



Managing Solid Waste Facilities to Prevent Odor



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SUMMARY

Controlling odors at landfills and transfer stations is one of the most critical challenges facing the solid waste management industry. Finding a solution is vital to the economy, since waste disposal is an essential service that affects business and the environment.

Solid waste facilities can be, and want to be, good neighbors. Through proper management, and with the use of a variety of good practices, odors can be prevented, minimized and managed. Indeed, systems that control odor by collecting and combusting landfill gas are also increasingly being used as a source of renewable energy, so important to our nation's economic well-being.

This paper contains basic, easy to understand information on:

- Why odor is a problem at solid waste facilities.
- The potential causes of odors at solid waste facilities.
- Special factors that affect odor severity.
- Proven odor management practices that successfully prevent or minimize problems.
- New and emerging technologies for measuring and preventing odors.

ODOR NUISANCE ISSUES



Landfill near houses being built

Complaints about odors have been cited as the most frequent cause of friction with facility neighbors. Population growth and expansion may even affect facilities originally constructed in remote areas, as residential and commercial growth moves closer. While risk¹ impact studies at facilities with severe odors have shown that odor is rarely an off-site health hazard, odor can be a nuisance for people living or working near a facility. Odor issues:

- Affect people's enjoyment of their properties, especially in warm weather.
- Raise concerns about property values in areas affected.
- Bring up health concerns, even where no measurable hazard may exist.
- Make it difficult to site new waste facilities or expand existing facilities, although other factors may favor a particular location.

WHY GARBAGE SMELLS

All matter in the world is subject to biological decay, and this decay produces odors. Garbage with a high organic content (e.g., meat, fish, vegetable peelings) and high water content (e.g., sludge), smells more than garbage with a low organic content and low water content.

Garbage that decays anaerobically (without air, e.g., inside sealed plastic garbage bags), smells far worse than if exposed to air.

Most people know from their own households that a wastebasket full of recycled paper is basically odorless, while a closed kitchen basket or plastic bag full of seafood, dirty diapers and orange peels can be extremely odorous, especially if left in the garage for a week awaiting pickup!

This, on a grand scale of thousands of pounds, is the challenge facing waste facilities. The challenge is made even greater because the sense of smell is so keen, and some odors commonly found at solid waste facilities can be detected at very low levels.

¹*Risk is something that has a measurable health affect, while a nuisance is inconvenient or annoying, but without a measurable health impact.*

CAUSES OF ODORS AT LANDFILLS

Landfill odors are caused by *landfill gas*, *trash at the “working face”* and *leachate*.

Landfill gas, trash, and leachate are the main causes of odor at landfills

Landfill gas (LFG) – Organic material decomposing anaerobically produces landfill gas. LFG is made up primarily of methane and carbon dioxide (both odorless), but does contain small amounts of odorous compounds that the human nose can perceive at very low levels. Since landfills may produce a large amount of this gas, offsite odors can result if gas management systems are not installed in time and operated effectively. LFG can also transport other landfill odors, if vented to the atmosphere.

Trash at the working face – Garbage disposed of at the “working face” (the area of the landfill where waste is actively being placed) is an obvious source of odor if not managed appropriately.

Leachate – Water from precipitation that flows into garbage and percolates down to the bottom of the landfill picks up odors from the biological waste products of decomposition with which it comes into contact. This “leachate” is collected in pipes running through the landfill for removal, treatment and disposal. It can create odor if gas in the leachate escapes through manholes, or is carried by LFG venting.

FACTORS INFLUENCING ODOR STRENGTH

Proximity to a landfill is obviously a major factor in whether odor is a nuisance, but it is not the only important factor. Other key issues that affect odor strength include:

Type of waste – Certain wastes smell worse than others. For example, sludge wastes are high in moisture and may have a high sulfur content. Other problem wastes include gypsum (primarily from wallboard), animal wastes, and composted yard wastes.

Volume of potentially odorous material – A small amount of odorous waste can be quickly covered, or may not be noticeable, while larger amounts spread over a wider area and managed improperly, may cause problems.

Time required to unload and cover – Waste that is covered quickly produces less odor. The longer the waste is left exposed, the more odor can move offsite.

Meteorological and topographic conditions – Wind speed and direction, humidity, terrain, and precipitation have an influence on transporting odor offsite. Temperature inversions hold odors closer to the ground where they are more likely to be detected. Ravines and other features may direct odors toward places where people live and work.

Size of working face – If the working face is small, daily cover can effectively limit odor transmission. The larger the working area, the likelier there will be offsite transmission of odor, unless effective measures are taken.

Time of day – Odor problems decrease when breezes are strongest, typically in the afternoon, since odor can be dispersed. In terrain with hills and valleys, cooling air in the evening and early morning travels down hills, carrying odors with it.



SPECIAL ODOR ISSUES

Transfer Stations – Most odor issues at transfer stations are due to short-term storage of loaded trailers and odors from waste inside the transfer station. Odor issues are worse at warmer temperatures, longer storage times and low wind conditions.

