the customer's unique feedstock and production requirements.

Wolf provided the material handling systems for three of the largest solid-waste-fueled power plants in the US, developing a proprietary system for processing these materials for use in this demanding environment. **MSW**

Sue Eisenfeld is a writer and consultant in the Washington, DC area.



The project is part of a larger commitment to produce clean energy, an important step toward the completion of the Turkey Point Renewable Energy Park.

As project owner, PPLRE also entered into a cooperative agreement with the Pennsylvania Game Commission to protect the welfare of the local bird population. In fact, the partners undertook a variety of measures to mitigate potential impacts on birds in the area. When LCSWMA and PPLRE first began investigating wind energy atop Turkey Point, four turbines were considered for installation along the perimeter of the landfill. However, after conducting extensive pre-construction avian impact assessments, the project partners scaled back the scope to two turbines and sited them in areas that had demonstrated the fewest avian flyovers during the preconstruction studies.

Local Community Feedback

Once the turbines were in place, the surrounding community really started to take notice. Local news media outlets fielded numerous questions from residents of Lancaster and York counties as the public became intrigued by the two large turbines sitting atop Turkey Point. Prominently situated along the Susquehanna River, the wind turbines are visible as people enter Lancaster County from the west. In fact, the partners were recognized for their work on this project by the Lancaster County Board of Commissioners and the Lancaster County Planning Commission through an Envision Lancaster County Smart Growth Leadership Award in February 2011. For LCSWMA, receiving the award signified that the project was not only a significant achievement for the project partners, but also for Lancaster County as a whole. "This renewable wind project represents the first commercial-scale wind project in south-central Pennsylvania and serves as an important landmark for the Lancaster community," Warner says. "The two turbines, which stand just shy of 400 feet tall from base to blade tip, are visible from various locations throughout the county and serve as visual affirmation of Lancaster's commitment to establish a more sustainable way forward."

Threefold Business Benefits

In many ways, this project exemplifies the advantages of micro-siting renewable energy technologies next to large manufacturing end-users. LCSWMA's ability to look beyond the physical limits that define its landfill and envision the facility as an integral part of the larger community that encircles it, resulted in a project that will provide environmental and economic benefits to three local businesses for years to come. For the authority, the project is part of a larger commitment to produce clean, renewable energy, and serves as an important step toward the completion of the Turkey Point Renewable Energy Park at its landfill.

For PPL Renewable Energy, the project helps to advance progress in meeting the requirements set forth by the Pennsylvania Alternative Energy Portfolio Standards Act of 2004. The Act established mandates for renewable energy generation and requires electric distribution companies and electric generation suppliers to include a specific percentage of electricity from alternative resources in the power sold to Pennsylvania customers. In order to meet these require-

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ments, PPL Renewable Energy decided to strategically build relationships with other businesses that needed or wanted to invest in renewable energy. PPL Renewable Energy funds, develops, constructs, owns and operates renewable energy facilities in Pennsylvania, New Jersey, and New England. "Partnering with other business owners who support clean energy improves the economics of the project and facilitates the approval and permitting process," said Steven Gabrielle, the director of asset management and development for PPL Renewable Energy. "PPL companies have a long history of providing energy in an environmentally responsible manner. PPL has invested billions of dollars in projects to reduce the environmental impact of existing power plants and develop new sources of clean energy."

Like most businesses, Turkey Hill Dairy is aware of the positive impacts that green energy practices have on the environment and the company's bottom line. When something is good for the environment and good for business, it often appears too good to be true. However, as green technologies become more refined and mainstreamed, people are beginning to see that what is good for the environment is also good for business. Not only is Turkey Hill Dairy benefiting from the stable and predictable energy costs provided by the power purchase agreement, it has also reduced its carbon footprint by replacing 25% of its power needs with clean, renewable wind energy. And that is something that everyone, including Turkey Hill Dairy's millions of customers, can feel good about.

Understanding how a business interacts within the larger framework of the surrounding community can better enable a company to identify partnership opportunities, as this approach provides a larger network from which to draw upon in the formation of symbiotic arrangements. Just as the phrase "environmental sustainability" encourages individuals to think about the larger life cycle effects of various products, site designs, and actions, so too should good business practices encourage companies to examine assets from a more global perspective. Imagine the picture that would unfold if business owners explored *inter*company enterprises with the same intensity as *intra*company enterprises. "At the landfill, we don't have the energy consumption needs to warrant a commercial-scale wind project. However, that didn't stop us from recognizing the opportunities that such a project could provide Turkey Hill Dairy and hence, LCSWMA, through a cooperative partnership," Warner says.

By recognizing the potential imbued within the unique geographic features beneath its landfill, the authority was able to glean more from its landfilling operations than simply the storage of waste. LCSWMA's ability to relate its primary mission of waste management to a larger vision of community partnership is what makes this project such an inspiring story. For even though Turkey Hill Dairy is positioned adjacent to the landfill, the dairy's site lacks the unique topographic characteristics to support a wind energy project.

So, whether intra- or intercompany-motivated, could micro-siting renewable energy technologies become a real solution to our growing energy needs? While this approach will not solve the problem alone, localized renewable energy technologies will undoubtedly play an integral role in the solution. For landfill owners and operators who are constrained by land reuse options at closed sites, renewable energy alternatives can and should be assessed as part of any long-term land management strategy. Developing a more sustainable path forward requires a redefining of the parameters that have become all too commonplace with respect to examining energy use and generation. Successful partnerships and innovative projects like the LCSWMA/PPLRE wind energy project help to make a case for this approach. **MSW**

