KENTUCKY COMPOST OPERATOR CERTIFICATION MANUAL

Kentucky Department for Environmental Protection

Division of Compliance Assistance

300 Sower Blvd. • Frankfort, KY 40601

Phone: 502.564.0323 • Fax: 844.213.0549

Email: envhelp@ky.gov • Website: dca.ky.gov

Revised March 2018

Certification and Licensing Program

Mission

Promote responsible environmental stewardship.

Goal

Provide operators with the basic knowledge required to manage drinking water, wastewater and solid waste systems.

The Division of Compliance Assistance offers free compliance assistance. Our services are available to all individuals, communities and businesses regulated by the Kentucky Department for Environmental Protection. We want to help you succeed!

Hotline and Website for regulatory, technical or operational concerns
502-564-0323
dca.ky.gov

Other programs administered by the Division of Compliance Assistance:

Kentucky Excel Program
Kentucky Brownfield Program
Kentucky Environmental Compliance Assistance Program

TABLE OF CONTENTS

This page left blank intentionally.

Chapter 1: COMPOST OPERATOR CERTIFICATION

Chapter 1 Learning Objectives

1. Understand the requirements and certification processes for compost operators
2. Understand and be able to apply the Kentucky regulations relating to the certification requirements for solid and special waste operations.
3. Understand the importance of professional conduct for certified operators.

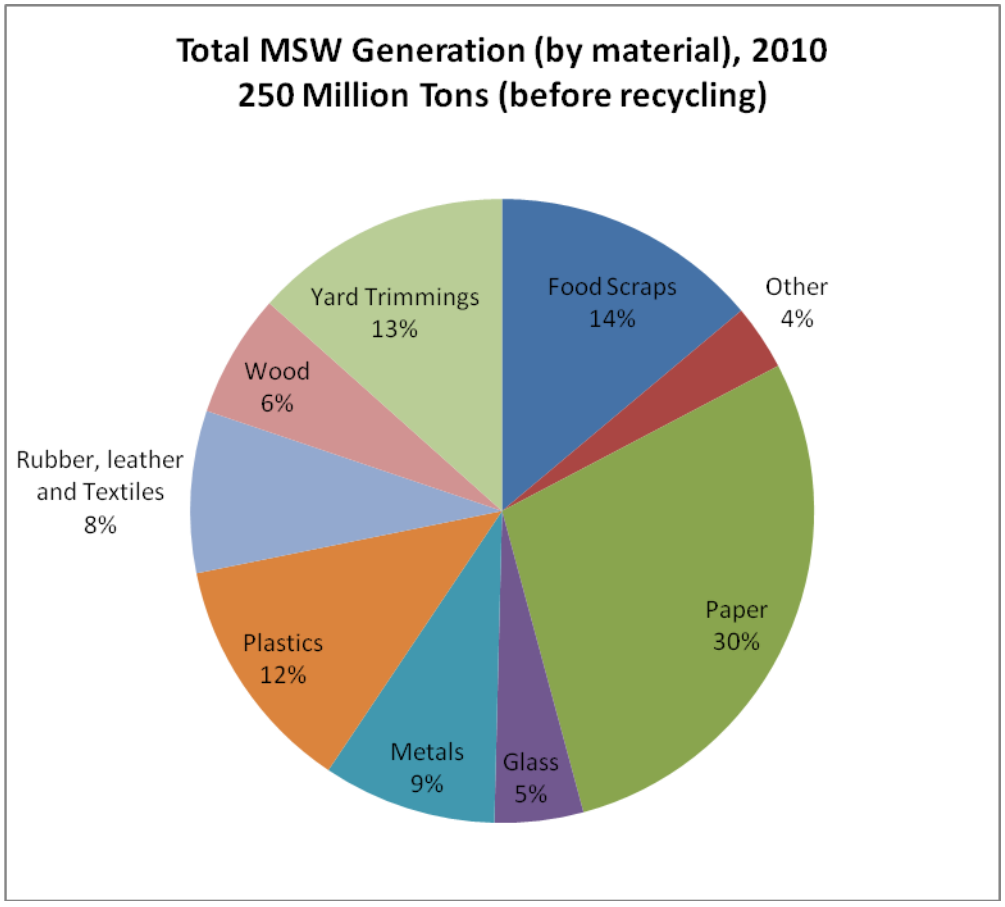
Waste Disposal in Kentucky

Some method of waste disposal has been a necessity throughout mankind's existence. However, in earlier ages, because of lower population over the earth's surface, nature was able to recycle mankind's waste, rendering it into reusable material and nutrients for plant growth. With the advent of industrial society and concentration of populations in cities and towns, along with the increased production of paper and packaging materials, mankind has created a solid waste disposal problem. As a result, alternatives and new ideas for solid waste treatment and disposal must be considered.

Results from the 2010 U.S. EPA survey (see Figure 1.1 below) suggest several alarming statistics:

- In general, three to five pounds of solid waste are generated nationally per capita per day.
- In Kentucky, it has been estimated that residential and commercial waste generated is **4.67 pounds per capita per day**.
- A community with a population of 40,000 would generate over 93 tons of waste per day or 34,000 tons per year.
- Each county in Kentucky has developed a solid waste management plan with the goal of **reducing by 25% the amount of solid waste annually going to landfills**.
- Composting is one important means to achieve this goal for wastes that are naturally biodegradable.
- Yard trimmings and food residuals together constitute 27 percent of the US municipal solid waste stream. That's a lot of waste to send to landfills when it could become useful and environmentally beneficial compost instead.

Figure 1.1. Municipal Solid Waste Generation in the United States



Source: *U.S.EPA, Municipal Solid Waste Generation, Recycling, and Disposal in the United States: Facts and Figures for 2010.*

Reasons to Compost

By Kentucky statute, **composting** is defined as the biological decomposition of organic solid waste under controlled aerobic conditions. Composting is an important option for waste disposal since reuse, in the form of compost, is the result. Since as much as **70% of the waste stream may be compostable**, this option can significantly reduce the amount of waste going to landfills. Thus, composting is one viable aspect of waste management with positive environmental results.

Compost (the product) may be used as

- Mulch
- Soil amendment
- A minor source of nutrient addition.

The use of **compost as mulch** may be the largest single use and it has many benefits.

- Placing the compost around shrubs, trees, flowers, and garden plants as mulch provides a means of reducing runoff through higher percolation and higher water holding or water retention capacities.
- By **increasing** water infiltration and retention in the soil, erosion is **reduced**.
    - Eroded soil is the number one pollutant in waters in Kentucky and in the nation.
- Mulch also reduces the amount of water evaporation by restricting the amount of sunlight reaching the soil thus cooling the soil surface.
    - This cooler soil surface reduces the evaporative rate and loss of water resulting in less frequent watering.
- During times of extended drought or high temperatures, the mulch may even prevent plant death.
- A layer of organic mulch will also reduce competition from weed growth.

Compost may also be incorporated into the soil as a **soil amendment**.

- Mixing compost into the soil increases pore space allowing increased water permeability and aeration.
    - Both result in an enhanced environment for plant root growth.
- As incorporated material continues to undergo further decomposition, the fertility of the soil may be enhanced.
- Most organic waste does not have large quantities of nutrients, but compost does have the advantage of releasing nutrients slowly.
- Compost has also been shown to suppress some common plant diseases.

Composting also preserves landfill space for wastes that cannot be recycled or easily biodegraded. The elimination of yard waste from the landfill can significantly reduce the municipal waste stream. Many communities understand this opportunity and have banned leaves and grass clippings from landfills. Yard waste is probably the most easily compostable material and the most logical waste for communities to initially divert from landfills. As yard waste and other materials are diverted from landfills to composting, tipping fees are often reduced for those materials.

Composting offers the obvious benefits of **resource efficiency** and creating a **useful product** from organic waste that would otherwise have been landfilled. Only operators that are certified by the Kentucky Division of Compliance Assistance, Certification and Licensing Branch can be in responsible charge of a composting facility. It takes knowledgeable, conscientious people to address the broad array of concepts critical to successfully managing composting programs.

Compost Operator Certification

All permitted composting facilities must have at least one certified operator. The Division of Compliance Assistance (DCA) is responsible for the certification of composting operators. Certification is obtained by:

- Meeting minimum education and experience requirements
- Submitting the appropriate forms and fee
- Passing the certification examination with at least a 70%

No person shall be eligible for examination for certification unless that person completes the appropriate training course provided by the cabinet, unless the Cabinet accepts an alternative training program. The regulations (which are described in detail in Chapter 2) require that an individual seeking composting certification shall have a High School Diploma or GED **and** one (1) year of acceptable operation of a landfarming or composting facility.

If an applicant does not meet the education and experience requirements, the cabinet may consider substitutions.

Certification Renewal or Maintenance

- A certification shall be issued for a period of five (5) years at the end of which the certification shall expire (unless revoked).
- Renewal procedures and requirements shall be the same as those for a new certification.
- Certificates shall be prominently displayed at the facility office and the certified operator shall be able to present their wallet card and/or certificate during an inspection.

Standards of Professional Conduct for Certified Operators

In order to safeguard the life, health, and welfare of the public and the environment and to establish and maintain a high standard of integrity in the certified operator profession, standards of professional conduct apply to persons certified in accordance with solid waste regulations (401 KAR 47:070) or special waste regulations (401 KAR 45:090). The cabinet may revoke the certification of an operator if it is determined that the operator:

- Has practiced fraud or deception;
- Has failed to perform his duties as required by state regulations;
- Has failed to use reasonable care and judgment in performance of his duties under state regulations; or
- Has knowingly or willfully violated the requirements of any state or federal regulation.

Individuals who have had their certification revoked shall be ineligible for future recertification.

This chapter presented an overview of the requirements and certification processes for compost operators, the Kentucky regulations relating to the certification requirements for solid and special waste operations, and the importance of professional conduct for certified operators. The next chapter will describe the regulatory framework associated with composting in Kentucky, identify the waste types and associated permits, and explain the permitting process.

