Is Garbage a Waste, or a Resource?

A view to the future of landfills, and a few other thoughts

BY ROBERT R. GARDNER, PE, RCFF

This is an exciting time to be a solid waste professional. Landfills continue to be the primary disposal option for most communities in the USA. However, new technologies are being developed and deployed to manage our various organic and inorganic wastestreams in response to citizen calls for decreased reliance on landfills. Composting, anaerobic digestion, and conversion technologies (e.g., plasma gasification) are being given serious consideration across the country. The actual cost to implement full-scale installations of the more cutting-edge technologies and the operational reliability of each is still uncertain, but in time, as various demonstration projects are tested, cost and operational reliability data will be developed. This Elements article addresses the philosophical shift taking place in our industry regarding how society’s discards are being viewed not as a “waste” but as a resource. I also provide an overview of two important regulatory initiatives affecting the landfill industry: the mandatory greenhouse gas reporting rule and the proposed federal coal ash residuals rules.

In recent years, we have witnessed an unprecedented reduction in the amount of waste being disposed in landfills. One company I spoke with recently indicated it had seen a 25% reduction in the amount of solid waste delivered to its landfill network as a result of the downturn in the economy, and with it the associated revenues. The compa-
ny indicated some of that wastestream has returned with the economy’s rebound, but it does not expect it to return to pre-2008 levels in the foreseeable future, if ever again. Some welcome the reduction as a good thing. Waste companies are adapting as well and are exploring alternative approaches to managing the solid wastestream and providing additional, sustainable services to their clients through increased recycling and alternative technologies. Maybe the economic downturn, like so many other crises in history, will cause us to seriously rethink how we manage our solid waste systems, from generation to disposal.

Materials Management Versus Waste Management
David Steiner, chief executive officer of Waste Management Inc. (WM), reported in the preamble to the company’s 2010 sustainability report: “Today, we’re reinventing our business model and reconsidering the nature of waste itself. They say that one man’s trash is another’s treasure. At Waste Management, this is literally true. An estimated $8 billion to $10 billion in value may reside in the waste we manage each year in North America. Our focus is on recovering that value—and that’s what sets us apart from our competitors. Waste is no longer something to get rid of—it’s a resource.

“Our customers are recognizing that environmental sustainability can cut costs and streamline operations. Our Upstream and Green Squad businesses help customers reach their sustainability goals by looking at their wastes and resource use in a holistic way. We evaluate every aspect of their business and recommend strategies for operating more sustainably—from maximizing recycling to reducing waste to avoiding the generation of waste in the first place.”

In some ways this is a sea change in the way we approach the management of solid waste; that is, to view it as a resource versus a waste. However, the concept really is not new, and over the 35 years since passage of RCRA we have developed and continue to develop more complex systems to manage and recover waste for beneficial purposes. We use garbage as a fuel for the generation of electricity and steam. We extract landfill gas from our landfills to generate electricity or use it directly in other combustion processes in lieu of fossil fuels. We recycle substantial quantities of fiber, glass, ferrous and nonferrous metals, yardwaste, organics, and construction-demolition debris. The EPA recognizes that for the goals of its Resource Conservation and Recovery program to be fully realized, there must be a shift of emphasis from waste management to materials management. We must better understand the life cycle costs of materials production, transportation, and final disposal. We must redouble efforts to find ways to use less material to produce the products we use (e.g., packaging), and utilize less toxic and renewable materials. We must figure out better ways to reuse the materials that we currently discard.

I just finished reading a book by the founder of Patagonia, Yvon Chouinard, titled, Let My People Go Surfing: the Education of a Reluctant Businessman. It is an interesting read and has relevance to the solid waste business, because Patagonia has looked long and hard at all its material procurement, manufacturing, transportation, and disposal practices with a goal toward “causing no unnecessary harm” to the environment. Patagonia has made many decisions that it the short term cost it more money but in the long term have been good for business and the environment. The company has changed how it purchases cotton by requiring the purchase of only organically grown cotton, and it has championed the use of recycled plastics in the production of synthetic materials to replace wool, which seems natural but actually requires the application of many chemicals along the way before it can be used in clothing. Patagonia has investigated the toxicity of the dyes it uses and adopted the use of less-toxic materials. The company also initiated various recycling programs for paper and organic waste in its offices, mailrooms, and shipping depots. Chouinard says, “Every time we’ve elected to do the right thing, even when it costs twice as much to do it that way, it’s turned out to be more profitable.” The company outlook seems never to assume anything, always to ask questions, challenging every assumption, and not to be satisfied until an issue has been fully vetted.