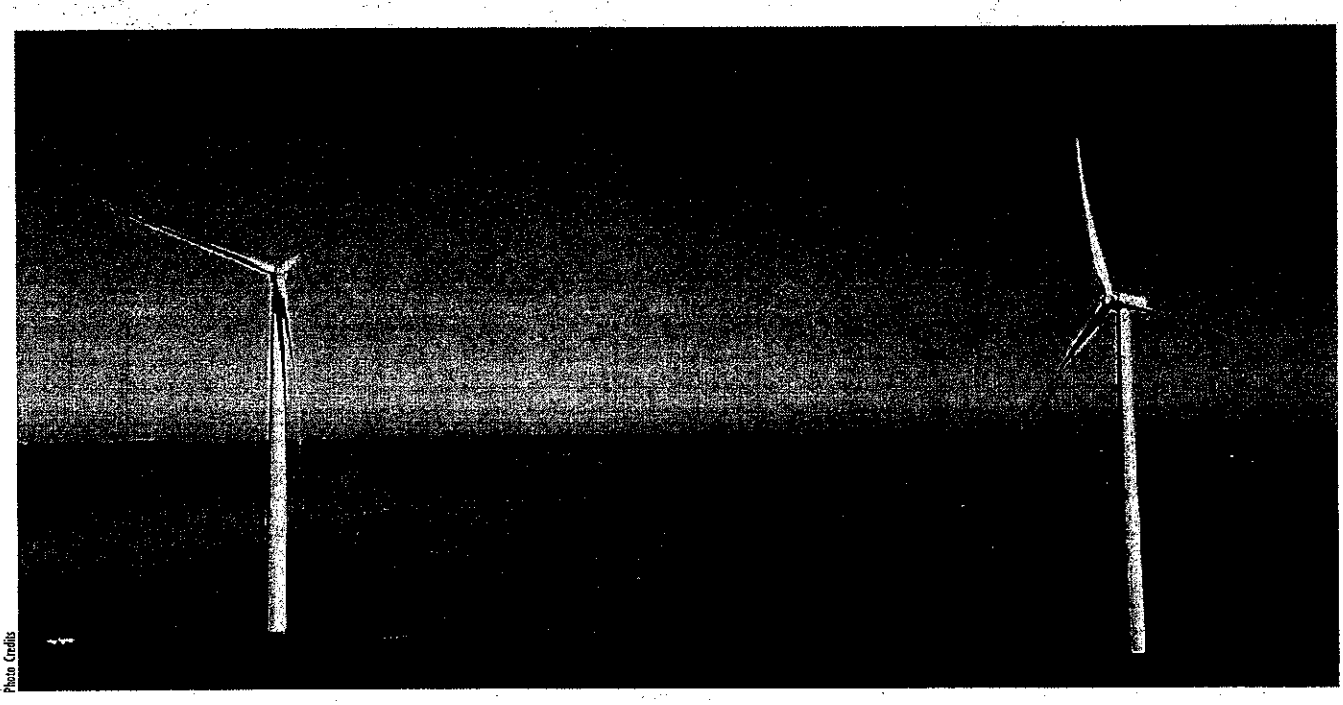
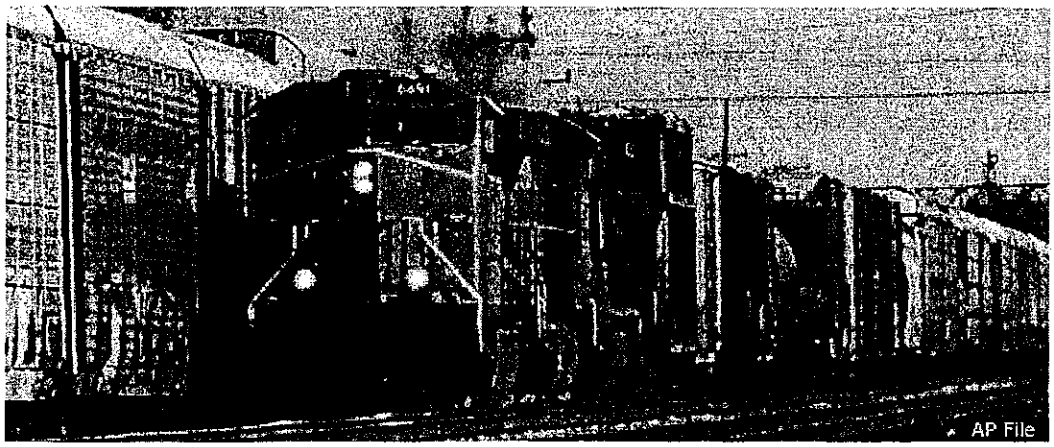


Photo Credits

Located at the edge of the a landfill, the project provides a neighboring dairy with 25% of its annual electricity needs.

Michelle Marsh is special projects coordinator for the Lancaster County Solid Waste Authority.

NRDC Threatens Railroads With Lawsuit Over Hazardous Waste Pollution



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LOS ANGELES — An environmental group threatened to sue two of the nation's biggest rail owners Tuesday under a novel legal theory that would classify diesel exhaust as hazardous waste.

The Natural Resources Defense Council sent letters to Union Pacific Corp. and Burlington Northern Santa Fe Railway, saying it will file a lawsuit within 90 days under the Resource Conservation and Recovery Act, which regulates hazardous solid waste disposal.

The notice letter, which is required before proceeding with a lawsuit, cited problems at 16 rail yards across California, from Oakland to San Bernardino.

The conservation group argues that minute particles in diesel air pollution, which include lead, cadmium, arsenic and other toxic elements, are solid waste. If successful, such a suit could open the door for legal action against similar air pollution sources such as ports, airports or anywhere with a lot of diesel equipment, said David Pettit, a senior attorney with the council.

"I think the reason why other people haven't tried it is on first glance you would think that the emissions are a gas and RCRA doesn't apply to gases," Pettit said. "The fallacy with that is the exhaust has two components: one is a gas and the other component is a solid and those solids will kill you if you inhale enough of them."

Lena Kent, a spokeswoman for Fort Worth, Texas-based BNSF, did not immediately return a call and emails for comment.

Aaron M. Hunt, a spokesman for Omaha, Neb.-based Union Pacific, did not address the notice but said the company had made substantial progress in reducing emissions over the past several years.

"Union Pacific operations are regulated at the state and federal levels, and we are in compliance with those environmental requirements," he said in an email. "Union Pacific has voluntarily worked with state and federal regulators for more than a decade to substantially reduce locomotive and other emissions in and around California rail yards."

Millions of cargo containers loaded on trucks and trains travel by freeway and railway through Southern California then to the rest of the country. The West Coast ports are the nation's principal gateway for cargo container traffic from Asia, with the ports of Los Angeles and Long Beach handling about 40 percent of the nation's cargo.

The rail yards have long been blamed for health problems in communities along those transit corridors. The tiny particles contained in diesel exhaust can penetrate deep into the lungs, carrying a variety of toxins that have been linked to acute bronchitis, lung disease, heart attacks and other health problems.

Exposure to the pollution is especially dangerous for children whose lungs are still developing and the elderly, whose immune systems may be compromised.

State and local air quality regulators have struggled to regulate train pollution. A federal appeals court last year struck down a lawsuit involving a local air regulator that wanted to reduce pollution from idling locomotives. The court determined the agency was overstepping its authority because only the federal government is authorized to regulate interstate commerce.

Southern California air quality regulators recently announced a major study focusing on a San Bernardino rail yard that has been found to pose the greatest health risk of any rail yard in the state. The two-year study will cost an estimated $846,000, and researchers hope it will determine whether there is a higher asthma and fatal cancer rate in the surrounding community.

The Natural Resources Defense Council's notice of intent to sue was also sent by two environmental justice groups, East Yard Communities for Environmental Justice and the Center for Community Action and Environmental Justice, which have been working for years on rail pollution and say little has been done.

"It is time for the rail companies to be good neighbors and right the wrongs they have imposed on California communities," said Angelo Logan, executive director for East Yard Communities.

The letter recommends a series of remedies for the pollution, including the use of cleaner locomotives, electrifying rail lines in urban areas and reduced idling.

Environmental law experts say that while RCRA regulates solid hazardous waste, it could potentially be applied to diesel particulates.

Holly Doremus, an environmental law professor at the University of California at Berkeley, said there has been debate over what constitutes solid waste, but in this case there's no doubt the tiny toxic elements are waste.

She added that typically the Clean Air Act is supposed to apply to such particulate pollution but the restrictions haven't been particularly effective.

"It's not a slam dunk either way, and I think it's very creative by the NRDC to have found this possibility," she said.

PHOTO GALLERIES

WASTE & RECYCLING NEWS

All CVS locations now recycle expired medicine

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Aug. 16 -- CVS pharmacy announced that all 7,200 of its locations now offer the Sharps Compliance Inc. medication disposal system, which allows customers to dispose unused or expired medication.

The postage-paid envelopes cost $3.99 each and allow customers to mail their unwanted prescription and over-the-counter medications to Sharp Compliance's Texas facility for disposal. The system was previously in many CVS pharmacy locations, but it has now been expanded to all facilities.

Controlled substances are excluded from the program.

Since the program was launched by Sharps, the company has collected and incinerated more than 123,000 pounds of medication, most of which has been collected in the last 10 months when some pharmacies signed on to the program.

In addition to CVS, Walgreens, Kroger and Rite-Aide have teamed with the company.

Contact Waste & Recycling News reporter Jeremy Carroll at jcarroll@crain.com or 313-446-6780.

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WASTE & RECYCLING NEWS

Landfill gas is 'awesome example of American ingenuity'

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Jim Johnson | WRN senior reporter

Aug. 8 -- If using natural gas to garbage trucks is considered a home run, then using natural gas created by decomposition of trash and other organic waste could be viewed as a grand slam.

For Joanna D. Underwood, the potential for this kind of renewable gas use is huge around the country.