Study Questions –Chapter 1

1. _____ pounds of solid waste is generated nationally per capita per day.
   a. 1 to 2
   b. 3 to 5
   c. 7 to 10
   d. 12 to 15

2. Solid waste includes household, commercial, and industrial waste.
   a. True b. False

3. The Commonwealth of Kentucky has as its policy the reduction of solid waste disposed through
   a. Reuse
   b. Recycling
   c. Composting
   d. All of the above

4. Upon adequate completion of the examination, compost operators will be certified for a _____ year period.
   a. One
   b. Two
   c. Five
   d. Ten

5. If DCA determines that a certificate was obtained by fraud; that the certificate holder failed to perform required duties; or failed to use reasonable care and judgment during the performance of duties, the certificate may be revoked.
   a. True b. False

6. Non-compostable solid waste includes items such as _____.
   a. Yard waste
   b. Glass
   c. Sewage sludge
   d. Paper

7. Yard waste makes up _____ percent of an average community's garbage.
   a. Two
   b. Five
   c. Thirteen
   d. Twenty-five

8. By Kentucky statute, composting is the biological decomposition of organic solid waste under:
   a. Anaerobic conditions
   b. Aerobic conditions
   c. Controlled conditions
   d. b and c

9. The process of mixing organic waste into the soil tends to _____ pore space allowing _____ water permeability and aeration.
   a. increase, increased
   b. increase, decreased
   c. decrease, decreased
   d. decrease, increased

10. Most organic waste does not have large quantities of nutrients.
   a. True b. False

11. Compost has not been shown to suppress plant diseases.
   a. True b. False

12. _____ is probably the most easily compostable material.
   a. Sewage sludge
   b. Paper
   c. Yard waste
   d. Metal

Chapter 2: REGULATION OVERVIEW AND PERMITTING PROCESS

Chapter 2 Learning Objectives

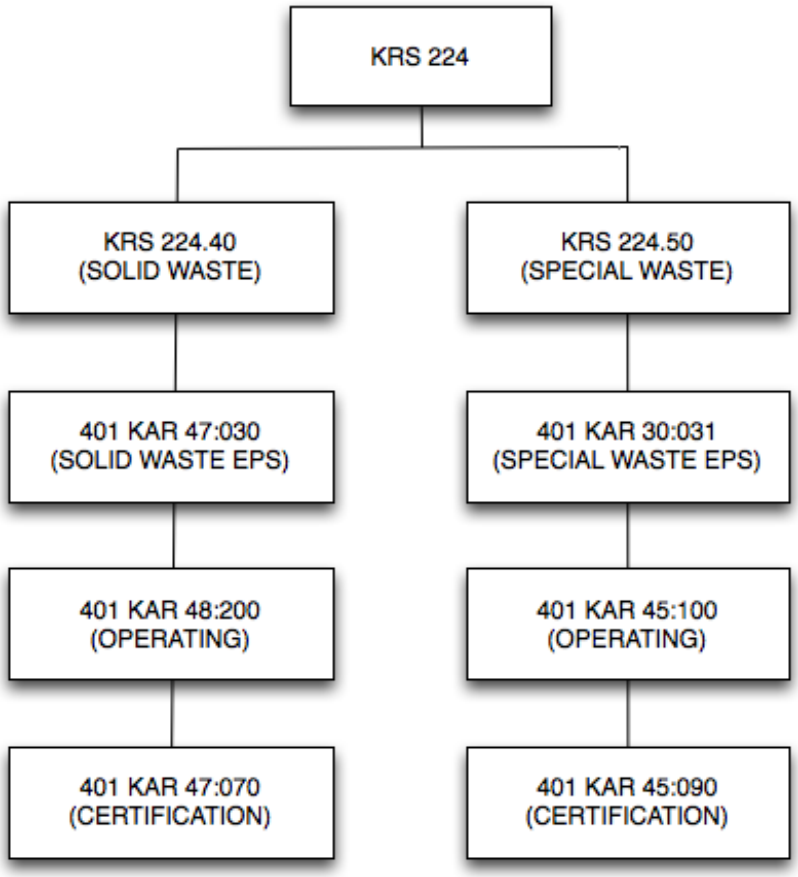
1. Understand the regulatory framework associated with composting in Kentucky.
2. Distinguish between solid and special waste types.
3. Understand the general permitting processes associated with solid and special waste types.
4. Explain the regulations associated with both solid and special waste composting facilities.
5. Understand the type of permit required for the different types of material being accepted.
6. Explain requirements of solid waste Registered Permit-by-Rule sites.
7. Know the steps in the application process.
8. Differentiate between type A and type B facilities.
9. Understand additional permit requirements.

Understanding the laws and regulations associated with composting and waste management can be confusing. Everything begins with the laws that are also referred to as the Kentucky Revised Statutes (KRS). The terms "laws" and "statutes" are frequently used interchangeably. The Kentucky laws (KRS) are established by the Legislature. The laws that pertain to composting and waste management are specifically contained in KRS 224 that authorizes the Cabinet to develop regulations that govern composting facilities and requires operator certification.

The Energy Environment Cabinet has developed Kentucky Administrative Regulations (KAR) to respond to the legal mandates outlined in KRS 224. The Kentucky Administrative Regulations (KAR) provide specific details related to each of the general requirements stipulated by Kentucky Revised Statutes (KRS).

The foundation of the regulations for managing solid and special wastes, developed by the Cabinet, is the Environmental Performance Standards (EPS). These standards provide the "commandments" for protection of human health and the environment in Kentucky. The EPS contain standards pertaining to groundwater and surface water protection, disease control, odors, soil contamination, etc. These standards apply to any solid or special waste facility in Kentucky including composting facilities. Figure 2.1 provides a graphical representation for understanding the Kentucky Regulatory Framework—beginning with Kentucky Revised Statutes (KRS) related to solid and special waste and moving through to Kentucky Administrative Regulations (KAR) and related Environmental Performance Standards (EPS).

Figure 2.1. Kentucky Regulatory Framework



With a working understanding of the regulatory framework, we can move to a discussion of the different types of waste and the regulations pertaining to each.

Waste Types

In general, waste is categorized as either hazardous or non-hazardous. Non-hazardous wastes are further broken down into (a) solid waste and (b) special waste. Because hazardous waste is not suitable for composting, the remainder of the training will focus on **solid waste** (including food waste and yard waste) and **special waste** (including water and waste water treatment sludges) and the regulations associated with each type of waste. Specific statutory definitions are included in the Glossary.

Operators must manage their waste in a manner consistent with federal and state laws that protect human health and the environment. While it goes beyond the scope of this manual to address all of the specific regulations, it is important that all operators understand the general permitting processes associated with both solid and special wastes. The permitting process is described below.

Permitting Process

The permitting process for operation of a composting facility differs for solid waste and special waste composting facilities. **Solid waste** composting facilities, which handle materials such as manure and yard waste, require a **Registered Permit-by-Rule. Special waste** composting facilities, which compost sludges, are required to obtain a **Full Permit.** Each of the permitting processes is described below.

Solid Waste Permitting Process

Solid waste composting facilities must register with the Division of Waste Management by completing and submitting an application form (DEP 7059A) for a Registered Permit-by-Rule for a Solid Waste Composting Facility. The application process begins with a public notice (401 KAR 47:110). **The operation must comply at all times with the Environmental Performance Standards set forth in 401 KAR 47:030** (see Appendix for Complete EPS). The registrant must also ensure that the operation complies with any local land use regulations and/or zoning ordinances. A permit from the Division of Waste Management does not relieve the permittee from the responsibility of obtaining any other permits, licenses, or approvals required by this Division or other state and local agencies.

While an operator may commence operations after five business days (after submittal to the Cabinet), registrants often prefer to wait to begin operations until the state responds to their registration with written approval (in order to avoid the possibility of receiving a notice of violation due to critical omissions in the application). There are no permitting fees for municipal and county government facilities for this type of registration. Application fees for private facilities as well as annual renewal fees are stipulated in 401 KAR 47:090. A public meeting may occur if the Division receives a request for a meeting because of the public notice. Additionally, any person who feels they are aggrieved by the operation of the compost facility may petition the Division to demand a hearing that could result in modification or revocation of the registration. Therefore, the applicant may want to consider conducting a public meeting if it is thought that the proposed operation might be controversial to the public, even if the Division does not initiate such a meeting.

Once the application for a registered permit-by-rule is reviewed by the Division, and found to be complete, the registrant will be issued a registration number. Quarterly and annual reports are required to be submitted to the Division. Quarterly and annual reports must be on a form approved by the Division (DEP 7108).

The registrant may make modifications to the approved registration, such as adding an additional source of material, by submitting a revised registration to the Division. The Division may also make modifications after approval if such modifications are determined necessary to provide adequate protection to human health and the environment. A solid

waste composting permit lasts for the life of the facility unless revoked. When the facility is no longer in operation, the permittee must send a request to the Division for closure.

Special Waste Permitting Process

Special waste composting facilities must obtain a ***full* operating permit**. The facility must apply for the permit in two phases:

1. The first phase is to complete and submit a Notice of Intent to Apply for a Landfarming or Composting Permit form (DEP 7021A)
2. The second phase is to complete and submit an Application for a Special Waste Composting Facility Permit form (DEP 7094D) and a Past Performance Information form (DEP 7094J).

1. Notice of Intent

The Division will review the Notice of Intent to Apply and notify the applicant that the facility is deemed to be either a Type A or a Type B facility. The distinction between Type A and Type B facilities are determined by:

- The anticipated volume of waste to be processed
- The concentration of parameters in the special waste to be processed.

Type A facilities have a higher concentration of listed parameters and volumes. These requirements are found in 401 KAR 45:100, Section 2. Type A facilities are subject to provisions for public participation during the permitting process; posting of financial assurance (for privately owned facilities only); surface and groundwater monitoring in accordance with 401 KAR 45:160; and the post-closure requirements of 401 KAR 45:100, Section 4.

Type B facilities have lower concentrations of the listed parameters and volumes. Regulatory requirements for Type B facilities are not as extensive as Type A facilities, but still require a Notice of Intent and Formal Application prior to beginning construction and/or operation.

KRS 224.50-760 requires any facility composting wastewater treatment sludge or water treatment sludge, whether Type A or Type B, to publish a public notice. KRS 224.50-760 also defines composting of wastewater or water treatment sludge as an industrial process, meaning such a facility must locate in an industrial zone. Applicants must investigate local zoning ordinances to ensure no violation will occur due to the location of the compost facility. Cities, counties, public and private schools, and special districts (as defined by KRS Chapter 65) are exempt from the industrial zoning requirement.

2. Application for a Formal Permit

When the Division completes its review of the Notice of Intent and makes a determination on the waste classification, the applicant shall then submit forms DEP 7094D and DEP 7094J. After being notified by the Division that the application is complete, the

permit applicant shall publish a public notice supplied by the Division. This notice shall be published in a daily or weekly local newspaper, of major circulation, where the proposed facility is to be located. This applies to all Type A and Type B permit facilities where the special waste to be composted is water or wastewater treatment sludge.

The Division now begins the technical review of the application. Upon completion of the technical review, a final determination is made by the Division to issue a draft construction permit or a notice of intent to deny. Type A facility applicants will be required to publish a second public notice at this time. The particulars of the public information procedures are found in 401 KAR 45:050.

After the close of the public comment period, the Division shall issue a final permit decision to issue or deny the construction permit. Once construction is completed, the Division will verify certification that all specifications for construction have been met. At this point, Type A, privately owned facilities will be required to post financial assurance for closure as specified in 401 KAR 45:080. Publicly owned facilities will be required to submit an approved budget that demonstrates the required funds for closure have been secured. Type A facilities must also post financial assurance for post-closure. The estimates for closure and post-closure are calculated based on criteria established in 401 KAR 45:080, Sections 2 and 3. Financial assurance for closure and post-closure must be submitted to the Division on approved forms.

Once financial assurance has been posted with the Division and the applicant has submitted the required fees, a construction/operation permit is issued. Construction/operation permits shall be effective for a fixed term not to exceed ten years.

3. Permit Review and Renewal

The Division shall review the conditions of the permit after five years and modify the permit as necessary. An application to renew a construction and/or operation permit shall be submitted to the Division at least 180 days before expiration of the permit. Persons applying for renewal of a permit shall use the Application for the Renewal of a Formal Permit form (DEP 7095).

4. Closure

After permanently ceasing to accept waste at a Type A or Type B composting facility, the closure report as specified in 401 KAR 45:100 Section 4 shall be submitted to the Division.

Type A facilities shall commence a two-year post-closure monitoring and maintenance period starting the first day after the facility permanently ceases accepting waste. The owner or operator shall conduct groundwater and surface water monitoring as required by the facility's approved groundwater and surface water monitoring plan, and the terms of the operating permit. Type B facilities are not subject to the post-closure requirements.