Sometimes it is difficult (or it takes much effort) to weed out fact from fiction in the debates that are prominent in our industry today. I read various solid waste publications each month, such as Waste Age, MSW Management, and BioCycle, and each has a perspective and definite bias. Each strives to demonstrate that its approach to managing solid waste is the “greenest.” For example, in the August 2008 BioCycle article, “Stop Trashing the Climate,” Brenda Platt and Eric Lombardi argue that landfill-gas capture systems are not effective in preventing methane emissions to the atmosphere and that the bulk of the landfill gas is generated before it can be captured. They claim data from the International Panel on Climate Change (IPCC) supports their argument.

However, Amy Van Kolken Banister and Pat Sullivan countered this argument in an article in the Elements 2010 edition of MSW Management, titled, “LFG Collection Efficiency: Debunking the Rhetoric,” by providing detailed background on the IPCC calculations and the actual collection efficiencies being achieved in the United States, which are significantly higher than represented by Platt and Lombardi. Banister and Sullivan reported that, based on literature reviews (and their collective practical experience at hundreds of landfills), LFG collection efficiencies for landfills with different types of cover and active LFG collection systems can be expected to achieve the following collection efficiencies (Solid Waste Industry for Climate Solutions [SWICS], 2009):

- 50%-70% (midrange default = 60%) for
a landfill or portions of a landfill that are under daily soil cover with an active LFG collection system installed
• 54%–95% (midrange default = 75%) for a landfill or portions of a landfill with an intermediate soil cover and an active LFG collection system
• 90%–99% (midrange default = 95%) for landfills that include a final soil and/or geomembrane cover system with an active LFG collection system
The midrange default values for the three cover types identified above were adopted by the EPA as part of its Mandatory GHG Reporting Rule (40 CFR, Part 98, Subpart HH). This gives strong credence that these values are representative of landfills in the United States.
My practical experience in the United States supports the conclusions of SWICS. Landfills effectively manage organic wastes within the municipal solid waste stream. The landfill gas control systems required by the EPA's New Source Performance Standards and the systems voluntarily installed by many landfill operators effectively collect, control, and utilize the collected landfill gases for beneficial purposes or flare the gas, providing a substantial reduction in greenhouse gas emissions. The number of landfill gas-to-energy projects that have been developed in this country (over 500 per the EPA Landfill Methane Outreach Program) and elsewhere is impressive and confirms that significant quantities of methane are collected at MSW landfills and either flared or used as fuel.
Of course, Platt and Lombardi argue that the organisms should be banned from landfills (the current approach in the European Union), and that organisms should be managed by composting or dedicated organic anaerobic digesters. However, I observe that these technologies also have emission and operational issues. I do not fault Platt or Lombardi for advocating composting and anaerobic digestion. I agree these are effective technologies for managing organic wastestreams and can be a cost-effective approach in suitable settings and conditions. For many communities, however, landfills still are the most cost-effective and safe means for managing its municipal solid waste. It's simply prudent fiscal policy for city managers to elect the safest and least cost option for waste management, particularly in an era where funding is scarce for public works programs.
Platt and Lombardi go on to take a shot at the waste-to-energy industry by stating that modern waste-to-energy facilities are “energy wasters” and generate more carbon dioxide per megawatt produced than do coal-fired power plants. Anyone who has ever been involved with these types of facilities know that they are not “energy wasters,” but that they are, in fact, more heavily regulated from an air-pollution control perspective than coal-fired power plants. Waste-to-energy plants can generate energy at approximately 550 kW per ton of waste. They are capable of recovering substantial quantities of ferrous metals and substantially reducing the volume of waste that is landfilled. Again, there is always another side to the story.
Our technical debates are sometimes like political campaign speeches, where everyone has their script and set of “facts” that are repeatedly stated to argue their points. I have seen policy makers turn a blind eye to facts and push forward agendas based on outdated information and personal bias rather than facts. However, we must continue the debate and the search for “the
truth,” but we need real data and real facts in order to make intelligent policy and business decisions on how best to manage our discarded “materials” in the future. I know the waste industry is pursuing fundamental research through organizations such as the Environmental Research and Education Foundation (EREF), SWANA’s Applied Research Foundation, and universities throughout the country.

