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Breaking Down the Risks of Composting

UNLESS FACILITY OPERATORS FULLY UNDERSTAND THE MANUFACTURING PROCESS AND ITS INHERENT DIFFICULTIES, FAILURE IS INDEED AN OPTION.

By Ron Alexander

Commercial-scale composting in the United Kingdom has grown significantly over the past several years, and will continue to expand into the foreseeable future. As the industry has grown, both landfill operators and waste managers have begun to study the science of composting, and both now see it as a recycling and manufacturing process. Today, composting is well understood as a manufacturing process, and clever composters can manipulate the process to manufacture products that best meet the requirements of their specific end users. However, even as the worldwide composting industry has seen its successes grow significantly, so too have its failures.

For the United Kingdom, organics have become priority materials to recycle because they are easy to target within the wastestream and can make a large impact quickly in meeting overall recycling targets. Also, some infrastructural requirements for the collection and management of organics already exist. However, different barriers and opportunities exist in organics management compared with more traditional recyclables. Organic materials differ from traditional recyclables most in that they are putrescible in nature. Of course, there are significant drivers to enhance the collection and management of organic materials. These drivers include the European Union (EU) Landfill Directive, Waste Strategy 2000, and Local Authority Recycling Targets.

In the Merseyside region of the United Kingdom alone, EU Landfill Directive targets

require 314,000 tons of organics to be managed by 2020, and Waste Strategy 2000 targets require 104,000 tons of recyclables to be generated by 2003–2004. Organic feedstocks that will be targeted in the short term primarily include garden waste and, later, kitchen waste as well as non-recyclable wood, paper, and cardboard. It is likely that much of these organics will be collected in source-separated fashion, but mixed-solid-waste composting is also an option that some local authorities may consider.

A variety of composting methods may be used in organics management based on the specific feedstock to be composted. Where outdoor windrow systems are less complicated and engineered and may be appropriate for feedstocks such as garden waste, in-vessel systems (which are typically patented) are often used for highly putrescible feedstocks and those that are more difficult to manage (e.g., kitchen waste, biosolids, MSW). As big-technology options become more financially viable for use in the United Kingdom, the opportunity for great successes, as well as great failures, exists. Failures are likely because these “black box” technologies often are seen as panaceas by non-technical individuals involved in the decision-making process. As a result, to help Britain develop a healthy composting industry and avoid industry failures, a study was completed within the US composting industry to evaluate why specific composting (and other waste management) facilities failed. In it, 21 North American fa-

cilities were identified, with the focus on biosolids and MSW composting facilities. One digester and a materials recycling facility (MRF) also were evaluated. Of the 19 composting facilities, seven are still in operation, and 12 of the “failed facilities” alone represent losses of \$423 million to \$500 million.

The UK composting industry has specific challenges and issues that are unique to it, and they must be addressed for it to grow to the extent necessary. To its benefit, the organics management industry has strong political drivers forcing its positive movement and therefore creating great interest, as well as investment, in the industry. However, based on UK regulation and EU legislation, a great deal of work must be done to expand the industry in a limited amount of time. Unfortunately, this creates an atmosphere where significant mistakes can occur. The United Kingdom also must deal with such issues as space restrictions, uncertainty in future regulation and legislation, underdeveloped compost markets, consultancy and operational inexperience, and a complicated waste management infrastructure.

What Goes Wrong

To assist the industry in avoiding errors common in composting-facility development, here are some common mistakes found to contribute to facility failures.

Facility Design

The mistakes made in the overall design of composting are numerous. Major factors include a lack of overall experience and an understanding of the composting process, as well as inexperience in the management of organic materials. These mistakes have been caused by consultancy companies and their clients (local authorities and private companies) by trying to meet unrealistic economic parameters, by usurping the formal review process, and, at times, by getting too involved

in the overall design without possessing proper and related experience. Facility design must take into consideration the biological nature of the process, odor management, and product-quality issues.

Odor/Odor Control Systems

Probably the greatest cause of facility "shut-downs" in the United States—and probably the world—is odors. Although odors are always generated during the commercial composting

ation of the facility is often the key to reducing odor generation and movement off-site.