At the conclusion of the two-year post-closure period, the permittee shall submit a certification that post-closure is complete and that the site or facility complies with all post-closure requirements. Any environmental remediation or corrective action for groundwater contamination shall be performed by the permittee before the Division certifies the composting facility's post-closure. Upon certification, the Division shall release the financial assurance bond.

Additional Permit Requirements

Other permitting standards for special waste permits include modification, suspension, revocation, and transfer of permits. Guidelines for these actions are found in 401 KAR 45:040.

All compost facilities are subject to the stormwater monitoring requirements of 401 KAR Chapter 5. Construction of ponds requires either a KPDES (Kentucky Pollutant Discharge Elimination System) permit or a KNDOP, (Kentucky No Discharge Operational Permit). The Kentucky Division of Water should be contacted for information on these requirements.

Effective August 24, 1995, anyone engaged in activities that have the potential to pollute groundwater is required to develop and implement a Groundwater Protection Plan (GPP). This applies to all commercial businesses, municipal, county, and federal governments, and private citizens. Activities associated with composting operations and the land application of solid and special waste also require the development and implementation of a GPP. Additional information related to GPPs is located in the Appendix. The KY Division of Water should be contacted for information on these requirements

Study Questions –Chapter 2

1. A solid waste composting facility is required to obtain a _____.
   a. Permit-by-Rule
   b. Registered Permit-By-Rule
   c. Notice of Intent
   d. Formal permit

2. Pond construction at a facility requires what kind of permit from the Division of Water?
   a. LOW
   b. NOV
   c. KPDES
   d. FLOW

3. What kind of special waste composting facility composts waste with higher metals levels?
   a. Type A
   b. Type B
   c. Type C
   d. None of the above

4. Solid waste composting facilities are not required to comply with the environmental performance standards.
   a. True b. False

5. What kind of special waste composting facility does not have post-closure requirements?
   a. Type A
   b. Type B
   c. Both Type A and B
   d. None of the above

Chapter 3: ESSENTIAL COMPONENTS OF COMPOSTING

Chapter 3 Learning Objectives

1. Understand the types and components of solid and special waste.
2. Comprehend the biological processes associated with composting.
3. List the essential components needed for controlling decomposition.

Introduction

Composting is a biological process influenced by the basic conditions that affect all living beings. By Kentucky statute, composting involves the biological decomposition of organic materials in **controlled** aerobic conditions.

- **Controlled** distinguishes composting from the natural rotting, putrefaction, or other decomposition that takes place in an open, unmanaged condition.
- **Aerobic** means that composting must occur in an oxygenated environment
    - As opposed to anaerobic decomposition, which occurs when materials are flooded with water or otherwise deprived of oxygen.
- The term **biological** distinguishes the process from chemical and physical treatment.
- The term **decomposition** is used because the composting process is rarely carried to complete **stabilization**, meaning no further breakdown of materials will occur.
- The term **organic** describes materials of a carbon source that are capable of being broken down biologically.

The composting process is directly dependent upon the well-being of the microorganisms, which do the majority of the biodegradation. Air, water, temperature, particle size, and pH are all important environmental factors in composting. Each of these factors is discussed below.

Microorganisms

The microorganisms that readily decompose or compost organic materials are naturally occurring throughout nature, including in the waste material. The microbes responsible for composting are in two main classes: **bacteria** and **fungi**.

The bacteria responsible for decomposing organic matter aerobically come from many different genera. These include *Bacillus* and *Thermus*, among others.

Bacteria are:

- Mainly responsible for decomposing materials such as leaves and grass clippings, which are referred to as “greens” in composting
- Usually present throughout the various stages of composting
- Generators of byproducts that are the sticky organic compounds responsible for binding soil particles together into stable aggregates.

Actinomycetes are:

- A special kind of bacteria that form long filaments
- More common in the latter stages of composting
- Capable of tolerating a drier environment, and

- Release compounds that give finished compost the characteristic "earthy" odor.

Fungi:

- Appear in the later stages of composting.
- Like actinomycetes, they also form threads easily visible in the compost, which are called **hyphae**.
- Both fungi and actinomycetes bind soil particles together with their mesh-like growth forms.
- Fungi are responsible for breaking down materials that are harder to decompose, such as woody materials and thick, leathery leaves.
- The rate of composting for woody materials begins to slow above 130^{o} F, however, and fungi will **not survive** at temperatures above 140^{o} F.

The microbe populations may double several times per hour when favorable conditions exist (Table 3-1) resulting in accelerated organic matter decomposition. This decomposition, actually the metabolism of a food source for the microorganisms, results in the generation of heat. Thus, the temperature of the composting material will rise, which is the most obvious indicator that composting is occurring.

Table 3-1. **Optimal Composting Conditions**

Oxygen	5 to 20%
Moisture	40 to 60%
Carbon:Nitrogen Ratio	25:1 to 40:1
Temperature	90 to 140° F (32 to 60° C)
pH	6 to 8

Aeration

Composting can either be carried out **aerobically** (with oxygen) or **anaerobically** (without oxygen). **Most conventional composting methods use the aerobic process in which oxygen is essential** (Table 3-1). For the purposes of the certification training, anaerobic composting will not be discussed.

- Air contains about 21% oxygen and microbes need at least 5% oxygen in the thin films around them to remain active.
- When oxygen levels go below 5%, the oxygen-requiring microbes shut down and other microbes not requiring oxygen (anaerobes) begin to multiply.

Aerobic composting is characterized by:

- High temperatures
- The absence of foul odors
- A more rapid composting process (as opposed to anaerobic processing)
- **Kentucky statutes consider only aerobic processes to be composting.**

Oxygen is added to the composting materials either by passive or active means. If the pile size remains small to moderate (5-10 feet tall) and particle size is medium to large, fresh air can passively diffuse in from outside the pile. Materials such as grass clippings must be placed in smaller piles or windrows, or have a significant amount of "bulking agent" to create larger pores to allow passive movement of enough oxygen into the decomposing materials (see Table 3-2).

Table 3-2. Densities of Yard Wastes

Material	**Condition**	**Typical Density (lbs./cu yd)**
Brush and dry leaves	loose and dry	100
Leaves	loose and dry	200-260
Leaves	shredded and dry	250-450
Green grass	compacted and moist	500-1100
Green grass	loose and moist	350-500
Yard waste	as collected	350-930
Yard waste	shredded	450-600
Sewage sludge	very moist	1100-1700
Wood chips	variable	400-650

Air is also pulled into the pile via the chimney effect (see Figure 3-1).

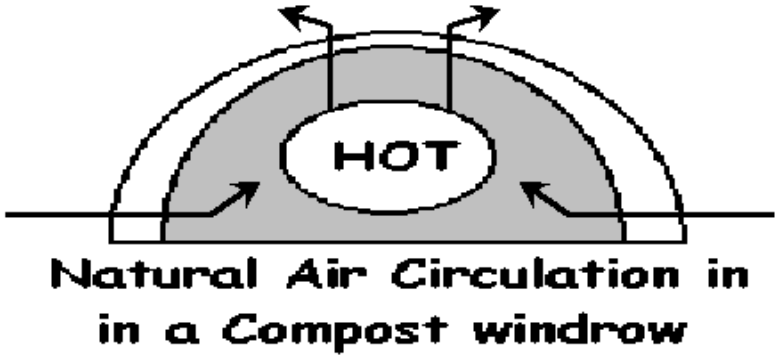


Figure 3-1 Air Circulation Through a Compost Windrow

One method to actively manage the oxygen in a compost pile is to regularly turn or mix the materials. The frequency of turning or mixing depends on the internal temperature of the material, the outside temperature, and the need to provide enough oxygen to the material. The first turning should occur when internal temperatures reach 140-150^{o}F following a steady temperature increase. However, if the internal temperature "peaks" or levels off at 100-120^{o}F before the first turning or mixing, the pile should be turned immediately to avoid going anaerobic as oxygen may be limiting. As the number of turnings increase, the peak temperature reached, after each turning, may be lower than the previous peak temperature. Also, as the number of times the material is turned or mixed increases, the particle size becomes smaller making it more important that close attention be given to temperature and aeration.

The most common complaint of neighbors to compost operations is offensive odors, which can occur when the process goes anaerobic. Once the process goes anaerobic, the compounds produced take a long time to be converted back to aerobic conditions to make a desirable product. When anaerobic-type odors are released during the composting process, this usually indicates poor management.

Temperature

The activity of biological systems is temperature sensitive. Up to a point, as temperature increases, activity also increases. Consequently, composting rates are determined, at least partially, by the temperature within the pile or windrow. Table 3-1 suggests the **optimum temperature is between 90^{o} F and 140^{o} F**. As the temperature approaches 140^{o} F, fewer microorganisms can tolerate those temperatures and composting rates will decrease.

The **size** of the pile or windrow and **porosity** of the material determine how readily heat escapes. Larger windrows and smaller particles provide greater insulating effect and slower heat loss. Figure 3-1 shows general temperature zones in a windrow. "Turning" the composting material permits the excessive heat from the center to escape. After turning the composting material, the temperature will start to rise again. When only a slight heat increase (10^{o} F above atmospheric temperature) or no increase in windrow temperature occurs after several times of turning, *and* if all other environmental factors are favorable, stabilization of the compost has likely occurred. At this point the compost is mature and ready for distribution and use.

Moisture

Adequate moisture levels in the composting material are another necessary component of efficient composting. Biological systems require adequate moisture or a moist environment. When the material is too dry:

- Microbial population expansion will be slow
- Temperature will not rise as quickly
- Composting will proceed more slowly

On the other hand, excess water or moisture in the material reduces the aerobic microbial population. Also, some of the excess moisture fills pore spaces between the particles, which restricts normal passive flow of oxygen into the material and promotes the more rapid development of anaerobic conditions. This suggests that more **attention must be given to managing aeration and temperature during the early stages of composting.**

The balance between adequate moisture and aeration is an important management consideration. Combinations of materials that include significant amounts of paper products may need to start the process at 65% moisture. Composting mainly non-woody yard waste, a mixture of leaves and grass clippings, may not need an addition of water in a humid climate such as Kentucky's. Conversely, woody material will very likely need additional moisture, unless freshly cut, as it tends to contain less moisture upon delivery and is very porous. Porous materials often dry faster, especially in warmer weather. This drying can be reduced by the addition of finer materials (leaves, grass clippings, or sewage sludge). These finer materials not only reduce the rate of drying, but also help the total mixture retain moisture for a longer period.

Carbon: Nitrogen Ratio

The two most important nutrients needed for microbes to grow and reproduce are **carbon** and **nitrogen**. Carbon (C), the building block of materials such as sugars and carbohydrates, is a dominant element in cellulose materials such as paper, wood, branches, some plant residues, and leaves. These materials are often referred to as "browns." The microbes in the compost pile obtain energy by breaking down these substances and releasing carbon dioxide. If the carbon is in a form that is difficult to decompose, such as lignin from

wood or paper, the rate of stabilization will be slow. Freshly-cut green wood is an exception as the sugars in the sap are more available to microbes thus allowing more rapid composting.

Nitrogen (N), found primarily in proteins, is necessary for the development of microbial proteins that balances the carbon for rapid growth and expansion of microbial populations to ensure a reasonable rate of composting. The nitrogen content of organic materials is often the most limiting factor in composting. Nitrogen content is high in: grass clippings, sewage sludge, animal manures, and some food waste. Materials high in nitrogen are also known as "greens."