Construction and Demolition Debris (C&DD) – Gypsum wallboard (drywall) is the biggest cause of odor at special C&DD landfills or at municipal solid waste facilities that accept this kind of waste. Chemical transformations cause sulfur products in the drywall board to turn into hydrogen sulfide (H₂S), which has a distinctive “rotten egg” smell. Large quantities of wallboard, generated from cleanup after natural disasters (e.g., hurricanes and floods) have created severe odor issues, when not properly handled.

Trash Trucks – Leaking waste trucks, blowing trash and unsightly or odorous trucks passing by the facility’s neighbors extends the odor problem outside the border of the landfill.

Bioreactor Landfill Operations – The bioreactor landfill is an emerging technology that relies on controlled liquid addition and temperature management to achieve rapid waste stabilization. It has a number of environmental and operational benefits and is expected to be used more frequently in the future. Odor issues must be controlled through the use of specially designed and managed LFG collection and control systems.

CONTROLLING AND PREVENTING ODOR AT LANDFILLS

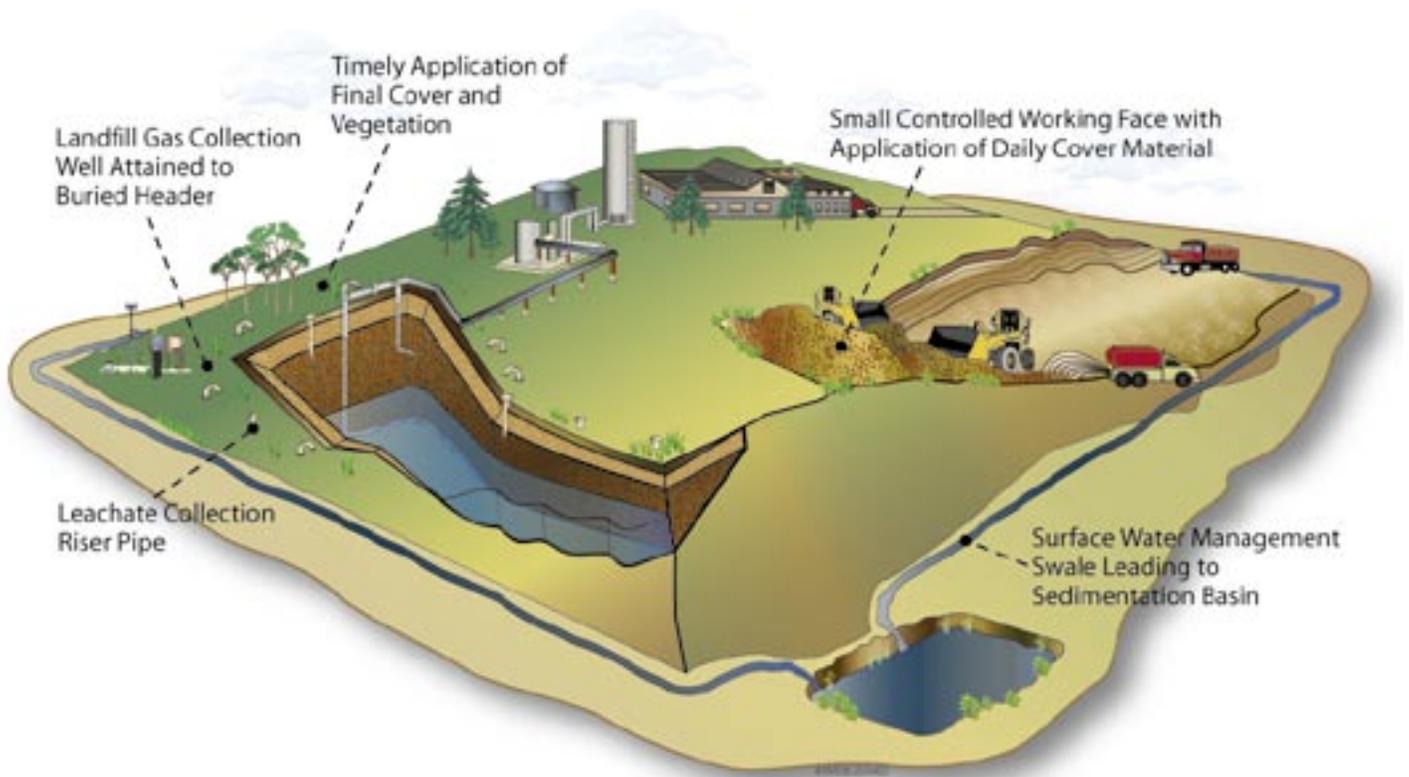
There is no “one size fits all” standardized application of odor management practices, but there are numerous effective odor prevention and control measures with a proven success record.