It was not that long ago that folks realized using natural gas could be a terrific step forward, said Underwood, president of Energy Vision, a nonprofit group in New York City concerned with transportation fuels and renewable energy. But the exact path was fuzzy, she remembered.

"The picture that has become much clearer in the last four years is the picture that involves renewable natural gas. And that is really this country's first sustainable fuel. It's renewable. It's the lowest carbon-based fuel in the world," she said.

Harvesting methane from sites such as landfills, waste water treatment plants and farms can help create a supply of domestic transportation fuel, she said. Creating an infrastructure to handle renewable natural gas allows communities and companies alike to better picture its future use.

"That's pretty exciting. Every community, right now, can begin looking at renewable natural gas and the organic waste that they have in their jurisdiction," she said.

"There is no other major option for significantly reducing our dependence on foreign oil right now other than natural gas: conventional natural gas and renewable natural gas," Underwood said.

McNeilus Companies Inc. makes both traditional diesel-powered refuse trucks and CNG-powered vehicles.

Jeffry Swertfeger, the company's director of marketing and communications, sees more and more interest from solid waste management companies wanting to close the loop between disposal sites and collection operations by using methane created by decaying waste as a transportation fuel.

"We call it the ultimate green machine, when you have a truck that's picking up refuse that's being powered by the methane from the refuse," he said.

"I think that's an awesome example of American ingenuity," he said. "These are the guys who make this country great."

One location he pointed to is Waste Management Inc.'s Altamont landfill in California, where methane gas is converted into liquefied natural gas to run company trucks in nearby markets.

That $15.5 million project uses about 3,000 cubic feet of landfill gas per minute to create about 13,000 gallons of LNG per day.

"It's easier for cities and communities to envision making the fuel if they already have a way to distribute it," Underwood said. "It can take the place of conventional natural gas. It also can be blended with it. They are chemically just about the same."

Contact Waste & Recycling News senior reporter Jim Johnson at jpjohnson@crain.com or 937-964-1289.

WASTE & RECYCLING NEWS

Report: Feds to ban e-waste it generates from landfills

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By Jeremy Carroll | WRN reporter

July 20 -- The federal government will leverage its purchasing power to drive the electronics manufacturing and recycling industries toward more sustainable products and practices, according to a report released today by an interagency taskforce on electronic stewardship.

The 34-page **report** was released as Obama administration officials gathered at Round2 Recycling Facility in Austin, Texas, to discuss the findings of the taskforce.

According to the report, the federal government should establish a comprehensive and transparent policy on used federal electronics that maximizes their reuse and ensures that all federal electronics are processed by certified recyclers.

The government will also ban its e-waste from entering landfills, according to the report.

The report said that the federal government will split its electronic equipment into two streams, functional and nonfunctional. The functional equipment will be donated to schools and nonprofit organizations or will be sold to private consumers. Nonfunctional equipment will be taken to third-party certified recyclers or handed over to manufacturers for their take-back programs.

The report said that government should encourage more methods to reuse and recycle electronics, and encourage the design of greener electronics with fewer hazardous materials and less virgin materials.

The task force also calls for an expansion of the Electronic Product Environmental Assessment Tool (EPEAT) to include additional electronics devices. The EPEAT rating is available for computers and monitors.

The U.S. EPA estimated that the U.S. generated about 2.4 million tons of e-waste in 2010, comparable to the 2.3 million tons that China produced that same year.

Contact Waste & Recycling News reporter Jeremy Carroll at jcarroll@crain.com or 313-446-6780.

WASTE & RECYCLING NEWS

Company plans to turn old beverages into ethanol

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Aug. 3 -- Disposal and Recycling Technologies Inc. (DART), which handles community recycling, oil treatment and wastewater treatment, is bringing a Dart Worldwide facility to Charlotte, N.C.

Detroit-based DART said its new location will turn alcohol and sugar-based beverages such as old beer, wine, soda, juice and liquor into fuel grade ethanol. In addition, the company said, the facility will also convert the used beverage containers and packaging into recycled plastic, cardboard, glass and aluminum.

"We believe that North Carolina is a central part of the East Coast, offering the best possible solutions to make this efficient and effective for all parties," Jeff Marvin, vice president of Dart Worldwide, said in a statement.

According to its website, DART's conversion technology has the potential to create 100% ethanol in addition to meeting fuel ethanol E85 (85% ethanol) American Society of Testing and Materials standards.

Contact Waste & Recycling News reporter Shawn Wright at swright@crain.com or 313-446-0346.

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WASTE & RECYCLING NEWS

U.S. Navy considers waste-to-energy at forum

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Aug. 5 -- The U.S. Navy recently held its first Waste to Energy Forum to discuss projects that could use solid waste to generate renewable energy on and off Department of the Navy sites, the Navy News Service reported.

In addition, renewable goals and WTE opportunities were discussed and industry recommendations were made on how to approach the delivery of renewable energy from waste.

More than 160 government and industry representatives attended the event and 33 companies participated, the Navy News Service said.

"I hope discussions ... tell us where waste-to-energy makes sense as we explore the fit between your technologies and our installations," Assistant Secretary of the Navy for Energy, Installations and Environment Jackalyne Pfannenstiel was quoted as saying at the forum.

This initiative, the Navy News Service said, is one of many that will help the Navy achieve Secretary of the Navy Ray Mabus' energy goals of improving energy security and efficiency, increasing energy independence, and leading the nation toward a clean-energy economy.

Contact Waste & Recycling News reporter Shawn Wright at swright@crain.com or 313-446-0346.

WASTE & RECYCLING NEWS

Recology awarded San Fran.´s $112M landfill contract

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July 27 -- The San Francisco Board of Supervisors voted Tuesday to award the city's $112 million landfill disposal contract to Recology.

The 10-year deal, which begins in 2015, calls for San Francisco-based Recology to send up to 5 million tons of the city's trash, by rail, to the company's Wheatland, Calif., landfill about 130 miles away in Yuba County. (San Francisco-based Recology, formally Norcal Waste Systems Inc., already collects San Francisco's garbage and recycling.)

Currently, Recology sends the city's waste to landfills owned by other companies, including the nearby Altamont Landfill, owned by Waste Management. The deal will bring jobs and $22 million to Yuba County, according to a **report** in the San Francisco Chronicle.

The board voted 9-2 to approve the contract, saying the deal would save the city millions of dollars.

"The merits of the Recology proposal are definitive: more than $100 million in cost savings to San Francisco rate payers, a reduction of fuel usage for the transportation of waste by 1 million gallons, and 10 million fewer truck miles on Bay Area highways by switching to rail haul," Recology President and CEO Mike Sangiacomo said in a statement.

Contact Waste & Recycling News editor John Campanelli at jcampanelli@crain.com or 313-446-6767.

WASTE & RECYCLING NEWS

Seattle recycles more, disposes less in landfills

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July 20 -- For the seventh year in a row, Seattle's recycling rate rose.

Last year, 53.7% of the city's municipal solid waste was recycled, an increase of 2.6% over 2009. It is the largest increase in the recycling rate since 2006, according to the city's 2010 Recycling Rate Report.

For 2010, the city generated a total of 724,468 tons of waste, disposing of 335,570 tons by landfill and recycling 388,898 tons.

Seattle's goal is to reach 60% recycling by the year 2012 and 70% by 2025. The rate is made up of single-family residential, multi-family residential, self haul and commercial disposal.

Last year, the single-family rate was 70.3%, which surpasses the 70% goal set for that sector next year. The 2010 multi-family residential rate was 29.6%, self haul was 13.5% and commercial was 58.9%.

Overall, Seattle generated 5,044 more total tons in 2010 than in 2009. However, recycling grew by 21,163 tons and disposal dropped by 16,119 tons.