Siting

The location of a composting facility often goes hand-in-hand with odor issues. Siting a

Organics in Industry

Technology Selection/Equipment

Consultants, their clients, and politicians have made mistakes by becoming enamored of a specific composting technology to the exclusion of others. At times, the favored systems have simply not worked, while in other cases the systems were not appropriate for the location or feedstocks. It is vital to obtain assistance from companies that possess experience in the composting process and equipment selection, as well as the varieties of technologies and equipment available, before a preferred technology is chosen and a tender is designed around it.

process, the volume of the odorous air stream, as well as the types of odorous compounds, can greatly affect the severity of the potential odor problem off-site. Odor systems are often underdesigned, unable to handle the quantity of air necessary for proper odor control, ineffective on the specific odorous compounds, or not included in the original facility design at all.

The science of odor control and odor monitoring is very complex, but the reaction of the general public is not. Odor generation and management must be considered in the design phase of facility development, but proper oper-

facility too close to neighbors is a classic mistake of the composting industry. Even "in-vessel" systems are affected by siting issues related to odor generation.

The logistics of a composting operation, which relate back to traffic or vehicles entering and leaving the facility, should never be disregarded. Truck traffic has caused problems with neighbors of composting facilities and has caused stress on infrastructure.

Product Quality/Marketing

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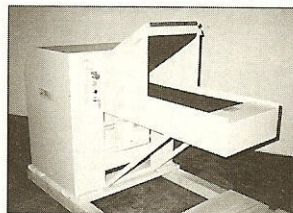
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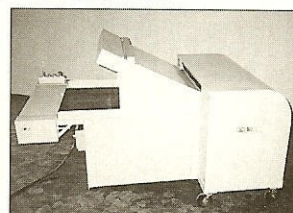
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LESSONS LEARNED DURING THE DESIGN AND PROCUREMENT STAGES

1. Base your design on the 'known' principles of composting.
2. Vendors must demonstrate positive past performance and a detailed understanding of their system.
3. Be cautious of those with little practical or successful experience.
4. Odor must be well managed.
5. Careful siting and community relations are key.
6. Understand your wastestream and determine the product you plan to produce.
7. Regardless of the procurement method, make sure to develop a capable project management team.
8. Budget for cost overruns, as well as delays in development and revenue generation.
9. Hire a facility operator or project manager and obtain his or her input before final design is completed.
10. Be patient and use design review and procurement processes that have worked in the past.

dramatically affects its marketability. However, aside from product-quality issues, history has also shown that a lack of market-development activity and underestimating the requirements necessary to develop a successful marketing program also have caused marketing failures.

One way to avoid such failures is to determine the realistic quality of product you expect to produce, and then do market research to determine if markets exist for it. Market research should be a significant part of your facility design and evaluation process. Understanding the needs of the market, as well as the investment necessary to develop a revenue-generating marketing program, is often overlooked. Poor marketing leads to large piles of compost being built throughout the composting facility. This may lead to odor generation, logistical problems at the composting site, public relations difficulties, etc.

Waste Characteristics and Properly Controlling Facility Inputs

Large-scale composting facilities, especially MSW composting facilities, should never be developed without completing a proper waste characterization. Using national or regional characterization figures, which did not represent actual waste characteristics, has caused great difficulty at several composting facilities. This is because misunderstanding the waste characteristics can greatly affect the operational costs and input capacity of a facility. Facilities composting biosolids have been developed with the understanding that garden waste from local municipalities would be used as the bulking agent, only to find out that the majority of the waste was grass and

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not “woody” (carbon-rich). As a result, the facilities had to purchase woodchips for use as a bulking agent, which significantly increased their operational costs.

MSW composting facilities have been designed with a belief that food-based materials and packaging would be the primary inputs, only to find that great volumes of non-recyclable paper and card were a majority of their feedstock. Other facilities have been designed and built assuming that the proper volume of feedstocks was available to make the facility financially viable, only to be proven incorrect. Also, assumptions should never be made when it comes to the ability to control the flow of waste materials entering the facility. Proper volumes must be guaranteed and contracted for before the facility is developed.