Understanding the importance of the carbon to nitrogen (C:N) ratio and knowing the C:N ratio of various materials for composting enables optimum composting conditions. Consequently, the concept of the C:N ratio must be understood if composting is to be successful in recycling some of the waste stream. For optimum composting, the C:N ratio should be in the range of 25-40:1 (Table 3-1). Keeping the range in the low 30's is more beneficial when starting the composting. If the total C:N of the material in the piles or windrows is less than 20:1, ammonia volatilization will occur. The microbes release the extra nitrogen as ammonia in the process of breaking down the carbon containing materials which can generate odor. As the C:N moves toward 40:1, the microbes may slow slightly until the excess C has been oxidized. Generally, supplying C and N at the suggested ratio ensures that other nutrients will be available to the microbes in the correct amounts.

Estimates for some materials are contained in Table 3-3. Keep in mind that these values will vary. For example, grass clippings from highly fertilized lawns will have lower ratios of carbon to nitrogen, and unfertilized lawns will have higher ratios. In addition, C:N ratios in leaves from some hardwoods (oak) will be higher than from some other trees (maples).

Blending of lower C:N materials with higher C:N materials can be necessary to avoid composting problems and to speed decomposition. Sawdust or finely ground wood can be combined effectively with an appropriate amount of grass clippings, sewage sludge, or animal manure to optimize the C:N ratio. When using sawdust in composting, the high C:N ratio of wood should be taken into account when estimating C:N of the total mixture.

The addition of commercial sources of fertilizer nitrogen may be used to lower the C:N ratio if low C:N materials are not available. This may significantly add to the composting cost, and may not be acceptable for some "organically" inclined gardeners or homeowners. As an example, mixing leaves with a high nitrogen waste, such as grass clippings, animal manure, or commercial nitrogen fertilizer will accelerate composting. Online compost calculators can be used to explore mixtures of materials that will give a C:N ratio of 30:1.

Table 3-3. Typical Carbon to Nitrogen Ratios of Compostable Materials

Sewage sludge: Activated	6:1
Poultry manure	6:1 - 10:1
Vegetable waste	11:1
Swine manure	13:1
Food waste	15:1
Sheep manure	16:1
Sewage sludge: Digested	16:1
Grass clippings	19:1
Cow manure*	20:1
Horse manure*	25:1
Fruit wastes	35-40:1
Leaves, fresh	37:1
Leaves, dry	47:1
Wheat straw	53:1
Newsprint	54:1
Corn stalks	60:1
Straw	80:1
Bark	100-130:1
Paper	170:1
Cardboard	378:1
Sawdust	450:1
Wood	600:1
* C:N ratio includes bedding	

Particle Size

Particle size of the materials to be composted influences the rate of composting. Small particles, which create a high surface area per unit of volume, allow the nutrients and energy to be more available to the microorganisms for successful, efficient composting. Shredding, chopping, and grinding create smaller particles, which expose more surfaces to microbial activity. Because these smaller particles may restrict passive airflow and increase oxygen demand of the microbes, finer materials need to be turned more frequently to prevent anaerobic conditions during composting.

The major problem with the absence of grinding, shredding, or chopping is the lack of a homogenous mixture. If a small particle material, such as sewage sludge, is mixed with a larger particle-bulking agent, grinding may not be necessary. When the rate of composting is not a critical issue, then more time can be allowed for composting larger particles. Unless the compost is screened, though, this will require a larger site for composting and delay the formation of uniform compost. Some compost facility operators have found that shredding leaves will reduce time required to produce stable compost. This shredding can occur as part of collection or it can be performed at the composting site.

pH

pH is an indicator of the acidity or alkalinity of the composting materials, and is measured on a scale of 0 (extremely acid) to 14 (extremely basic), with 7 being neutral. The composting process is most efficient when pH is between 6 and 8, which are normal values (Table 3-1). This factor can be very useful in diagnosing and correcting certain operating problems.

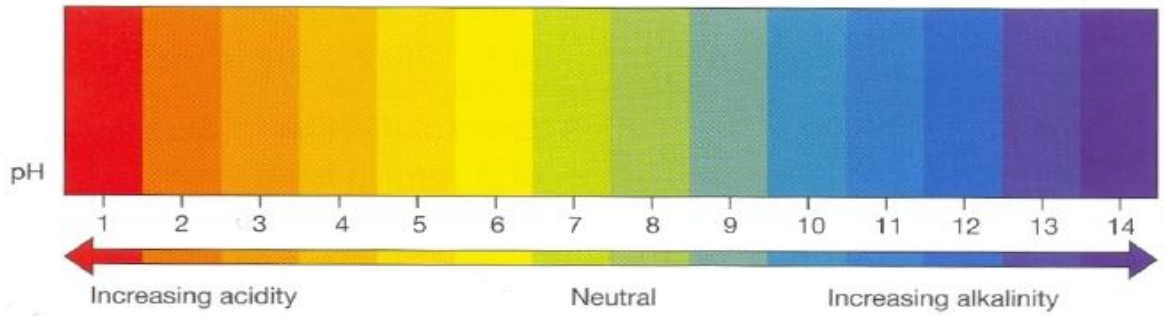


Figure 3-2 pH Scale

During the initial stages of decomposition, organic acids are formed that are normally consumed by the microbes. However, without sufficient oxygen available to the microbes, these acids will not be converted to usable carbon or carbon dioxide as quickly. Thus, excess acidity may lower the pH below 6, and in turn slow down the composting process. This is

more likely to happen when larger amounts of easily composted organic compounds are present such as undiluted animal manure or some green wastes. Extra aeration, through the use of more bulking agent or more frequent turning, will usually solve the problem. In extreme cases, it may be helpful to add some lime or other neutralizing agent to raise the pH back to a desirable range. It is also important to avoid raising the pH above 8, which can cause the release of odorous ammonia. If the starting materials were balanced for C:N, ammonia release in this instance may rob the composting process of sufficient nitrogen, which will slow the process. The final compost pH is an important factor in compost quality. Testing compost during decomposition or at the final stage can be very simple, and can be done on-site with a soil or plant media testing kit.

Study Questions –Chapter 3

1. The organisms responsible for most of the decomposition during composting are _____and _____.
   a. Beetles, earthworms
   b. Amoebas, nematodes
   c. Bacteria, fungi
   d. Earthworms, nematodes

2. _____ is the most obvious indicator that composting is occurring.
   a. An increase in temperature
   b. Liquid running out from the compost
   c. A rotten egg smell
   d. Animals digging into the compost

3. The optimum range for composting is _____ percent oxygen.
   a. 1 to 5
   b. 5 to 20
   c. 20 to 50
   d. 25 to 30

4. When the temperature of compost nears 140 degrees F, microorganisms begin to die off and composting decreases.
   a. True b. False

5. As moisture and compaction in the compost material increases, _____ decreases.
   a. Odor
   b. Particle size
   c. Aeration
   d. C:N ratio

6. _____, found primarily in proteins, is necessary for the rapid growth and expansion or microbial populations to ensure a reasonable rate of composting.
   a. Nitrogen
   b. Carbon
   c. Potassium
   d. Phosphorous

7. Carbon content is high in
   a. Woody materials.
   b. Sewage sludge.
   c. Food waste.
   d. Grass clippings.

8. An ideal ratio of carbon to nitrogen in materials to be composted is
   a. 5:1
   b. 30:1
   c. 100:1
   d. 400:1

9. Small particles have a high surface area, allowing more access for microbes and more efficient composting.
   a. True b. False

10. Materials with a small particle size need to be turned less frequently than those with a large particle size.
   a. True b. False

11. Knowing the pH of your compost is important because pH can influence
   a. The rate of composting.
   b. Generation of odors.
   c. Effects of finished compost of plants.
   d. All of the above.

Chapter 4: COMPOSTING METHODS

Chapter 4 Learning Objectives

1. List the different methods for composting.
2. Understand the advantages and disadvantages of the different composting methods.

Composting Methods

There are several different methods of composting organic materials. The three most common are windrow, static pile, and in-vessel. Of the three methods, windrow composting is the most common in the state of Kentucky. The methodologies vary in:

- Degree of technology used
- Attention necessary to monitor the operation
- Space needed for the active composting site
- Length of time available to obtain a finished product
- The ability or need to combine various materials

Because of the varying levels of management and technology, the costs associated with each method will vary significantly. In general, the lower the level of technology, the greater will be the need for available space, and the composting time will be longer. However, lower levels of technology will tend to have the lowest cost per ton of material processed.

Windrow Composting

One of the most common and economical methods of composting is windrow composting. When windrow composting, the material is placed in windrow approximately six to ten feet high and turned or aerated mechanically (see Figure 4-1). Front-end loaders or commercial windrow turners may be used to aerate and turn the material. Some commercial windrow turners may limit the windrow height to six feet or less. Many municipalities have found the windrow composting process attractive as it can be successfully performed with minimal capital investment.

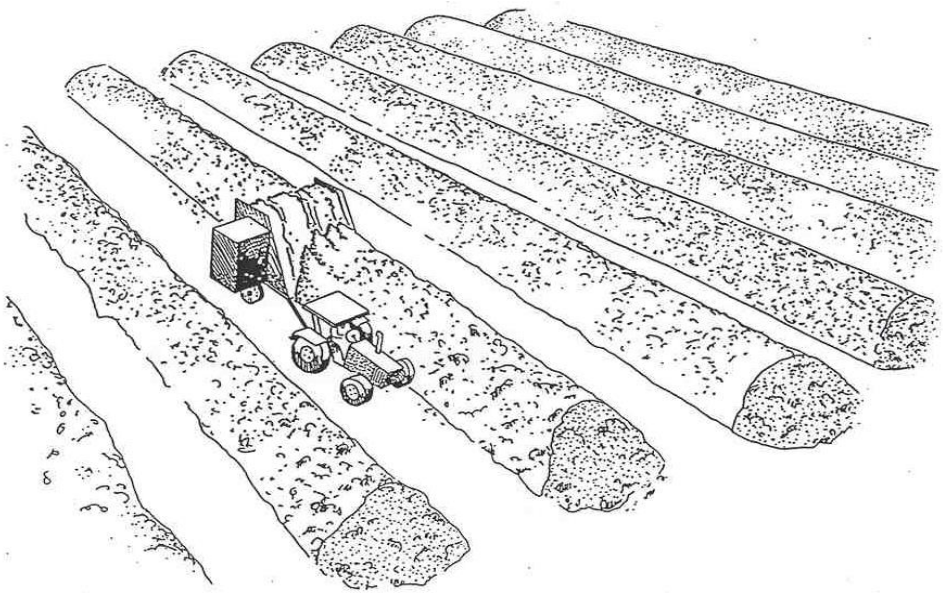


Figure 4-1 Windrow composting with an elevating face windrow turner.
Adapted with permission from On-Farm Composting Handbook, NRACS.

When compared to other methods, windrow composting requires lower capital investment and less effort. However, the time required to produce stable compost will vary considerably as a function of the materials being composted. With leaves, a marketable product can be produced within four to five months. Woody materials will require up to a year or more, but this can be reduced through the blending of materials with a lower ratio of carbon to nitrogen, i.e. sewage sludge.

There are very few complications associated with windrow composting. Windrow composting requires greater area and unless conducted on an impermeable all-weather pad, may result in groundwater contamination. Additionally, there may be difficulties operating equipment when areas are moisture-saturated. Slight odors may also develop during the windrow turning process as wetter or more compacted layers are exposed, but these can be kept to a minimum through frequent turning and other good management practices.