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WASTE & RECYCLING NEWS

Report: Feds to ban e-waste it generates from landfills

By Jeremy Carroll | WRN reporter

July 20 -- The federal government will leverage its purchasing power to drive the electronics manufacturing and recycling industries toward more sustainable products and practices, according to a report released today by an interagency taskforce on electronic stewardship.

The 34-page **report** was released as Obama administration officials gathered at Round2 Recycling Facility in Austin, Texas, to discuss the findings of the taskforce.

According to the report, the federal government should establish a comprehensive and transparent policy on used federal electronics that maximizes their reuse and ensures that all federal electronics are processed by certified recyclers.

The government will also ban its e-waste from entering landfills, according to the report.

The report said that the federal government will split its electronic equipment into two streams, functional and nonfunctional. The functional equipment will be donated to schools and nonprofit organizations or will be sold to private consumers. Nonfunctional equipment will be taken to third-party certified recyclers or handed over to manufacturers for their take-back programs.

The report said that government should encourage more methods to reuse and recycle electronics, and encourage the design of greener electronics with fewer hazardous materials and less virgin materials.

The task force also calls for an expansion of the Electronic Product Environmental Assessment Tool (EPEAT) to include additional electronics devices. The EPEAT rating is available for computers and monitors.

The U.S. EPA estimated that the U.S. generated about 2.4 million tons of e-waste in 2010, comparable to the 2.3 million tons that China produced that same year.

Contact Waste & Recycling News reporter Jeremy Carroll at jcarroll@crain.com or 313-446-6780.

WASTE & RECYCLING NEWS

Ford recycling old tires, carpets, jeans to make parts

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Tire Business staff report

July 19 -- Ford Motor Co. is using recycled tires, carpet and blue jeans in an effort to reduce the environmental footprint of its new vehicles.

According to an Environmental News Service (ENS) report, the Dearborn, Mich.-based car maker and supplier Recycled Polymeric Materials (RPM) have found a way to give discarded tires new life as environmentally-friendly seals and gaskets for Ford vehicles.

"When it comes to finding a way to use more renewable and recyclable content in our vehicles, Ford and our suppliers are looking at every part of a vehicle," said Dr. Cynthia Flanigan, technical leader, research and innovation. "As long as an application makes sense and upholds strict quality standards, we'll look to get these sustainable materials inside our vehicles."

The vehicle gaskets and seals are derived from 25% post-consumer particulate from recycled tires and 17% bio-renewable content from soy.

In total, Ford said more than 2.2 million pounds of rubber from recycled tires has been made into RPM seals and gaskets and more than 210,000 used tires have been recycled. Some 150,000 pounds of soy has been used to create seal and gasket materials.

Ford's "reduce, reuse and recycle" commitment is part of the company's broader global sustainability strategy to reduce its environmental footprint while accelerating the development of advanced, fuel-efficient vehicle technologies.

The company has undertaken efforts to increase, in the last several years, the use of recycled plastics and bio-based materialsùprovided the materials are environmentally favorable and meet Ford's durability and performance requirements.

It has used soy foam seat cushions, wheat straw-filled plastic, recycled resins for underbody systems, recycled yarns on seat covers, post-consumer cotton from blue jeans made into interior padding and natural-fiber plastic for interior components.

"Our team continues to develop new technologies that reduce our environmental footprint," said Dr. Debbie Mielewski, technical leader, plastics. "We have already been successful in incorporating soy foam seats on all North American vehicles and are actively expanding the research front into a variety of new plastics and rubber areas."

On some models, Ford is using cylinder head coversùmanufactured by Dana Holding Corp.ùthat are made of a nylon resin from Wellman Engineering Resins from 100-percent recycled carpet, according to the ENS report.

Last year Ford claimed its use of Wellman's nylon resin EcoLon saved more than 4.1 million pounds of carpet from landfills and reduced oil consumption by more than 10,238 barrels of oil.

The cylinder head covers are used on the 3.0-liter Duratec engine in Ford Fusion and Escape. They can also be found on the 5.0-liter engine, which powers Ford's Mustang and F-150 models.

Ford said about 85% of the materials used on its vehicles by weight are recyclable, and 95% of all vehicles retired from use each year are processed for recycling.

Tire Business is a sister publication to Waste & Recycling News.

WASTE & RECYCLING NEWS

SWANA: Landfills safe long-term

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Jeremy Carroll | WRN reporter

July 11 -- Final cover systems are the most important piece of a closed landfill when it comes to protecting public health, and the discharge of significant leachate in a closed landfill is unlikely, a peer-reviewed study on the long-term risks to the environment of Subtitle D landfills said.

The Solid Waste Association of North America recently issued the report, titled "The Long-Term Environmental Risks of Subtitle D Landfills," and discussed the report's findings in an online session with industry professionals.

Subtitle D regulations were instituted in 1991; some Subtitle D landfills are closing and have entered their 30-year post closure period.

"The federal EPA has not provided any guidance on what states should do [beyond the 30-year closure period]," said Jeremy O'Brien, the director of applied research for SWANA. "This is a real issue for our industry and one that we tried to address in our research."

Some environmental groups have argued that post-closure monitoring of landfills should never end, O'Brien said, and California has taken the step to make sure there is oversight during the post-closure period. In 2010, the state enacted a law forcing post-closure monitoring to continue "until the waste no longer poses a threat to public health, safety and the environment."

The Environmental Research Education Foundation, which was cited in the SWANA research, advocates for custodial care that would ensure the final cover system remains intact, but state regulation would end after the normal 30-year, post-closure period ends.

"Once the care activities at a landfill could be performed by a landscaping company, then I think you are in custoidal care and you've moved beyond regulated care," said Jeremy Morris, senior engineer with GeoSyntec, which worked on the study for EREF.

He said the company came to the same general conclusions as the SWANA study, saying the only real risk in the time beyond post-closure is preventing cap failure. Once the only maintenance needed is making sure the cap doesn't suffer major failure, the custodial care model should take over, he said, with the site being able to be transitioned to other uses, including passive green spaces, golf courses or locations for alternative energy uses like wind or solar farms.

The research SWANA presented showed after the 30-year, post-closure period ends, significant leachate discharges would be unlikely.

O'Brien said with reasonable dilution assumptions, groundwater at landfill boundaries would likely meet drinking water standards even if a discharge occurs.

"For a closed landfill with a fully functional, final-cover system, or one where only minor breaches have occurred, the environmental and public-health concerns are likely to be relatively minor," O'Brien said.

High temperatures above the bottom liner system could significantly shorten its life, and that is an area of some concern, he said.

"Most landfill managers don't monitor the temperatures above the liner," O'Brien said. "One of our recommendations is that we start doing that."

To read the report, visit SWANA online at www.swana.org.

Contact Waste & Recycling News reporter Jeremy Carroll at 313-446-6780 or jcarroll@crain.com.

WASTE & RECYCLING NEWS

10 more GM facilities go landfill-free

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July 8 -- General Motors Co. is extending its efforts to divert waste from landfills.

The automaker, which already has achieved landfill-free status at 76 manufacturing locations, now says 10 nonmanufacturing sites also reuse, recycle or convert to energy all waste from normal operations.

"Our nonmanufacturing facilities see the importance of being waste-reduction leaders, and they know their customers value it as well," said John Bradburn, manager of GM's waste-reduction efforts. "Being landfill-free has become a point of pride for our people and we hope even more facilities achieve the goal this year."

GM's facilities, in total, recycled 92 percent of the waste they generated in 2010.

Contact Waste & Recycling News senior reporter Jim Johnson at jpjohnson@crain.com or 937-964-1289.

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WASTE & RECYCLING NEWS

New method for recycling pays off for Republic

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By Jim Johnson | WRN senior reporter

July 11 -- It's being called a "transcyclery" and it's the first one of its kind at Republic Services Inc.