**Regulatory Initiatives**

Rulemaking on the municipal solid waste management front has been relatively quiet this year. The most significant regulatory initiatives affecting landﬁlling operations are associated with greenhouse gases, stormwater management, and the management of coal combustion residuals (CCR, mainly ash).

**Greenhouse Gas Mandatory Reporting Rule**—On October 30, 2009, the US Environmental Protection Agency finalized its mandatory greenhouse gas reporting rule. This rule has added another layer of complexity and cost to the chore of environmental monitoring for which MSW managers are responsible. The rule required monitoring to begin January 1, 2010, certiﬁcation of the designated representative for each facility by January 31, 2011, and the ﬁrst annual report to be submitted by March 31, 2011, for calendar year 2010 reporting results. On March 1, 2011, the EPA issued a news release indicating that it was extending the 2010 reporting deadline to later in the year to allow for the data uploading tool. The final schedule will be published later this summer. All affected facilities were required to determine if they are subject to the rule and begin monitoring by January 1, 2010. For those who produce, import, or export certain fuels or industrial gases (coal-based liquid fuels, petroleum products, natural gas and natural gas liquids, carbon dioxide, nitrous oxide, and ﬂuorinated greenhouse gases), the rule requires reporting the amount of fuels or industrial gases supplied.

For the most part, the final rule applies to facilities that emit at least 25,000 metric tons of carbon dioxide equivalent (MTCO2e) per year, which must report their greenhouse gas emissions using speciﬁc monitoring requirements. It applies to facilities with stationary fuel combustion units that have an aggregate maximum rated heat input capacity of 30 million British thermal units per hour (mmBtu/hr) or greater; a level that applies to a host of electrical generating, metals production

<table>
<thead>
<tr>
<th>DISPOSAL/MANAGEMENT OPTION</th>
<th>QUANTITY (TONS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfilled</td>
<td>46</td>
</tr>
<tr>
<td>Surface Impoundments</td>
<td>30</td>
</tr>
<tr>
<td>Beneficial Use</td>
<td>50</td>
</tr>
<tr>
<td>Mine Fill Operations</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>137</td>
</tr>
</tbody>
</table>

![Together, we can solve your clearance issues.](image)

Parker Chelsea, the leading power transfer solutions provider to the Work Truck Market, makes PTO and Pump installation simpler and more reliable on Refuse, Fire/Rescue and Pumper Cleaner Trucks. Because of the large physical size of the pumps used on these applications, clearance has always been a challenge, this combined with the torsional vibrations from today’s diesel engines that prematurely wear cut mating PTO and Pump splines makes for a very challenging application. Chelsea’s new 890 Series (Patent Pending) was designed with this in mind to provide you with maximum clearance and our wet spline system to lubricate the mating PTO and Pump shafts.

**ENGINEERING YOUR SUCCESS.**

www.parker.com/chelsea
Ingenious solutions. Practical experience. The Ausenco Vector Advantage.

When you need solid waste engineering solutions you can trust, you need experience. Our reputation for innovative, practical and economical solutions makes us an industry leader. It’s the result of 25 years of experience and a portfolio that includes 700 million square feet of liner design and CQA.

We offer an outstanding range of services, including:
- Liner and Cover Design
- Bioreactor Design
- Landfill Siting / Permitting
- Stability and Hydraulic Analyses
- Landfill Master Planning
- Construction Quality Assurance Services
- Leak Location / Geoelectric Surveys
- Geotechnical / Geosynthetics Laboratory

Talk to us about how we can help you achieve your project objectives.
T +1 530 272 2448
E info@ausencovector.com
W www.ausencovector.com
Choose experience. Choose Ausenco Vector.