Static Pile Composting

Static pile composting is somewhat similar to windrow composting except aeration and cooling is accomplished by forcing or blowing air through the windrow rather than mechanically turning. Normally a blower or fan, controlled by timers or thermo-switches, will blow air through perforated pipe located under or near the bottom of the windrow. This air moves through the windrow and out the surface. This air replaces the oxygen used by the microorganisms and carries away some of the heat. Through static pile composting, it is possible to maintain nearly optimum conditions in the windrow at all times, thus speeding the composting process.

Another advantage of the static pile system is less space is needed as the windrows can be placed very close together. Some projects have found it desirable to use both the static pile system and the windrow composting system. The static pile is used for the first few weeks when the most rapid decomposition is taking place and thus the demand for oxygen is greatest. The material is then moved to an adjoining area for mechanical aeration for the balance of the composting period.

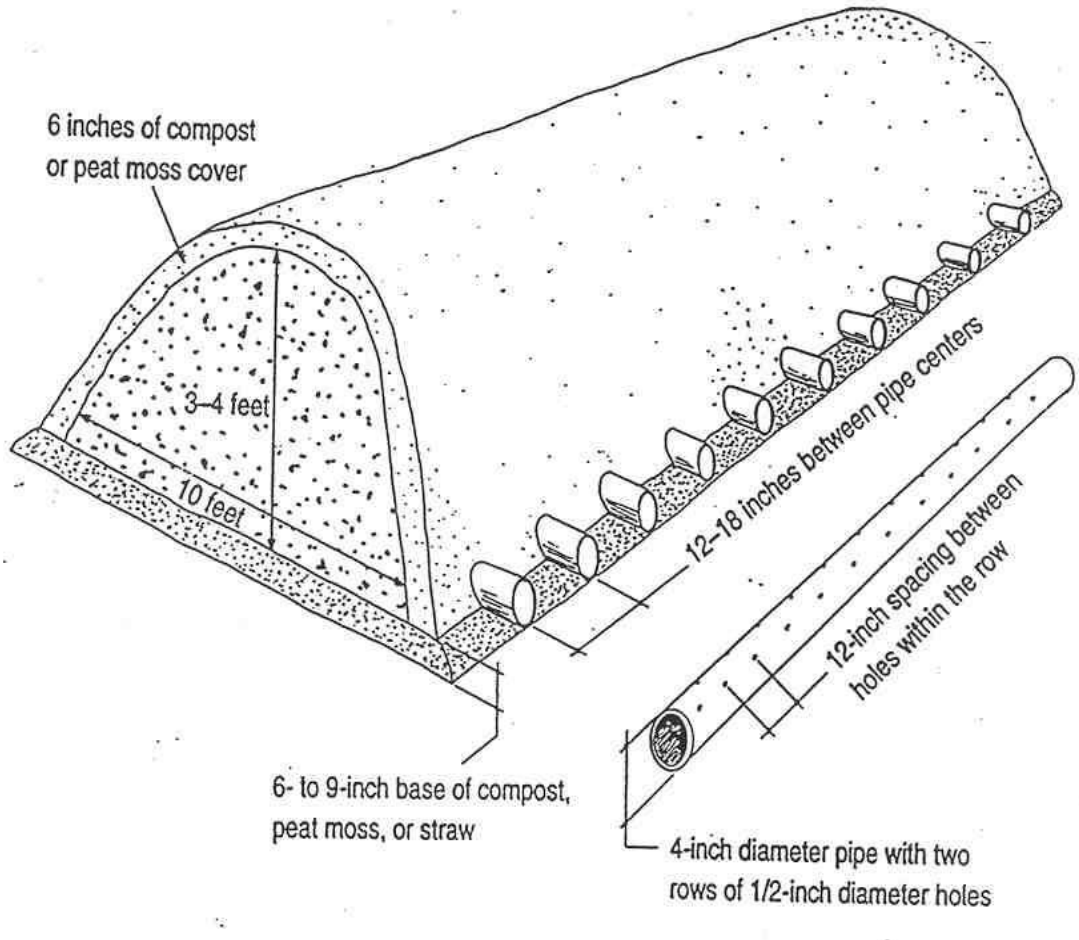


Figure 4-2 Passively aerated windrow method for composting manure.
Adapted with permission from On-Farm Composting Handbook, NRACS.

The major disadvantages of the static pile composting procedure are the need for:

- Increased management
- Dependence on electricity or another power source to operate fans and controls

Both of these will increase cost. Daily monitoring will likely be necessary even if materials are not being received or dispersed. The static pile system may be used under a roof or outside.

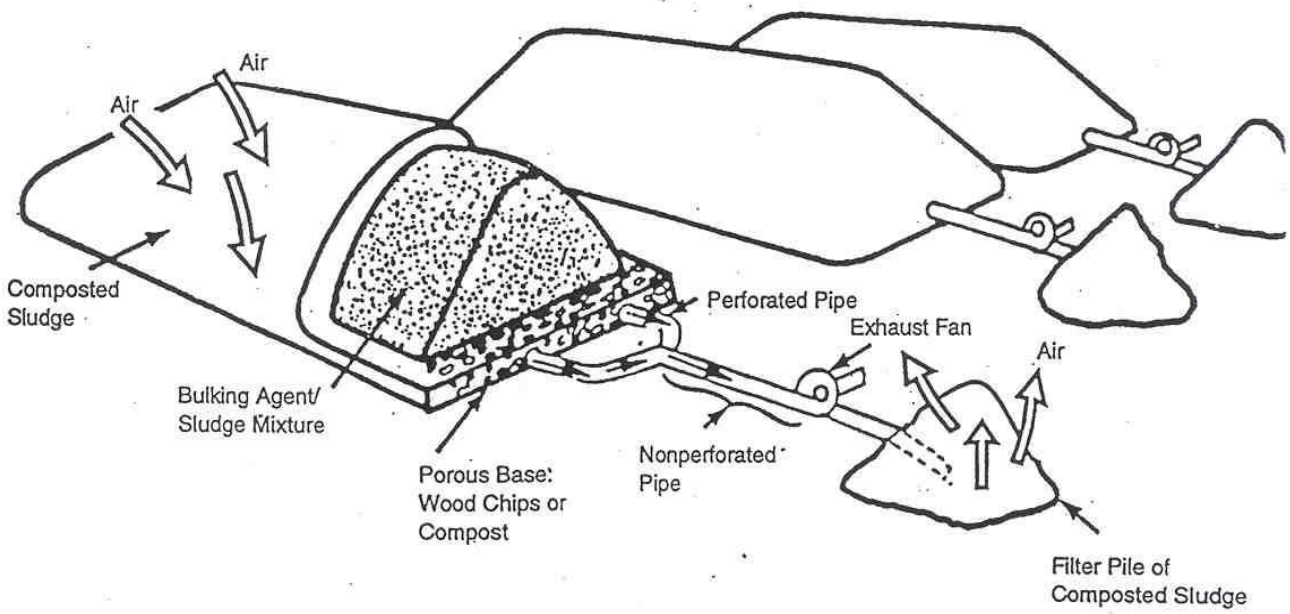


Figure 4-3 Static aerated pile composting
Adapted from Control of Pathogens and Vector Attraction in Sewage Sludge, EPA/625/R-92/013 December 1992

In-Vessel Composting

In-vessel composting includes a variety of systems involving mechanical agitation and forced aeration, and is normally enclosed within a building. An in-vessel system is capital intensive and requires high levels of technology and management. However, an in-vessel system may incorporate more automation and thus reduce hours of labor per unit of material processed. Such a system may not be economically sound for yard waste or separated municipal solid waste but may be appropriate when sewage sludge is part of the materials to be composted.

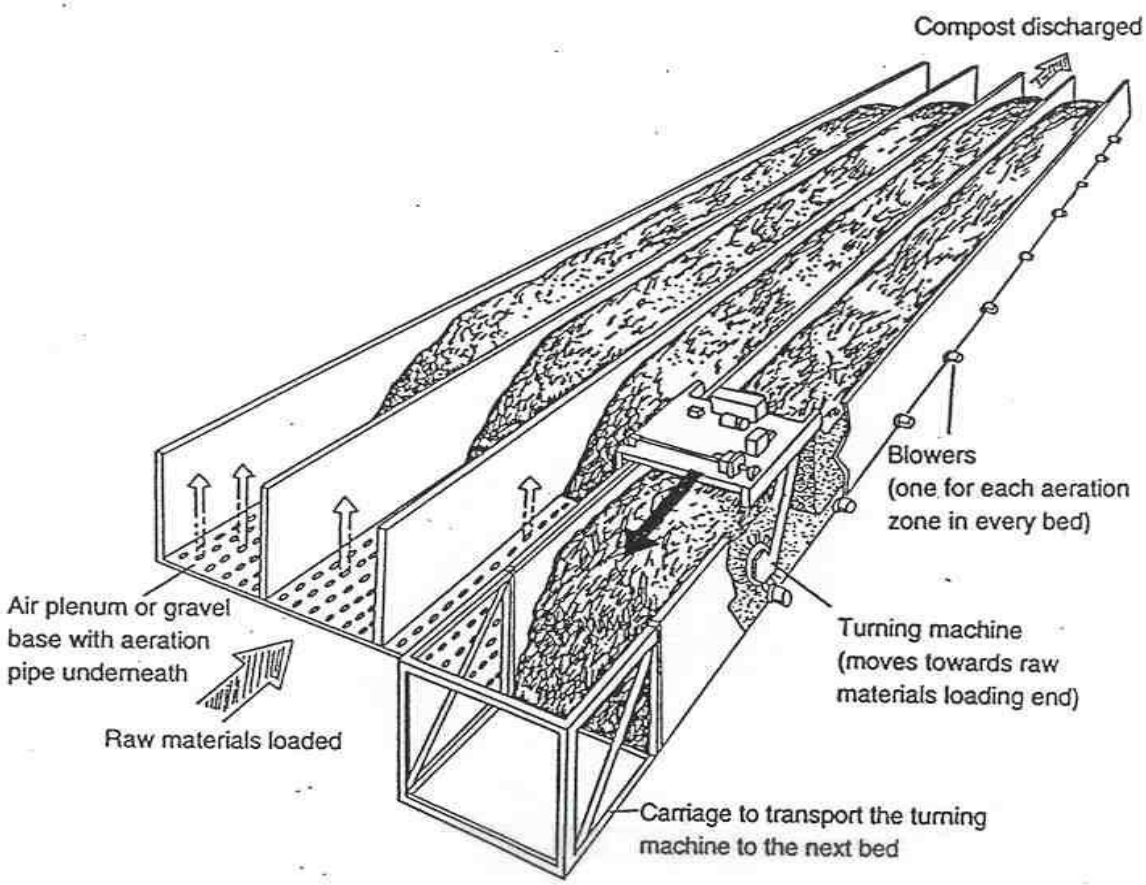


Figure 4-4 Rectangle agitated bed-composting system
Adapted with permission from Royer Manufacturing.

The major advantages of the in-vessel system are:

- The avoidance of weather problems
- Faster processing
- Better odor control
- Automation

Most in-vessel systems are designed and supplied by consultants and commercial suppliers.