Transfer stations typically aggregate trash, allowing collection trucks the opportunity to dump their loads and head back out onto the streets for more door-to-door action.

The trash is then usually sent off in tractor-trailers, which can haul larger loads less expensively to landfills.

But a new facility in Pennsylvania is taking the transfer station concept and applying it to recyclable materials.

Cans and bottles, paper and plastics -- those sorts of things -- are being handled at what the company says is a first for the second-largest solid waste management company in the country.

Located at the Modern landfill in York, Pa., the new million-dollar facility is handling about 70 to 75 tons of single-stream recyclables per day, sending them off to a materials recovery facility about 85 miles east in King of Prussia, Pa.

"The old days of everything going in the landfill are over," said Tim O'Donnell, general manager of the landfill where the transcyclery is located.

And gone are the days when trash companies have to decide whether recycling is part of their core business, he said.

"We see this as a permanent thing," he said. "Good for the environment. à It's also good business now, too."

Healthy commodity prices have helped make an economic case for recycling for some time now, but O'Donnell said his company is investing in recycling and places like the transcyclery to offer the service profitably even when prices moderate.

"Typically, you're not seeing transfer stations being built at landfills," O'Donnell said. "What's unique about it, and it's really happening in the marketplace in Pennsylvania, we're starting to see a significant investment by the private sector in the recycling infrastructure."

As area president for Republic Services operations in eastern Pennsylvania and New Jersey, Dean DiValerio sees the opportunity to construct these recycling transfer stations elsewhere.

The economics of such an approach, especially when commodity prices are healthy, are compelling.

"Well, let's put it this way," DiValerio said, "the million dollar investment into the facility is an investment we're going to pay back in a very, very short period of time.

"It really allows us to expand our service offerings at competitive rates due to the fact that we have the ability to internalize volumes versus delivering into third-party sites. So that's good for our customers, and that's good for the organization, obviously, and for our shareholders," DiValerio said.

Creating recycling transfer stations creates what the area manager called "a great deal of flexibility" in how the company can handle those materials.

While DiValerio has yet to crunch the numbers beyond the 85 miles between York and King of Prussia, he said the transcyclery concept could work to connect company operations well beyond that range.

"Most likely, we could probably make the economics of this work up to 150, even maybe up to 175 miles," he said.

Funneling more recyclables into centralized facilities helps those sites become more profitable and can allow for expansion.

The economic benefits of this approach also could allow the company to expand recycling services that did not make economic sense under a previous approach. That could include, for example, offering single-stream recycling services to commercial customers, O´Donnell said.

Internalizing recycling volumes ù handling them at your own facilities -- allows for higher profit margins because third parties and their need to make a profit are not involved.

"When you internalize and you have vertical integration, even when the prices do dip, you can control your costs a lot more effectively when you are controlling both ends of the market," O´Donnell said.

Based on the early results of the Modern landfill site, Republic Services already is looking at constructing a similar facility at its Conestoga landfill in Morgantown, Pa., located about an hour away. n

Contact Waste & Recycling News senior reporter Jim Johnson at 937-964-1289 or jpjohnson@crain.com.

WASTE & RECYCLING NEWS

Honda to press suppliers to stop using landfills

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By Lindsay Chappel | Automotive News

July 14 -- Honda of America Manufacturing Inc. has almost entirely stopped sending factory waste to landfills. Now it will invite its suppliers to follow suit.

Honda is launching a program this year to help North American suppliers kick the dump habit, says Karen Heyob, associate chief engineer and manager of the automaker's zero-landfill program.

"Landfilling is almost always the cheaper alternative," Heyob said. "We could save money if we just sent everything to a landfill. But we don't want to be that kind of company. Landfills are not the solution for waste management."

Honda, which launched its zero-landfill efforts in 2001 at its just-opened plant in Lincoln, Ala., said July 14 that 10 of its 14 U.S., Canadian and Mexican factories have now achieved zero-landfill status.

"When we say zero landfill, we mean absolute zero" for those factories that reach that level, said Honda spokesman Ed Miller. "Not 2% or 1%, but zero waste is going to landfills now."

The company has spent the past decade looking for alternative uses for waste materials, ranging from oily rags and packaging materials to cafeteria garbage and paint sludge. As a result, Honda this year will generate about two pounds of landfill waste per vehicle produced in North America, down from 63 pounds in 2001, Heyob says.

She said Honda's new Supplier Sustainability program will encourage parts and material companies to adopt similar zero-landfill goals.

"We believe there's a lot of opportunity in doing this to help suppliers manage their costs better," she said.

Despite the lower expense of hauling waste to a landfill, she said that Honda's initiatives have resulted in better plant efficiencies and less waste.

In one case, employees at Honda's assembly plant in Marysville, Ohio, found a way to extract more sealer out of its storage barrels. The plant had been disposing of 7% to 8% of every barrel of sealer because it couldn't be pumped out. Plant associates now cut into the barrel to get to the rest of it.

Miller said that Honda has no plans to brag about the green initiative in its vehicle advertising.

Lindsay Chappell is a reporter at Automotive News, a sister publication to Waste & Recycling News. Contact him at lchappell@crain.com.

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WASTE & RECYCLING NEWS

SWANA: Landfills safe long-term

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Jeremy Carroll | WRN reporter

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"Most landfill managers don't monitor the temperatures above the liner," O'Brien said. "One of our recommendations is that we start doing that."

To read the report, visit SWANA online at www.swana.org.

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WASTE & RECYCLING NEWS

Landfill gas to help power Marine base in Calif.

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July 13 -- The Miramar Marine Corps Air Station in San Diego will soon be powered by landfill gas.

Ground was broken Tuesday on a landfill-methane power plant at the Miramar landfill, which is located next to the air station. The plant will provide nearly half of the base's electricity, or 3.2 megawatts, according to a **report** in the North County Times.

"From this trash we're going to power the airfield," Naval Facilities Engineering Command Southwest representative Capt. Keith Hamilton said during the ground-breaking ceremony. "This is base No. 1 of the Department of the Navy's inventory. This is a model, a template, a first of its kind."

The plant -- a joint project involving the city of San Diego, the military and Fortistar Methane, is scheduled to be completed by December.

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The North County Times - Californian

MILITARY: Miramar methane to power air station

BY Brandi Perez bperez@nctimes.com | Posted: Tuesday, July 12, 2011 7:45 pm

A groundbreaking Tuesday at the Miramar Landfill next to Miramar Marine Corps Air Station unveiled the nation's first methane-producing power plant fueling a military base.

The plant will provide 3.2 megawatts of renewable energy to Miramar, enough for nearly half of the air station's energy needs.

"From this trash we're going to power the airfield," said Naval Facilities Engineering Command Southwest representative Capt. Keith Hamilton.

The Navy is pushing its land-based installations to get 50 percent of their power needs from alternative sources such as solar and wind.

The methane project ---- along with other renewable energy projects within the next two years ---- will exceed the Navy's goal for Miramar several years early, officials said.

"This is base number one of the Department of the Navy's inventory," Hamilton said. "This is a model, a template, a first of its kind."

The project was a partnership between the sity of San Diego, Fortistar Methane Group LLC, Naval Facilities Engineering Command Southwest and Miramar.

Miramar commanding officer Col. Frank A. Richie said the project is significant.

"This has very much relevance to what we do every day on the battlefield," he said. "Most of our convoys run off water and fuel. We're dependent on fossil fuel. On the battlefield it is quite simple ---- (fuel) equals lives. Not only can we conserve on the battlefield, but we can at home, too."

He said the Marine Corps uses 200,000 gallons of fossil fuel every day in Afghanistan.