Politics

Several composting facilities were doomed from the start because of poor political decisions in the design of the composting facility. Examples exist where local politicians have been invited on junkets to evaluate composting facilities without involving proper technical representation to assist them. Poor systems choices have been made as well because powerful members of the selection committee have been enamored by specific composting systems, even though those systems were not the best for their particular situation.

Politics dealing with local residents and regulatory bodies also have caused the operation of many facilities to be altered or snuffed out completely. The lesson is that technical decisions need to be made by technical individuals who have practical experience.

Financial

Failures have also occurred because composting facilities were undercapitalized from the beginning and were unable to properly operate without compromising the long-term integrity of the program. Undercapitalized facilities have been forced to ramp up too quickly, trying to manage larger volumes of incoming waste than they were able to during the startup phase (so they could receive additional gate fees). This caused odor problems, forcing improper performance testing of equipment, and the production of poor-quality compost.

In other cases, little money was set aside for contingencies or upgrades to the system, forcing the facility to limp along until revenue could be generated to make repairs or upgrade the system. Also, in-depth evaluations of the cost to build and operate the facility have been improperly completed during the design of some facilities, leading to a higher cost per ton

to manage the materials than expected (or promised by the technology provider).

We have seen successes and failures, and what we have learned is that most of the latter can be avoided. One of the best ways to avoid failures in the development of large-scale composting facilities is simply to understand the realities of composting. Some of these realities are:

- Composting is an excellent waste management option, but it is not a perfect option for every organics management application.
- Composting is both an engineering and biological process.
- No composting facility is odor-free.
- Even successful composting facilities have problems from time to time.
- Most composting facilities create “reject” material (product that has to be landfilled). MSW composting facilities often have a 35%–45% reject rate.
- Operational challenges increase exponentially with facility size.
- Developing markets for compost products takes time and investment (no composting

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LESSONS FOR OPERATIONS AND MARKETING

1. Establish operations and monitoring protocols consistent with the principles of proper composting.
2. Communicate with the community, customers, and end users.
3. Train your facility staff.
4. Anticipate challenges of various types.
5. Build ongoing employee training, plant optimization, and safety programs.
6. Commit resources toward marketing.
7. Product quality must match the requirements of end users and desired uses.
8. Complete market research during project planning and develop a marketing plan that is based on facility requirements and market regional conditions.

facility should be developed without an understanding of where the compost will be used).

- If it sounds too good, it usually is.

To improve your chances of success, learn from past successes and failures. We must allow past experiences in compost facility design and operation to shape the design and operation of future facilities. The keys to shaping your facility are:

- Understand the composting process.
- Seek out assistance with the facility-development process.
- Select the proper composting technology and consultancy assistance.
- Understand your markets.
- Allow for proper planning and technical review process.
- Start the planning/design process early (don't let a short time frame cause bad decision-making).

- Never be a guinea pig—don't be the first one to develop a composting facility based on a new or unproven technology.

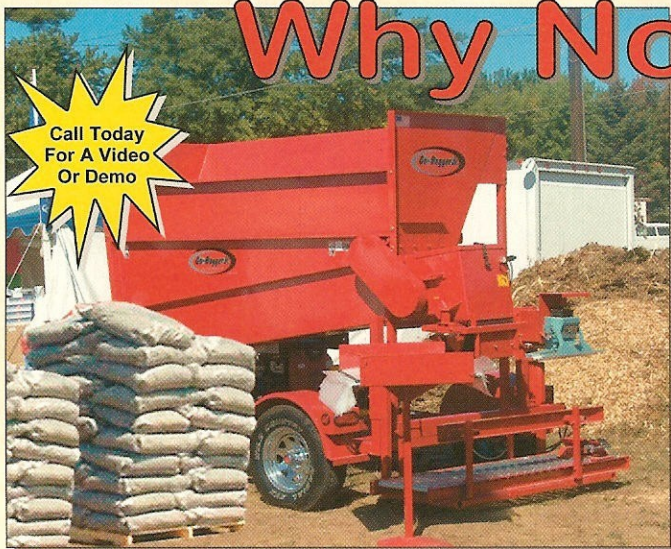
Remember, bigger and/or higher technology solutions are not always the best choice.

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Guest author Ron Alexander, who is based in Apex, NC, has been involved in the composting industry for more than 15 years.

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