With proper design and management, any of the above three composting systems are capable of processing yard waste, municipal solid waste, or special waste. The most appropriate process for any given community will be determined by:

- Available space
- Available capital
- Technical expertise
- Materials to be composted
- Federal, state and local ordinances

Study Questions –Chapter 4

1. One of the most economical methods of composting is _____ composting.
   a. Windrow
   b. Static pile
   c. In-vessel
   d. Anaerobic

2. When windrow composting, the materials is placed in windrows of approximately _____feet high.
   a. 2 to 4
   b. 6 to 10
   c. 15 to 20
   d. None of the above

3. Due to compacted layers or moisture within the pile, _____ may develop during the windrow turning process.
   a. Blowing dust
   b. Increased particle size
   c. Odors
   d. High temperatures

4. Forced air may be used to aerate composting materials.
   a. True b. False

5. A disadvantage to aerated static pile composting is that more space is needed compared to other methods.
   a. True b. False

6. Which of the following is not an advantage of in-vessel composting?
   a. Decreased cost
   b. Faster processing
   c. Automation
   d. Improved odor control

Chapter 5: OPERATING YOUR COMPOST SITE

Chapter 5 Learning Objectives

1. List the operational procedures involved in composting.
2. Explain the importance of each of the critical factors in the composting process to maintaining regulatory compliance as stipulated in the permit.
    a. C:N Ratio
    b. pH
    c. Porosity
    d. Moisture
    e. Temperature
    f. Aeration
3. Understand the potential problems associated with receiving, processing, and distributing composting materials.
4. Describe the marketing and uses of compost.

Introduction

It is often said that composting is both art and science. It can take years of experience to quickly recognize what actions need to be taken to keep the process fine tuned. But knowing the optimal conditions for composting before getting started can go a long way to ensuring that yours is a successful operation. Getting the right combination of materials into a mix before the process begins can save time and money, avoid environmental problems, and make sure your customers keep coming back for more. This chapter describes the basic considerations that go into producing a consistently high quality product.

Composting Operations and Procedures

As discussed in Chapter 4, there are several levels of technology available for composting projects (i.e. windrow, static pile, and in-vessel composting). The one that is best suited to any particular community will depend primarily upon:

- The existing or proposed collection/separation system
- Site selection
- Equipment
- Available labor
- Materials to be composted
- The market for the resulting compost

Economics plays a very important role in composting, as the market value of the end product is relatively low. This chapter focuses on operational issues associated with receiving, processing, and distributing composting materials.

Receiving Composting Materials

The receipt of materials at a composting facility may present unique challenges. One of the key considerations is ensuring that the facility only accepts wastes which are allowed per the facility permit. The least expensive method may be to have residents deliver their waste to either the compost site or selected drop-off centers. However, this method of receipt may limit participation and, unless someone is on hand to monitor the materials dropped off, considerable contamination may result.

The use of plastic bags to collect materials for a compost site is **discouraged**. Plastic bags require excessive labor to open and separate and are totally unsuitable for grinding and mixing with the material for composting. However, **paper bags** are suitable for composting, as they will decompose along with other organic material. Another disadvantage of bags is the risk that undesirable materials such as rocks, cans, bottles or other non-compostable materials. This may damage machinery used in the composting procedure and produce an undesirable end product.

Wastewater solids (i.e., sewage sludge or other wastewater residuals) will likely be delivered to the compost site directly from the treatment plant by trucks. The moisture level of this material may require special handling. This should be well understood at the planning stages if wastewater solids are to become a part of the composting system. In addition, wastewater solids, grass clippings and some municipal solid wastes may contain high moisture and/or nitrogen levels. This material may develop undesirable odors and draw flies and other vectors if not handled properly and quickly.

It is important that a system be available to identify the content of the materials being received, in order to mix and blend the materials to the desired conditions. This may mean that it is necessary to maintain a supply of drier material that has a high carbon:nitrogen ratio. Ground brush, chipped wood, shredded paper, ground pallets, or even straw may serve this purpose. With proper planning, a compost site manager should be able to mix and blend materials that are not well suited for composting individually into a very compostable blend (see Figure 5.1).

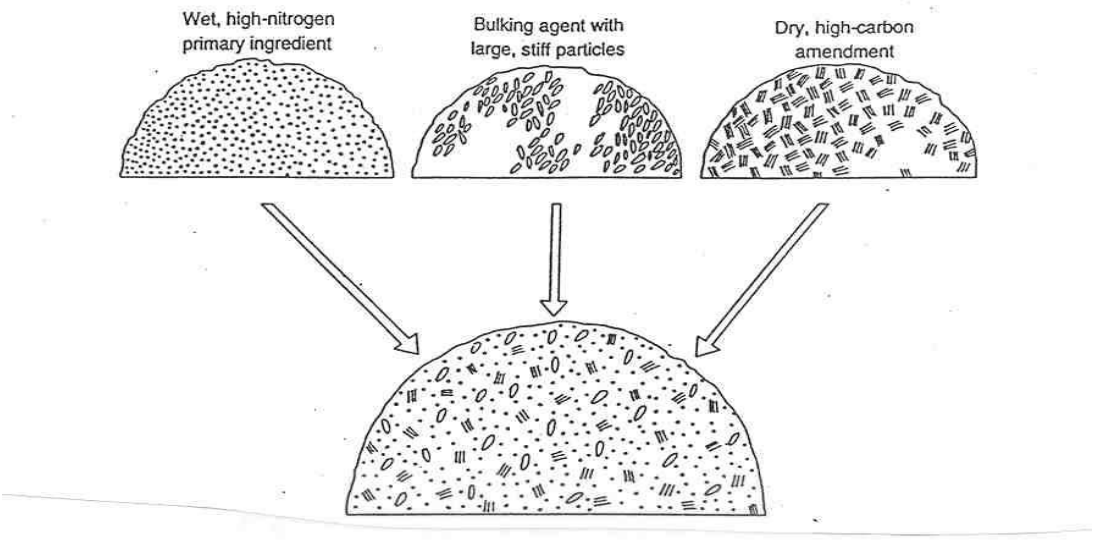


Figure 5-1
Combining Raw Materials to Achieve the Desired Characteristics for Composting.
Adapted with permission from On-Farm Composting Handbook, NRACS

If the incoming material cannot be immediately placed into the composting system, a staging area would be necessary. The staging area is necessary while material awaits processing. Care should be taken to avoid contamination of finished product. Windrows or piles should be positioned in such a way as to prevent the ponding of water. Ponding of water will develop undesirable anaerobic conditions and may also cause equipment problems with mud holes developing in the wet areas.

The receipt of material such as dry leaves or paper products may result in nuisance conditions due to blowing debris leaving the site. Closed containers or fencing may be

required for these materials if they cannot be incorporated into the composting process upon receipt.

Processing Composting Materials

Grinding or Shredding

Some facilities do not grind or shred leaves in their composting projects. However, grinding greatly enhances the speed of decomposition and produces a more uniform and desirable end product. Brush and wood will require some form of grinding or shredding. While it is desirable to grind or shred the leaves or other yard waste as soon as they are delivered in order to speed up the decomposition, the timing of this is not crucial. This may enable the project to spread its workload more evenly. Grinding or shredding not only reduces the size of the particles but also serves as a very good mixing system. There are many different grinding and shredding machines available from which to choose. Should purchasing a machine not be feasible, mobile grinding services are available.

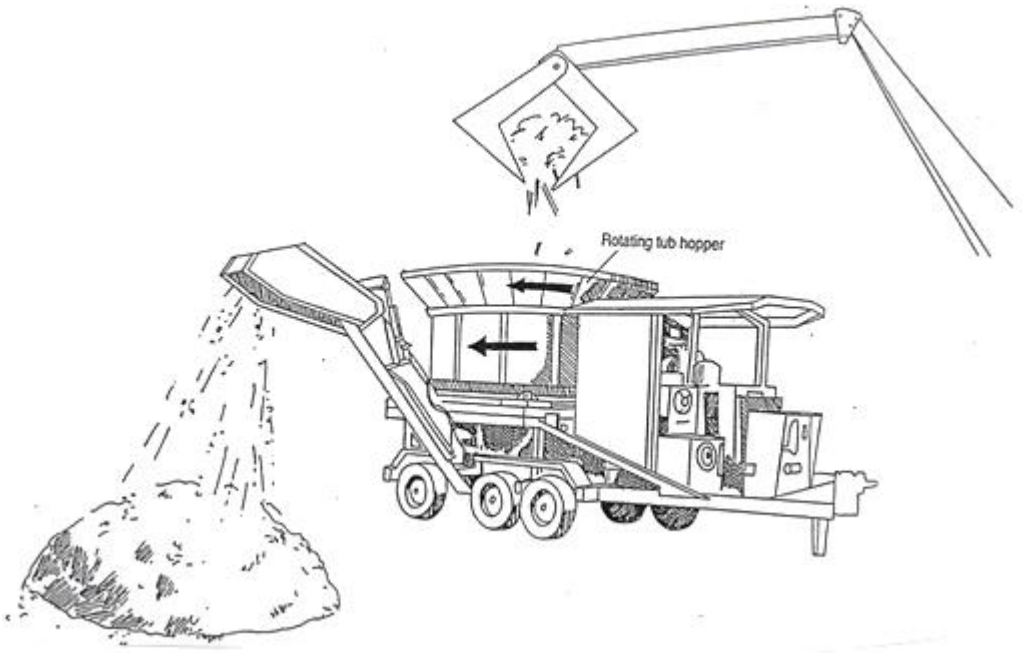


Figure 5-2 Tub Grinder

Adapted with permission from On-Farm Composting Handbook, NRACS

Mixing

As discussed in Chapter 3, getting the right mixture of your available composting materials is key to a smooth composting operation. Carefully combining materials to keep the C:N ratio in the 25-40:1 range will prevent many problems. Thick layers of green and brown materials do not compost nearly as quickly as well-mixed combinations of the two. Fine materials such as wastewater solids will benefit from being blended with coarser materials. Use of bulking agents and thorough mixing will increase the movement of oxygen into the materials. Another benefit of combining materials of small and large particle sizes is providing surface area for microorganisms. Blending wet and dry materials to get a moderate moisture content prevents wet materials from aerobically decomposing and creating foul odors. Grinding or shredding materials like tree limbs not only reduces the size of the particles but also serves as a very good mixing system. Thorough mixing is particularly important in static pile systems since they will not be turned.

Windrow Formation

For the best results, the compost needs to be kept in the aerobic state. This is most often accomplished by placing the material in windrows. These windrows need to be placed so that they do not block surface water drainage. The distance between windrows should be adjusted to allow for movement of equipment in the turning or aeration process. Care should be taken to avoid running equipment onto the composting material. This will compact it and reduce the air (oxygen) content, thus increasing the need for frequent turning.