"Energy is both a national and international issue," said Fortistar President Mark Comora. "We look at the Miramar facility as a small example of what needs to be done day by day. All energy and all issues are local."

Comora said the project expands an existing plant to power two additional engines that will send power directly to Miramar.

He estimated the total project ---- which began two years ago ---- to cost $12 million to $15 million.

Landfill gas is composed of approximately 50 percent methane ---- a greenhouse gas 21 times as powerful as carbon.

Producing power from a renewable fuel ---- such as landfill gas ---- reduces the emissions for the entire facility and is equal to removing 3,545 passenger vehicles from the road, Comora said.

"We're taking a waste product and converting it into a fuel," Comora said. "People are saving money, and they're using renewable energy.

The project completion is slated for December and has a 15-year power supply agreement with Miramar.

Comora said he wants to figure out how to supply 100 percent of the military base's energy needs with renewable energy.

"Miramar is a very special project," he said.

For now, those involved in the project are simply happy to see what lies just around the corner.

"I am extremely pleased that early next year I can flip on the switch and half of the power will be coming from San Diego's trash," Richie said.

WASTE & RECYCLING NEWS

County's flow control law ruled unconstitutional

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June 17 -- A flow control law in upstate New York is unconstitutionally vague, a federal court in Syracuse has ruled.

Jeffery Holbrook, owner and operator of JWJ Transfer Station in Oswego County challenged the law, approved in late 2008 and made effective July 1, 2009. The transfer station accepts construction and demolition waste that is generated both in and out of the county, which the company's permit allows.

The U.S. District Court in Syracuse, N.Y., ruled that the flow control law in Oswego County, 35 miles north of Syracuse, was both unconstitutional for its vagueness and as it applied to JWJ.

"Businesses are leaving this county every day," Holbrook said in a statement. "I'm happy that the court stopped the county from pushing another one out."

Contact Waste & Recycling News reporter Jeremy Carroll at 313-446-6780 or jcarroll@crain.com.

WASTE & RECYCLING NEWS

Calif. Supreme Court upholds plastic bag distribution ban

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July 14 -- Reversing a lower court ruling, the California Supreme Court has upheld a Manhattan Beach ordinance that bans the use of plastic bags by local businesses.

Save the Plastic Bag Coalition, a group of plastic bag manufacturers and distributors, sued to stop the law from going into effect, saying the Los Angeles area-city did not prepare an environmental impact report before enacting the law.

The Court of Appeals had sided with the coalition, but the Supreme Court overruled that decision with a July 14 unanimous **ruling.**

"Substantial evidence and common sense support the city's determination that its ordinance would have no significant environmental effect," Judge Carol Corrigan wrote in the 22-page ruling.

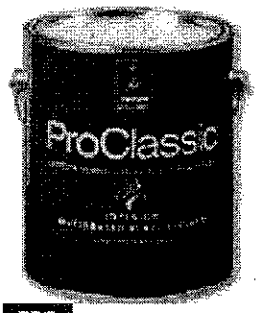
The law was passed in 2008 to ban the use of point-of-sale plastic carry-out bags.

Contact Waste & Recycling News reporter Jeremy Carroll at jcarroll@crain.com or 313-446-6780.

Mary Pitto

To: Daria Kent
Subject: RE: Sherwin-Williams Wins Green Chem Award for Bottle-Based Paint

Sherwin-Williams Wins Green Chem Award for Bottle-Based Paint



PRO click to enlarge

Sherwin-Williams has won an EPA green chemistry award for paints made from recycled soda bottles, among other materials.

The company won the Designing Greener Chemicals category at the Presidential Green Chemistry Challenge Awards for water-based acrylic alkyd paints that can be made from recycled PET plastic, acrylics, and soybean oil. Unlike traditional alkyd (oil-based) paints, the Sherwin-Williams alkyd has low levels of volatile organic compounds, the EPA said. But the paint still offers the performance benefits of alkyds, the agency said.

In 2010, Sherwin-Williams manufactured enough of these new paints to eliminate over 800,000 pounds of VOCs. The paints are sold as ProClassic Waterbased Acrylic Alkyd, ProMar 200 Waterbased Acrylic Alkyd, and ProIndustrial Waterborne Enamel.

In other categories, **Genomatica** won a Greener Synthetic Pathways award for developing a microbe that uses sugar fermentation to make 1,4-Butanediol (BDO), a high-volume chemical building block used to make many common polymers, such as spandex. When produced at commercial scale, Genomatica's Bio-BDO will be less expensive, require about 60 percent less energy, and produce 70 percent less carbon dioxide emissions than BDO made from natural gas, the EPA says. Genomatica is partnering with major companies to bring Bio-BDO to the market.

The Greener Reaction Conditions award went to **Kraton Performance Polymers** for its reverse osmosis membranes for salt water purification. The Nexar family of halogen-free, high-flow, polymer membranes are made using less solvent, allowing them to purify hundreds of times more water than traditional membranes, saving 70 percent in membrane costs and 50 percent on energy costs, the EPA says.

The Small Business award went to **BioAmber** for the integrated production and downstream applications of biobased succinic acid, and the Academic Award went to **Bruce Lipshutz** from the University of California, Santa Barbara, for work to reduce the chemical manufacturing industry's dependence on organic solvents and therefore minimize waste.

You can listen to podcasts about this year's winners here.

In related news, a **Pike Research** study out yesterday projected that the green chemistry market will grow from $2.8 billion in 2011 to $98.5 billion by 2020.

Despite this dramatic growth, Pike said that this emerging market represent "a drop in the bucket" compared to the $4 trillion global chemical industry. By 2020, Pike expects that the total chemical industry will expand to $5.3 trillion in annual revenues.

"Green chemistry markets are currently nascent, with many technologies still at laboratory or pilot scale," says Pike Research president Clint Wheelock, "and many production-scale green chemical plants are not expected to be running at capacity for several more years.

"However, most green chemical companies are targeting large, existing chemical markets, so adoption of these products is limited less by market development issues than by the ability to feed extant markets at required levels of cost and performance."

Pike Research forecasts that the biggest penetration for green chemistry will be in the polymer sector (5.7 percent), as it is somewhat more developed than the other key sectors. The special, fine, and commodity chemical sectors are more nascent.

Pike identified three major themes driving the green chemistry movement:

- Waste minimization in the chemical production process;
- Replacement of existing products with less toxic alternatives; and
- A shift to renewable (non-petroleum) feedstocks.

WASTE & RECYCLING NEWS

Gone to the Birds? Landfills might want to try Predatech falconry

Share |

Jim Johnson

Keith Everett has spent years earning a living by getting inside of birds' head – what they do, how they do it and why.

Now the falconer says he has a tool to help landfills beat back the nuisance that birds can create.

The president of Carlisle, Ontario-based Predatech has developed a variety of programs over the years to help keep birds at bay, including the use of live falcons that fly around landfills to scare other birds away from the trash.

"Falconry is one of the most effective techniques, but it has its limitations as well, weather being one," Everett said. Dusty conditions can be difficult for live falcons, he said.

Everett was at Waste Expo in Dallas with a new arrow in his quiver that isn't impacted by conditions.

Mounted high above the show floor on a long metal pole was a mechanical peregrine falcon known as Robop, or Robotic Bird of Prey.

The battery-operated bird mimics the look, sound and movement of a live falcon.

And seagulls, being seagulls, can't tell the difference between live predators and their robotic cousins.

There are a variety of ways to keep birds from looking for an easy meal at landfills, including pyrotechnics and noise cannon blasts as well as the use of live predators.

"Some people can't afford falconry programming," Everett said, and that's where Robop comes in. "Through my program development, training and support, I can develop a program for companies or facilities that can work into their daily routine."

Depending on a facility's size, a single Robop can be moved around a landfill site to scare off birds from various locations at different times.