WORKS IN VACUUM – NO STALLING CAN RUN DRY – NO CAVITATION

Drive motor above wellhead = No pump pulling!
- Lower costs to own — better results
- Low, low maintenance — easier, safer servicing
- No greenhouse gas emissions — ever
- Helps keep operations compliant — no venting in well
- Pumps almost any liquid
- More, cleaner methane — higher value
- Ships as complete package

COMPARE TOTAL COSTS — BE SURPRISED
For your Cost of Ownership Calculator,

and manufacturing, chemical processing, and other industrial facilities. The EPA believes there are just over 10,000 facilities that will have to report under the rule, including 3,000 stationary fuel combustion units, 2,551 MSW landfills, 1,502 natural gas suppliers and 1,108 electric generating facilities.

The rule applies to MSW landfills (not industrial or C&D landfills) that accepted waste after January 1, 1980, if they produce at least 25,000 MTCO₂e (whether or not the landfill gas [LFG] is collected). MSW landfills must use an EPA model to estimate gas generation. Landfills on contiguous properties under common control must be included in the estimates (even if they have been closed for years). However, the EPA model uses relatively high coefficients for generation, which means that old closed landfills are assumed to produce relatively little gas. The rule requires use of a conservative 10% factor to account for methane oxidation as LFG passes through the soil of a typical landfill cover.

MSW landfills subject to the rule must report the following information:
- Landfill operations (open/closed/year)
- Waste disposal calculations
- Waste composition (if available)
- Modeling parameters used
- Methane data
- Landfill area, cover types by area, and oxidation fractions used

LFG Modeling Results
If the MSW landfill facility has a gas collection and combustion system (GCCS), the facility must report the above (ignoring the effect of its GCCS), and also must report the following:
- Flow of collected LFG
- Methane content of LFG
- Temperature and pressure data for LFG
- Description of control device(s) both onsite and offsite
- Control device operating hours
- Description of GCCS, landfill areas, and waste depths
- Computed methane volume captured
- Computed methane generated (corrected for oxidation using EPA model)
- Computed methane generated (corrected for oxidation using LFG recovery flow and collection efficiency)
- Methane emissions, method 1 (modeling)
- Methane emissions, method 2 (gas captured and estimated collection efficiency)
Coal ash residuals

Although the disposal of coal ash residues typically is not a municipal solid waste concern, the changes that are being considered at the federal and state levels may force utilities to dispose of coal ash residuals in landfills designed and constructed as if they were MSW landfills (siting restrictions, design criteria for composite lined landfills, leachate collection systems, and run-on and run-off controls, operational criteria, groundwater monitoring, reporting, and closure and post-closure care requirements.) CCRs currently are exempt wastes as defined under RCRA. CCRs are the byproducts of the combustion of coal and consist of bottom ash, fly ash, or other residuals from air pollution control devices. The EPA reports that in 2008, 136 million tons of coal combustion residuals were generated by electric utilities and independent power producers. The breakdown of how this wastestream was managed is provided in Figure 1 and Figure 2.

The EPA estimates that there are approximately 300 landfills and more than 600 surface impoundments that receive CCRs (EPA, Public Hearing, Knoxville, TN, October 27, 2010). The EPA has identified potential environmental concerns relative to the management of CCRs including the leaching of pollutants from landfills and surface impoundments into groundwater and surface waters and structural failures of impoundments.

On June 21, 2010, the EPA published proposed rules governing disposal of coal combustion residuals produced by electric utilities. The proposals appear in the Federal Register [Volume 75, No. 118, pages 35128-35264]. The proposals would regulate coal ash (coal combustion residuals) from electric utilities as either a "special waste," subject to RCRA Subtitle C hazardous waste regulations, or as a new category of Subtitle E (solid waste) facility requiring detailed design, operation, closure, and post-closure care requirements to be met, or else the facility would be considered an "open dump" subject to citizens' suit enforcement under RCRA.

Either EPA approach will change the way coal ash is managed in the United States. The EPA says that beneficial uses will still be exempt from regulation as a solid or hazardous waste pursuant to the Blevill Amendment (and state laws), but the EPA says that unencapsulated uses—e.g., use as large-scale stabilized fill or reclamation of quarries—are not considered beneficial uses. Such large-scale uses would be characterized as landfills under either proposed approach.
The EPA says it is still looking at how to distinguish closely-related beneficial uses (which the agency appears to continue to support) such as use of coal ash in flowable fill and highway grade stabilization.