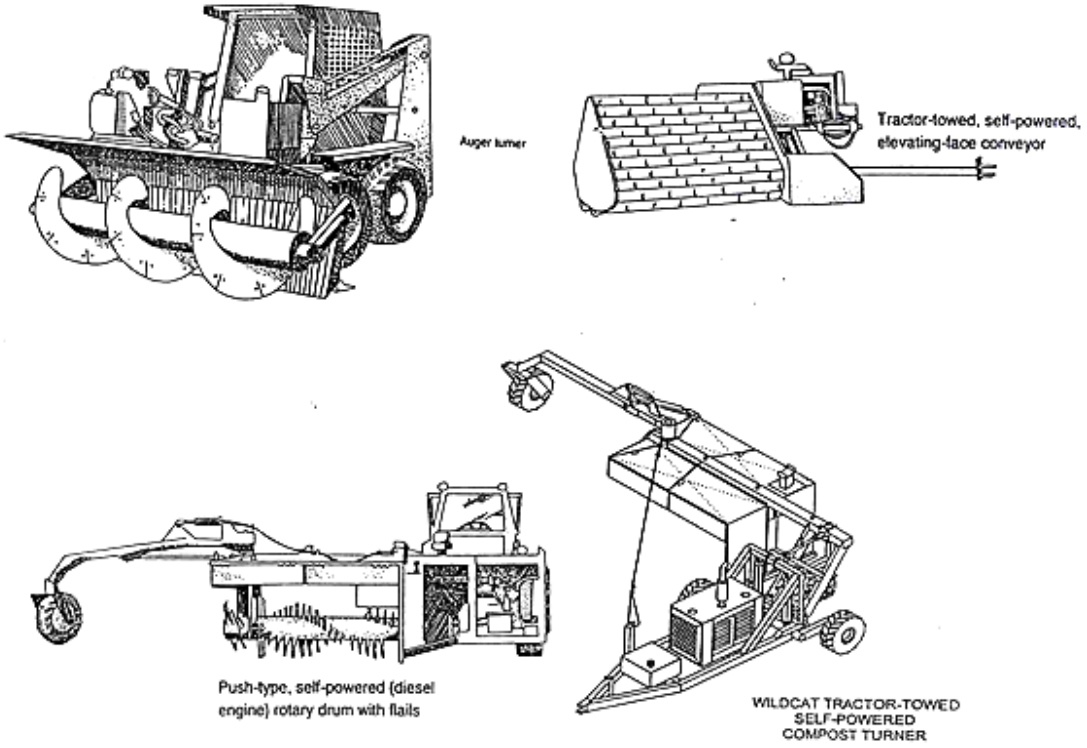


Figure 5-3 Windrow Turners.

Auger turner adapted with permission from Brown Bear Corporation.
Tractor-towed/push turners adapted with permission from Wildcat Manufacturing.

Operational Considerations

As discussed in Chapter 3, composting is essentially a biological process. From an operational standpoint, there are six critical factors (e.g., **C:N ratio**, **pH**, **porosity**, **moisture**, **temperature**, and **aeration)** that must be considered that largely control the rate of composting. Each of these factors is elaborated below.

C:N Ratio

In the initial stages of the composting process, microbes usually begin on the lower C:N materials. Often in the low technology windrow system, inadequate mixing leads to hot spots that need more frequent monitoring and may need to be turned more frequently before the temperature of the total windrow reaches an optimum level. Because the mobility of the microbes is negligible, it is necessary to provide intimate contact between the microbes and the waste materials. This can be accomplished by grinding some wastes and thoroughly mixing all wastes.

pH Properties

Proper pH is necessary for optimal composting to occur. The preferred pH range is 6 to 8 due to the broad spectrum of microbes involved in composting. The natural buffering capability of the organic matter in compost often permits a wider range for short periods. In the early stages of composting, the formation of organic acids may lower pH, but the pH should rise back to around 7 as composting progresses. However, continued readings outside the preferred range indicate potential problems that can negatively impact the process. During the composting process, frequent monitoring of pH is a valuable tool to indicate that the mixture of materials is balanced properly.

Figure 5-4 pH Monitor

Porosity, Texture, and Structure

The porosity, material texture, and structure affect composting by what influence they have on aeration. **Porosity** determines airflow resistance and is related to overall particle

size and variation in particle sizes of the materials. The spaces between particles must be connected to allow adequate airflow into the area of microbial activity. Large particle size and a uniform sizing of materials result in higher porosity.

Structure is derived from particle rigidity and is determined by an ability of the composting mass to resist settling. Some reduction in windrow size will occur during composting from loss of carbon dioxide and reduction in particle size that is not the result of settling and is considered normal.

Texture controls the surface area available for microbial activity. Microbial activity is largely confined to the surface and edges of particles; thereby they utilize the oxygen present in a thin film on the surface or edge of the material. As surface area increases with a decrease in particle size, the rate of microbial activity increases given that adequate oxygen can be maintained. When particle size becomes too small there is a loss of porosity making a compromise necessary.

Predicting porosity characteristics of the mixture from individual materials is nearly impossible. However, bulk density of the total mixture of materials can be used to give some assessment of porosity. Initial mixtures that weigh less than 35-40 lbs. per cubic foot are adequate, and those weighing more than 40-45 lbs. per cubic foot tend to have low porosity.

Moisture

The structural strength of the materials to be composted determines the upper limit for moisture content. Higher moisture contents initially for paper (65%), and for tree bark, sawdust and ground wood (75-85%) will allow faster composting, but many materials (except woody materials) lose strength when moisture content goes above 60%. Many materials that are received in a wet state (e.g., sludge, fresh animal manure, food waste, and fresh grass clippings) will lose their integrity when moisture contents are above 55%. The use of an absorbent such as straw or sawdust may be required when high moisture wastes are composted. Therefore, successful composting will proceed when the mixture contains 55-60% moisture initially, and will be much slower when initial moisture is below 50%.

The 60% level can be checked when a handful of the initial mixture, squeezed very hard, yields a drop or two of free liquid. More than 3 or 4 drops may indicate too much moisture. On-site moisture testing devices are available which can allow for more accurate monitoring and results.

Figure 5-5 Wet Enough to Squeeze Two to Three Drops of Water

Temperature

Each group of microbes involved in composting has an optimum temperature range. Generally, there are **three** "sub-ranges" of optimum temperature of various groups of microbes.

Cryophilic (cool)	**41 to 59ºF**
Mesophilic (warm)	**59 to 113ºF**
Thermophilic (hot)	**113-158ºF**

Most successful composting is conducted in the thermophilic range although soon after turning, the temperature may go down into the mesophilic range. Composting in the thermophilic range leads to faster decomposition, and killing of pathogens and any weed seeds. Pathogen reduction is why most composting involves the higher temperature range. This temperature range is not maintained throughout the entire mass of composting material as the outside edge of the material serves as an insulator to the warmer interior. This outside material must be mixed into the composting material during turning.

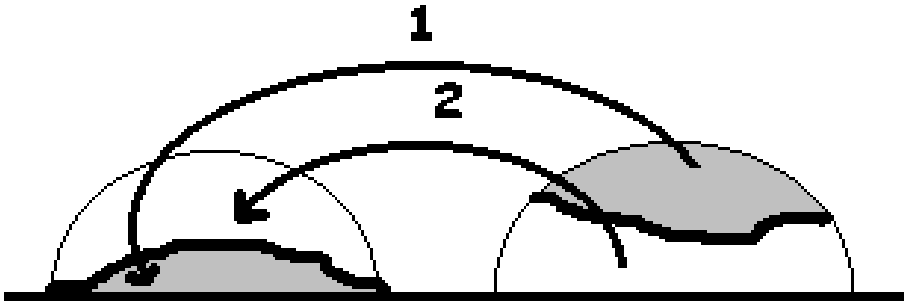


Figure 5-6 Turning to Maintain Temperature and Aeration
(1.Top to Bottom, 2. Bottom to Top)

Turning is required, not only for aeration and mixing, but also to allow the heat from the interior to escape. Composting does become less efficient when the temperature exceeds 140°F. When the temperature reaches **150 to 155°F**, turning should follow quickly to avoid the potential for spontaneous combustion or the elimination of favorable bacteria which will negatively impact the composting process.

The temperature should be checked no less than daily after windrows are formed. A commercial thermometer with a 3 to 4 ft probe is necessary to measure temperature. By keeping careful records, the operator can optimize turning as temperatures rise above those required, and greatly accelerate pathogen reduction and composting. The measuring device should be long enough to reach into the interior of the mass being measured, and records should be kept of the temperature readings. These readings should be compared to previous readings. If the temperatures during early composting stabilize below thermophilic range or decrease from the previous reading, it generally indicates that the material may be going **anaerobic** (oxygen deficient) and may need immediate turning for adequate aeration. In addition, it may be necessary with mixtures of materials with widely differing sizes or moisture contents to measure the temperature in layers from the outside to the interior.

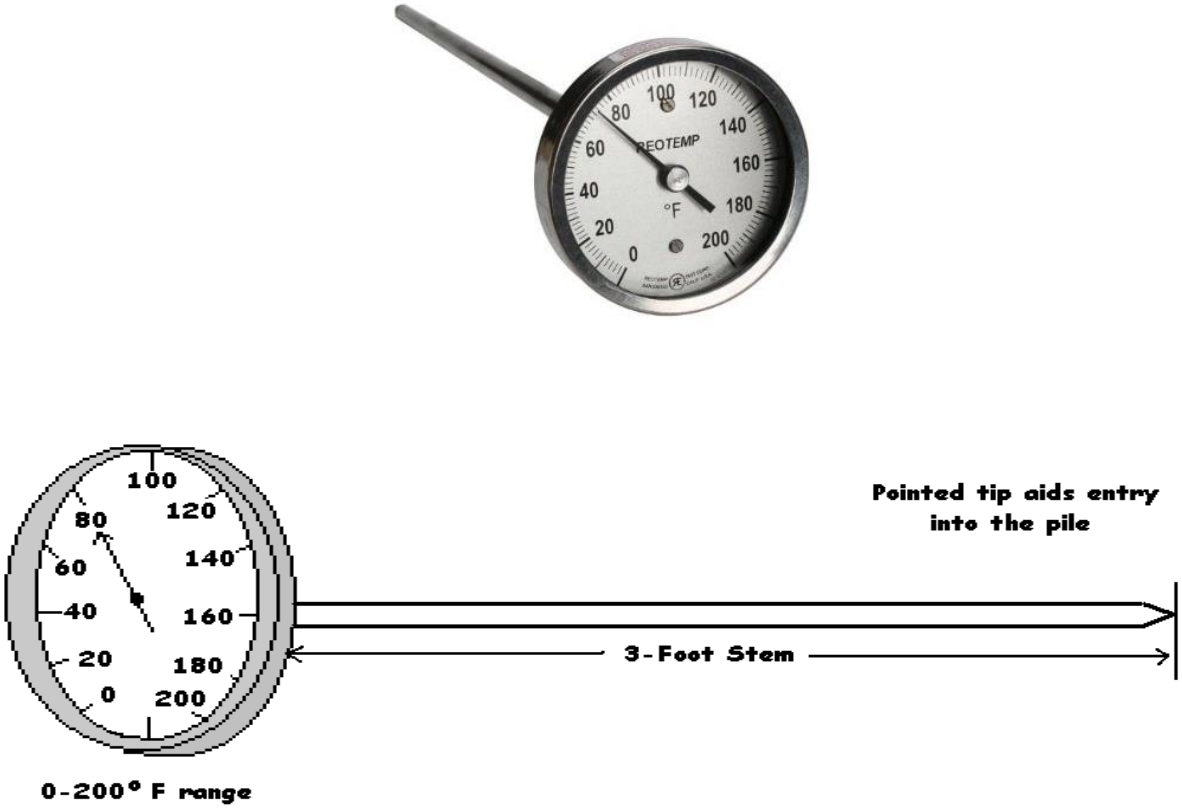
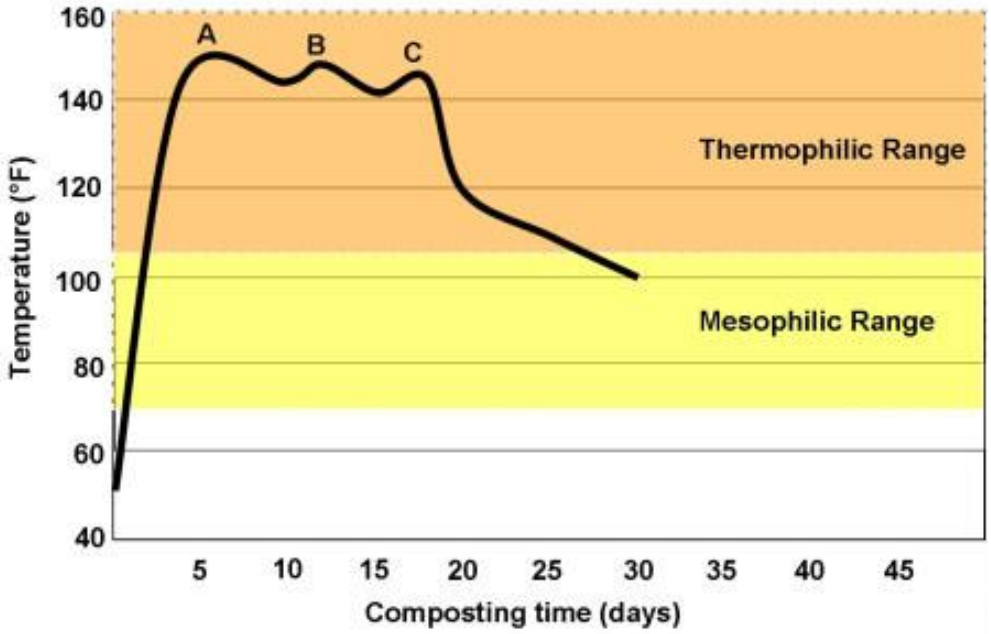


Figure 5-7 Long Stem Compost Thermometer

After the mixture is turned several times, the maximum temperature reached in the interior is lower than the previous maximum (see Figure 5-8).