Larger locations might need more than one robotic bird to keep the scavengers looking over their shoulders.

Everett is a distributor of robotic birds made by Robop Ltd., which traces its roots back to 2001 and is based near Edinburgh, Scotland. Robops are in operation in several countries around the world.

"Birds are territorial. So they know where they roost; they know where they feed," Everett said. "Once they learn something, it becomes a behavior pattern. And through proper technique, and utilizing these techniques, we can break those patterns. They no longer have success. There is a constant threat of a predator, and they will move on to greener grounds."

John Donald is managing director for Robop's operations in Scotland and said Everett is pioneering the use of the robotic bird at landfills. No one particular bird deterrent system will be successful in all applications, he said, but his company has been in business for 10 years and has installed Robop in 15 countries.

That includes a Robop at a waste recycling center in London. "Among other things, they process a lot of food waste," he said.

There's one question Donald says his company receives all the time: Does Robop work?

"This is a question that's on everybody's mind. This is one of the key challenges for us," he said. "Yes, it does work."

A common installation involves keeping birds off of the roofs of large buildings, Donald said.

"We've had a lot of really successful installations," he said, but "it's not a panacea for all bird problems."

Everett has worked since 1993 at the Halton Region landfill in southern Ontario, providing bird control through falconry. So what was once a hobby became a full-time job.

"Falconry is a wonderful sport," he said. "It's not really that important that you catch something. It's just seeing the predator-prey relationship happen before you – the chase."

More information is available at www.predatech.ca.

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Santa Maria Times.com

Questions about waste, procedure split board vote on Los Flores Ranch facility

New landfill gets nod from county

By Marga K. Cooley/Associate Editor mcooley@santamariatmes.com | Posted: Wednesday, June 15, 2011 12:15 am

A new regional landfill planned for 291 acres of unincorporated property south of Orcutt, which is owned by the city of Santa Maria, will move forward, the Santa Barbara County Board of Supervisors decided Tuesday.

During a hastily called special meeting, the board voted 3-2 — with 2nd District Supervisor Janet Wolf and 3rd District Supervisor Doreen Farr voting no — to approve an amendment to the county's siting element.

The vote paves the way for the new landfill to open on the Los Flores Ranch property as expected in 2015, when the existing Santa Maria regional landfill reaches capacity.

Faced with a Thursday deadline on the issue, the board scheduled Tuesday's special meeting after the item was pulled from the administrative agenda at last week's regular board meeting in an effort to get answers to questions from Farr, such as who can haul waste to the landfill, what kind of waste will be accepted there and whether it's accepted from out of the county.

Santa Maria Utilities Director Rick Sweet gave the board background on the new landfill, and the board heard a brief statement from Santa Maria Mayor Larry Lavagnino.

Among five points the mayor said were "very important to the city of Santa Maria and the County of Santa Barbara," is that there is no feasible alternative to the new landfill site that can be put in place before the present landfill reaches capacity.

The new landfill is unique in that it solves potential contamination issues posed by the proximity of the existing landfill to the Santa Maria River, and offers a backup facility to the county-owned Tajiguas Landfill in Goleta, which serves the South Coast and the Santa Ynez and New Cuyama Valleys.

At stake for the county is what collateral environmental impact the landfill, which is not contiguous with Santa Maria, will have on the region in terms of truck trips and risk of spills if waste is accepted from outside the county.

The supervisors also wanted to make sure that the county gets its share of host fees and other possible revenue generated by the site.

The city of Santa Maria purchased the 1,774-acre Los Flores Ranch property in 2006, and will use the remaining land for recreational purposes.

Before Tuesday's vote, board members wrangled over why the issue hadn't been brought to their attention earlier in the process, especially since Farr and 1st District Supervisor Salud Carbajal sit on the Multi-Jurisdictional Solid Waste Task Group, which has been involved in the project's evolution since 2004.

Both said the issue was discussed by the task group, but that the larger county ramifications weren't clear. Farr said that while it might have been a mistake to assume, she expected it to come before the board when there was still time to discuss environmental issues associated with the project.

An environmental impact report on the landfill, which has been completed and certified by county staff, calls for a liner system under the waste, a methane gas collection system for a future gas-to-energy project, a leachate collection system and a ground water and gas monitoring system.

Fifth District Supervisor Steve Lavagnino moved to approve the site element amendment, saying that a number of good questions were raised, including why responses to the environmental report weren't made available to the board.

But, he said, the bottom line was that Santa Maria hasn't made any changes to the landfill project since the county responded to the environmental report.

"I realize we have questions. We may have dropped the ball," Lavagnino said, but I don't think there's substantial evidence that we need to go back and look at this."

Said 4th District Supervisor Joni Gray, "I would firmly second that. We simply have got to get the disposal site out of the Santa Maria River, now. I haven't been able to believe we've been doing that for all these years."

Carbajal said he had the same questions as Farr.

"I don't want this to be a landfill for out-of-county trash," he said. "If we ever have discussions about that, I'm looking to have the EIR (environmental report) amended."

That said, Carbajal noted that the new landfill is the only one in 25 years that has been permitted in California.

"I just want to make sure the city of Santa Maria continues to work with the county in good faith on the collateral issues that are of major interest to Santa Barbara County," he said.

After the vote, the board asked that representatives from Santa Maria return Aug. 2 with answers to Farr's questions, including what types of waste will be accepted at the landfill, how much, under what timeline the city expects to accept it and where it plans to accept it from.

WASTE & RECYCLING NEWS

Bag ban and recycling proposals fail in Oregon

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June 13 -- The legislative effort to ban single-use plastic carryout bags or to set a high standard for recycling of plastic bags in Oregon has failed.

Supporters of the bill acknowledged June 10 that they did not have the support to enact either measure this year.

·It appears the time for a statewide solution to this issue has not yet arrived,ö said the five key legislators who had supported the measure in a jointly issued statement. ·But this issue is not going away. We are not going away. And these bags aren't going away. They will be around for a thousand years.ö

The letter was signed by state Senators Mark Haas, Alan Bates, Jason Atkinson and state representatives Ben Cannon and Vic Gilliam.

The concept of setting benchmark recycling targets for plastic bags emerged three weeks ago. Those targets would have required manufacturers to recycle 20 percent of the bags sold in the state by 2012, 40 percent by 2013, 60 percent by 2014 and 80 percent by 2015 and every year thereafter.

The proposed Oregon ban on plastic bags would have been the first statewide ban in the United States. The failed bill also would have placed a 5-cent fee on paper bags at checkouts.

With the demise of the bill, city of Portland officials said they would immediately pursue a plastic bag ban.

Plastic bag manufacturer Hilex Poly Co. LLC had aggressively fought the ban, taking out newspaper and radio commercials and creating a website, www.bagthebanoregon.com.

The Hartsville, S.C., company employs 1,250 and has 30,000 recycling bins in place across the United States, as part of its Bag-2-Bag recycling program that began in 2004. It does not have a bag manufacturing plant or bag recycling facility in Oregon.

Mark Daniels, vice president of sustainability and environmental policy for Hilex Poly, told Plastics News that the company will recycle 25 million pounds of plastic films and plastic shopping bags this year at its recycling plant in North Vernon, Ind. That's up from the 20 million pounds of film and bags the company recycled in 2010 and the 10 million it recycled in 2009.

Daniels said all the plastic film and bags that Hilex recycles are used to make plastic bags.

There are bans on plastic carryout bags in 22 cities in the U.S., with eight of them enacted this year. In addition, Washington, D.C., and Montgomery County, Md., have a 5 cent tax on paper and plastic carryout bags. The Montgomery County tax goes into effect Aug. 1; the D.C. tax has been in effect since Jan. 1, 2010.

The plastic bag sector employs more than 10,000 people in the United States.