**Subtitle C Approach**
Under the Subtitle C approach, use of surface impoundments to manage wet ash will be phased out over five years (with final closure two years after phase-out). The phase-out is the result of a new land disposal restriction for coal combustion wastewaters. After five years, such wastewaters can have no more than 100 mg/l of total suspended solids if they are to be placed in a land disposal unit (e.g., a surface impoundment).

Landfills would be allowed to receive coal ash if the ash has no free liquids, provided the landfill includes a leachate collection system and a composite liner. The liner and leachate collection systems are required for new landfills and for lateral expansions of existing landfills.

The Subtitle C approach will mean that collection of wet coal ash will be a thing of the past. Utilities will have to implement dry collection, or shift more materials to beneficial use, or both. Smaller coal-burning facilities will look hard at these requirements and might well decide to close as a result. Even if they decide to close, however, they will have to comply with closure and postclosure care requirements (including Subtitle C groundwater monitoring).

The RCRA corrective action program has been one of the slowest and most cumbersome (not to mention expensive) programs administered under Subtitle C.

A key element of the Subtitle C approach would be the sitewide corrective action authority that the EPA and the states would have to address historical releases from solid waste management units (broadly defined). The RCRA corrective action program has been one of the slowest and most cumbersome (not to mention expensive) programs administered under Subtitle C.

**Subtitle D Approach**
The Subtitle D approach is based on changes to the eight open dump criteria (floodplains, endangered species, surface water, groundwater, land application, disease, air, and safety) first published 30 years ago.

Under the proposed rule, three of the existing criteria (floodplains, endangered species, and surface water) will apply as written to coal ash facilities, but the remaining five criteria will be replaced with specific design and operating requirements for coal ash facilities.

The Subtitle D approach will not eliminate wet collection of coal ash, but will require existing surface impoundments that continue to receive ash to be retrofitted with a composite liner. An alternative approach to this alternative proposed by the
EPA will not require retrofitting liners.

The Subtitle D approach relies heavily on utilities to post information (e.g., annual certification reports from independent professional engineers) on a public website. The Subtitle D approach also includes a unique groundwater monitoring and contaminant detection program focusing on inorganic constituents, many of which are naturally occurring.

**Common to Both Approaches**

Under both the Subtitle C and Subtitle D approaches, utilities will be obliged to compile detailed design and operating data for larger surface impoundments, and have these documents (and the design) certified by an independent professional engineer. Impoundments with either a “high” or a “significant” hazard potential (as defined) must prepare and make available an emergency action plan to cover what will be done in the event of a dam safety emergency.

Both approaches require fugitive dust to be controlled such that dust does not exceed 35 μg per cubic meter in air.

Eight public hearings were held in the fall of 2010 to enable the EPA to present the proposed rule and hear public comments. The schedule for approval of the new CCR regulations depends on a number of factors; the most significant being which regulatory program option is selected (Subtitle C or D).

The EPA reports that for Subtitle D, the rule would be effective six months after promulgation, and for Subtitle C, the requirements would become effective in authorized states when the state adopts the rule. In this case, the timing will vary from state to state.

**Conclusion**

“Times they are a changing,” or so the saying goes. How we view and where and how we dispose of our waste is changing. Regulations and technology are evolving. Our business is never static. 2011 is shaping up to be an interesting year for the solid waste industry.

Robert B. Gardner is senior vice president with SCS Engineers and director of SWANA’s Landfill Management Division.

Now on www.mswmanagement.com

BLOGS, NEWS, THE LATEST ISSUE & WEB-ONLY ARTICLES

SEE A RELATED ARTICLE AT

www.mswmanagement.com/legal-regulatory

---

**Why use AmCon Daily Covers?**

AmCon is a well-known manufacturer of Alternate Daily Covers since 1988. Our covers are shipped throughout the US, PR, South America, Mexico and Canada. At AmCon we strive to exceed our customer’s expectation through quality, service and satisfaction. Our Premium Covers are made with the highest regard to strength and performance. Recently, the new Competitive Cover has been added to the product line in response to landfills that use a lighter, less expensive daily cover. Stocked sizes are 50’x50’, 50’x100’, 100’x100’ and 100’x150’. Orders are filled promptly. Chain and cable pockets can be custom fabricated. AmCon’s Premium tarps are fabricated to fit all tarp machines.

**Call For A Quote And You’ll Become A Customer For Life!**

1 800 866-0369, 8-5 EST