The following techniques, alone or in the best combination for the particular site, represent a proactive approach to stopping odors *before* they become a problem:



Trained technicians balance LFG system and seek ways to reduce odors

- **Control LFG production and management** – Timely planning and installation of an LFG collection and control system before odor problems arise is key to a proactive and successful odor management system. Since LFG is also a renewable energy source, collecting the gas can have a positive effect on the environment and help reduce our nation’s dependence on fossil fuels. Appropriate LFG collection and control includes:
 - *Design and installation of a properly sized LFG control system*, including LFG collection through extraction wells and/or horizontal collectors interconnected by header piping to a vacuum blower; and *combustion* in an enclosed or utility flare, engine generator, gas turbine, or boiler.
 - *Close attention to known problem areas*, including the ends of leachate pipes, cleanouts, and manholes.
 - *Making sure there are air-tight seals* around all LFG control equipment, to keep air out and LFG in, direct the LFG to the control device, and maintain a safe area.
 - *Ongoing operation, monitoring and maintenance* by a trained LFG technician.
- **Improve stormwater management** – Water increases the production of landfill gas, so grading and drainage to reduce and properly manage water infiltration is key.
- **Improve working face operations** – Keeping the working face to a size that can be covered quickly, accommodating special waste issues (e.g., immediate burial of animal kills or sludge), and possibly even establishing alternate workface locations for days when wind conditions warrant, are ways to improve the odor situation. Operators might also consider accepting the strongest smelling wastes at times when weather conditions are most favorable.
- **Adopt special operational procedures for C&DD waste** – Since wet wallboard waste creates a distinctive and powerful odor, such waste must be separated and protected from stormwater. Daily cover might be advisable, even in jurisdictions that don’t require it.
- **Review or adjust waste types accepted** – Waste type can affect odors, so operators may alter the type of waste they accept in areas where odors are a problem. Or, pre-treatment of some loads may be required to neutralize particular odor-causing compounds.
- **Establish odor complaint procedures** – Formal odor complaint and investigation procedures help operators make adjustments to prevent or minimize odors. A complaint log, with information on the day, date, time, weather conditions, and odor characteristics, can be a good tool. Establishing a simple on-site weather



An effective landfill gas collection and control system, proper operations, and good housekeeping practices will minimize odors.

station that records data on weather conditions can be used to compare complaints with operations information to determine possible causes.

- **Provide good cover materials** – Good cover materials (soil) can filter odor, control gas and reduce water infiltration. When tarps are used for daily cover, granular odor control material can be placed under the tarp.
- **Practice good housekeeping practices** – Regular inspection and repair of the landfill cap in closed areas keeps gas from escaping into the atmosphere.
- **Provide temporary or permanent membrane capping** – Capping a landfill is an excellent odor barrier, and closed landfills with such caps and proper LFG systems rarely have odor problems. A temporary membrane (synthetic material) cap can be installed in areas to improve LFG collection while minimizing air emissions and liquid infiltration.
- **Use odor-neutralizing chemicals** – Odor-neutralizing chemicals sprayed along the perimeter or a boundary can be effective. Chemicals are more than 99% water and contain “essential oils” and a trace of soap. This option is generally considered only after housekeeping and LFG control options are applied.
- **Field odor monitoring** – While not in itself a way to minimize odors, new monitoring and measuring techniques make it possible to detect and quantify smells. This helps landfill operators ensure that they comply with agreed upon standards. New devices on the market include the field olfactometer, a portable instrument for detecting and measuring odors.

CONTROLLING AND PREVENTING ODORS AT TRANSFER STATIONS



Transfer station

- Design facility to minimize odor transmission – Orient doors with respect to prevailing wind direction.
- Improve transfer station operations
 - Remove waste from the tipping floor or pit, and outdoor parking/staging areas at the end of each operating day, and clean these areas.
 - Use enclosed trailers when loaded trailers must sit on site temporarily.
 - Practice “first-in, first-out” waste handling practices.
 - Collect and remove partially full containers at rural stations.
 - Keep building catch basins, floor drains and drainage systems clean.
 - Divert odorous waste loads to facilities with less sensitive surroundings, or directly to the landfill, during adverse weather conditions.
 - Refuse to accept highly odorous wastes, or require pretreatment.
 - Conduct as much as possible of the waste handling process inside.
 - Practice good housekeeping including regular cleaning and disinfecting of containers, equipment, and other surfaces that come into contact with waste.
- **Consider misting systems** – Consider use of misting systems and exhaust/ventilation systems.
- **Use a biofilter** – Transfer station air exhaust can be collected and passed through a biofilter (rip rap or concrete media covered by organic material, like wood).

THE SOLID WASTE INDUSTRY IS WORKING TOWARDS A SOLUTION

While we may all wish we could simply throw away our trash and not think about where or how it's disposed, *and certainly never smell it again*, in reality we must work towards a solution that prevents and controlling odors to the maximum extent feasible, so that vital waste management services can continue. The solid waste industry is committed to opening a cooperative dialogue on this and other issues affecting waste disposal.



NSWMA

The National Solid Wastes Management Association (NSWMA) is a trade association representing for-profit companies in North America that provide solid, hazardous and medical waste collection, recycling and disposal services.

This paper is one of a series that NSWMA produces as part of its mission to provide quality, objective information on solid waste management issues that will help the public understand the vital role solid waste facilities play in our communities and in the economy.

For a complete list of available information on this and other topics, please visit our website at www.nswma.org. <area on website for public papers?>



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