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WASTE & RECYCLING NEWS

Oregon expands returnable law to include most beverages

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June 14 -- Oregon Gov. John Kitzhaber signed an expansion of the state's bottle recycling law on June 9 that will include juices, teas, coffee and sports drinks not previously covered by the original law.

The law would also increase the deposit from 5 cents to 10 cents if the redemption rate is below 80% for two consecutive years.

"Oregon is a national leader when it comes to recycling in large part because of our pioneering bottle deposit system," said Sen. Jackie Dingfelder, D-Portland, in a statement. "Even with our national reputation, we can do better. Our rate of redemption was once as high as 90%, but today that number has dropped to 75%."

Originally passed in 1971 as the country's first bottle return law, Oregon's bottle bill has resulted in the return of more than 3 billion containers, a report from the state Senate said.

The law will go into effect no later than 2018 and will include most beverages sold in the state, with the exception of wine, liquor, milk and infant formula. The jump to 10 cents per bottle cannot occur before 2017.

The measure passed, 47-12, in the state House of Representatives on May 4 and the Senate, 19-11, on May 25.

The law was previously amended in 2007 to include bottled water. A total of 11 states have bottle return laws, and only Michigan has a deposit of 10 cents per container.

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THE SACRAMENTO BEE sacbee.com

Californians generate less garbage in recession, ease landfill pressure

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Here's another side effect of the recession: With people buying less, garbage cans in California are emptier these days.

The amount of trash hauled to landfills has dropped to its lowest level since the state began keeping track in 1989, according to preliminary figures compiled by the Department of Resources Recycling and Recovery. California now has enough landfill space to last nearly 50 years.

So why are trash companies still pushing to expand their landfills or build new ones?

Landfill operators, competing for increasingly precious waste, insist the new space will be needed when the economy rebounds. But industry experts say structural changes – increased recycling, waste-to-energy technology – may keep demand in check.

"In the 1990s, people were worried about a landfill crisis. Now, the opposite is true," said Evan Edgar, a lobbyist for the California Refuse Recycling Council.

Consumers and businesses produced about 30.4 million tons of trash in 2010, 28 percent less than in the 2005-06 boom years.

Some of the decline stems from aggressive recycling and composting programs set up by cities and counties. But state officials, economists and waste management industry experts say the weak economy is the main driver.

"People do in fact buy fewer cases of beer, less clothing and less food when they are unemployed, their income is dropping off or they fear that their income will drop off," said Richard Porter, professor emeritus of economics at the University of Michigan and author of a 2002 book "The Economics of Waste."

For Jerard Watson of south Sacramento, the point hits home each time he takes out his garbage can, which is much lighter these days.

Watson said his employer, a local shipping company, recently announced cutbacks in worker hours, forcing him to tighten his spending. Watson said he eats fewer meals at restaurants and purchases more of his groceries in bulk, reducing the packaging and food waste he throws away.

"You never know what tomorrow will bring," he said.

Charlie Wilson, a plumber from east Sacramento, said he has been out of work for about 15 months, during which time the foot-high stack of trash he used to throw out each week has dwindled to half that much.

"There's absolutely less trash, because we don't buy as much," Wilson said.

This new consumer frugality has squeezed landfill operators, who rely on fees paid for each ton of trash that arrives at their gates.

Several municipal landfill operations have imposed job freezes and wage cuts in recent years. Folsom's Waste Connections Inc., a private company, laid off 175 people and eliminated 400 jobs through attrition in 2008. The downsizing included 30 positions, or about 10 percent of the company's California workforce.

"It's a hard time for the industry," said landfill expert Neal Bolton.

According to CalRecycle, there are about 1.5 billion tons of unused landfill capacity in the state – enough to last 49.3 years at current disposal rates.

Edgar said the glut comes as the waste management industry is going through major, long-term changes.

In recent years, the industry and the state as a whole have made great strides in recycling and composting. The state currently diverts more than half of its trash from local landfills, a tenfold increase since 1989.

At the same time, waste companies have developed new technologies that turn waste into energy, Edgar said. These changes will likely reduce the amount of landfill space needed in future years, even after the economy recovers, he said.

Despite the abundance of dump space, some individual operators whose landfills are running out of room are pushing to expand as they compete against other landfills with plenty of space. Waste Connections, for instance, recently obtained county approval to quadruple the size of its Potrero Hills landfill.

The company paid $57.5 million to buy the landfill in 2009. Now it's backing legislation to overturn Measure E, an initiative passed by Solano voters 27 years ago to limit the waste that can be shipped to Potrero Hills from outside the county.

The landfill, which sits near Suisun Marsh, a state-protected wetland, had been importing about 500,000 tons of garbage from the Bay Area before Measure E was upheld last year in court.

"While we see a flat trend now, we don't think that will be sustained," said Jim Little, Waste Connections' senior vice president of engineering and disposal. "We take a very long view of the cyclical economy and its demographics."

Elsewhere in the Bay Area, the city of San Francisco is pursuing a plan to send 500,000 tons of its trash each year on train cars to the Yuba County town of Wheatland.

San Francisco now dumps most of its waste at Altamont Landfill near Livermore, but officials say that the Yuba County landfill would help save the city more than $130 million over a decade through lower "tipping" fees.

Altamont has 45.7 million cubic yards of capacity, or nearly eight years' worth of space. Keller Canyon Landfill in Pittsburg has enough capacity for 35 years, according to CalRecycle records.

WASTE & RECYCLING NEWS

Expanded paint recycling becomes law in Conn.

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June 8 -- Connecticut has become the nation's third state to have a program requiring paint manufacturers to safely manage leftover latex and oil-based paint from households and painting contractors.

Earlier this week, Connecticut Gov. Dannell Malloy signed into law the new program that will increase opportunities for residents and contractors to recycle architectural paint, while decreasing costs for local agencies.

The legislation, which was supported by the paint industry, is set to be implemented on or before July 1, 2013, and will include the cost of safely managing leftover paint in the purchase price of new paint. The new law also will set up an industry-led program to reduce paint waste, increase reuse and recycling and safely dispose of remaining unusable paint.

It is the third law resulting from a multi-stakeholder negotiation that was facilitated by Boston-based Product Stewardship Institute, a nonprofit environmental organization that focuses on reducing the health and environmental impacts of consumer products.

The first two laws were passed in Oregon in 2009 and in California last year.

Contact Waste & Recycling News reporter Shawn Wright at swright@crain.com or 313-446-0346.

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WASTE & RECYCLING NEWS

Study: Biodegradable products in landfills may be harmful

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June 1 -- Biodegradable products, such as disposable cups and utensils, may be doing more harm than good in landfills, according to researchers from North Carolina State University.

The **study,** which was published online in Environmental Science & Technology, found that so-called eco-friendly products release a powerful greenhouse gas as they break down.

The problem is attributable to the rate at which biodegradable materials break down, the study found. According to Federal Trade Commission guidelines, products marked as biodegradable should decompose within "a reasonably short period of time" after disposal.

But that rapid deterioration may be environmentally harmful, the researchers found.

Federal regulations do not require landfills that collect methane to install gas collection systems for at least two years after the waste is buried. If materials break down and release methane too quickly, the study said, much of the methane will likely be emitted before the collection technology is installed. This means less potential fuel for energy use and more greenhouse gas emissions.

The researchers found that a slower rate of biodegradation is more environmentally friendly because the majority of the methane production will occur after the methane collection system is in place.

"Methane can be a valuable energy source when captured, but is a potent greenhouse gas when released into the atmosphere," said Morton Barlaz, co-author of the study and a professor and head of N.C. State's Department of Civil, Construction and Environmental Engineering, in a statement. "In other words, biodegradable products are not necessarily more environmentally friendly when disposed of in landfills."

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