Figure 5-8 Pile Temperatures change Over Time As Materials Are Decomposed



The compost should be reaching a stable condition when the maximum temperature of the interior is no more than 10°F above the prevailing average daily air temperature.

Aeration

When spaces between the particles are interconnected all the way to the interior, adequate oxygen will passively move from the outside air to the interior. As mentioned earlier, excessive moisture can fill the spaces between particles reducing passive air movement. This is more critical when wet materials are not thoroughly mixed before initial composting or during the turning process. In these instances, more frequent turning may be necessary early in the process to allow some evaporation of excess moisture and good aeration of the mixture.

Windrow composting often produces a distinct layer just outside the hot interior where fungi rapidly grow and fill the spaces between particles. This plugging of spaces leads to restriction of airflow to the interior. This is one of the reasons that composting materials may need to be turned more regularly at the beginning of the process. However, a lack of achieving any specified temperatures with some materials may require re-examining windrow construction or materials going into the mixture in order to achieve required temperatures for pathogen reduction.

Distributing (Marketing) Finished Compost

Screening

Prior to marketing, screening of the compost may be necessary to produce a more desirable looking product. When composting leaves, screening is normally not necessary, as grinding followed by composting will produce a very homogeneous material. However, some materials may require the use of bulking agents such as chipped or ground wood. This woody material may decompose much slower and require screening prior to marketing. Materials removed through screening may be returned to the system for regrinding and composting. Depending upon the desired end product, screens which remove materials from ½" to 1" in size may be desirable (see Figure 5-9 for a typical Trommel Screen).

Screens may be purchased or mobile screening services may be contracted. The latter may be the most economical approach unless the composting site has a very large volume. Availability of custom services, volume of operation, intended market, and an economic analysis may be necessary to determine the best solution to screening needs.

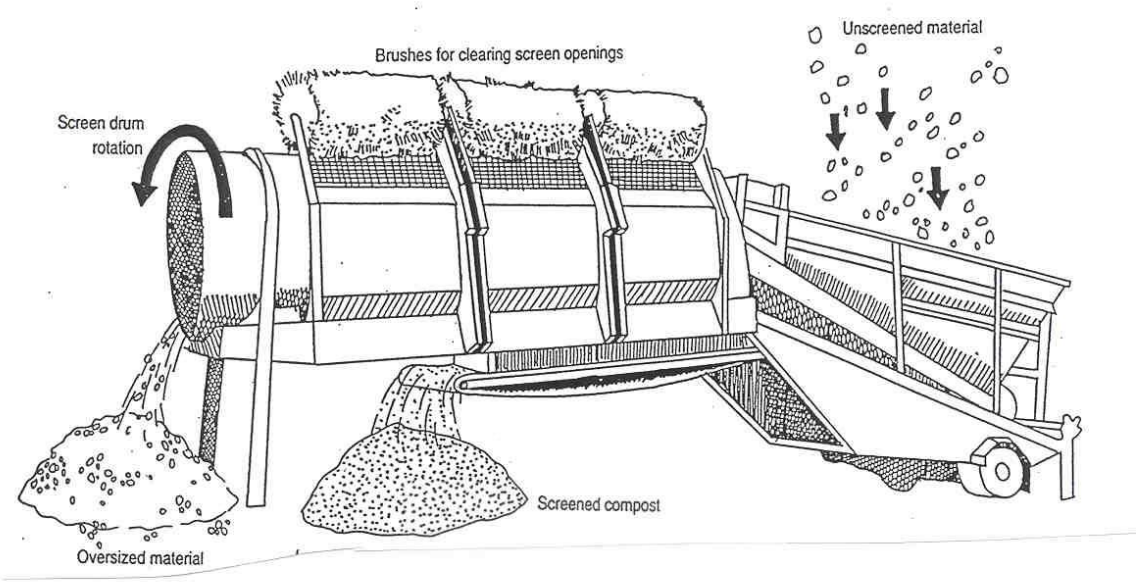


Figure 5-9 Trommel Screen

Adapted with permission from On-farm Composting Handbook, NRACS.

Curing

Curing is the final stage of compost processing that occurs after much of the readily metabolized material has been decomposed, in which the compost material further stabilizes. Curing of compost is a vital part of the finishing process. Curing serves as a bridge between active composting and finished compost. Active management during the curing phase is minimal, but materials ready for curing should be separated from active windrows so that testing can occur and materials are not contaminated with fresh materials or leachate.

Compost Stability and Maturity

The terms stability and maturity are often used interchangeably in composting, but they refer to two different concepts along the same spectrum. **Stability** is more commonly applied to the chemical composition and microbial activity of the compost. A stable compost is one in which decomposition is no longer rapidly occurring (e.g., a stable compost windrow *generally* has a temperature less than 10 degrees Fahrenheit above air temperature and a carbon:nitrogen ratio of around 10:1). In general, if applied to the soil, the microbes in stable compost will not remove nitrogen from the soil in order to continue to decompose.

Maturity refers to the suitability of the compost for use around plants. Mature compost does not contain compounds that would inhibit plant growth, such as certain organic acids.

Several methods can be used to determine compost stability or maturity. Two common methods that can be performed on-site are 1) the **cress seed germination test** (which involves testing the germination of cress seeds in a sample of finished compost) and 2) the **Solvita test** (which is a purchased kit with color readings to determine compost maturity). There are other methods available that involve private laboratory testing to determine maturity and stability.

If your marketing plan requires you to demonstrate high quality product, compost prepared for distribution should also be analyzed for the following: nutrient analysis, pH, inert material (e.g., glass or plastic), and soluble salt content. While you may provide customers with information about nitrogen, phosphorus, potassium or other nutrients based on analytical results, be careful not to make any guarantees regarding nutrient content. Specific claims of nutrient value of any product are protected and regulated by law.

With the increasing costs of landfill tipping and laws and regulations prohibiting disposal of yard waste in landfills, opportunities have developed for private sector involvement in composting projects. If composting is to become a viable economic venture, the compost operator may need to be paid for receiving the waste and be able to charge for the end product. Free distribution of compost by municipalities may actually hinder the development of this entrepreneurship while reducing recovery of total waste management costs.

If a viable market for the compost is to be developed, it will be necessary to produce a homogeneous product with consistent quality. The compost must be free of foreign material such as glass and plastic. In addition, the product must have been composted long enough so it is truly a compost and not just ground waste. This is particularly important if the compost is to be worked into the soil rather than used as surface mulch.

Compost Uses

By definition, compost is not considered a fertilizer. To be registered as a fertilizer, compost products must meet the standards of the Kentucky Fertilizer Law. For more information, contact the Division of Regulatory Services at the UK College of Agriculture. Aside from providing a source of nutrients, compost has many other benefits.

Compost, when mixed with the soil, increases the water holding capacity of soils and makes soils easier to cultivate. It also helps reduce erosion. Soils in many areas of Kentucky have rather high clay content. Although clay has good water holding capacity, the infiltration rate for clay is very slow. The incorporation of compost into clay soils will greatly increase this infiltration rate and reduce runoff.

Potential Compost Users

Bulk Users	**Retail/Wholesale**
Land reclamation	Garden centers
Landfill cover	Home gardeners
Parks	Topsoil
Highway maintenance	Golf courses
Cemeteries	
Schools	
Nurseries	
Greenhouses	
Sod farmers	
Lawn care	
Landscape contractors	
Industrial park grounds	

Lawn and Garden Use

The use of compost in lawns and gardens has been one of the most important markets for compost. It is commonly used for incorporation into the soil as well as surface mulch to reduce:

- weed growth
- Evaporation
- Water runoff

The demand for compost has a potential for a significant increase, as peat moss becomes less available and more costly due to restrictions of peat moss production through environmental concerns. At least one major lawn and garden supply company is developing compost sites throughout the nation to replace peat moss with compost.

Municipalities

Many communities use large quantities of compost in municipal facilities such as:

- Golf courses
- Parks
- Flower gardens
- Landfill cover

In addition, some state, county, and local governments require contractors to use compost in reseeding roadsides and construction sites. Municipal use of compost can provide a good demonstration to the public on the value of compost. In addition, municipalities may determine that composting is an important process that will reduce total waste management costs for taxpayers.

Agricultural Application

For centuries, farmers have known the value of returning livestock manure and crop residues to the soil. Compost added to farmland would have much the same value as crop residues. Unfortunately, the bulk and relatively low value of compost does not normally justify the expense of purchasing, transporting, spreading, and incorporating compost onto farmland. While farmland can always be considered as an option for compost use, it does not provide an economic incentive for composting until large quantities of compost are available that cannot be marketed through other uses.

Composting Municipal Wastewater Treatment Solids or Septage

Composting municipal wastewater treatment solids (WWTS) or septage prior to land application can be a means to meet a Process to Further Reduce Pathogens (PFRP) under 401 KAR 45:100 Section 12. To meet the Class A pathogen reduction requirements of 40 CFR 503, the time, temperature and turning records documenting PFRP must also be supported by

fecal coliform or *Salmonella* bacteria analysis. Only then may composted WWTS be allowed to be used for all general purposes including lawns and gardens.

Mixing

WWTS for composting has usually been dewatered to achieve a solids content ranging from 20 to 25%. This level of moisture (75-80%) exceeds that desirable percentage for composting, which will require drier materials to be mixed with the sludge to lower the total moisture to 60% or slightly less. Also, WWTS is usually made up of small particles and has a low C:N ratio (usually less than 20:1).

Different types of final WWTS treatment influence selection characteristics of other materials for composting. **Aerobically** digested WWTS has a higher level of volatile compounds that indicate a higher potential energy level. This allows for the rapid achievement of thermophilic range temperatures during composting. **Anaerobically** digested WWTS tend to have lower levels of volatile compounds that benefit from combining with a high-carbon material to more quickly achieve high temperatures. If a high-carbon material (straw, leaves, etc.) is not available, it will take longer for the composting materials to reach desired temperatures.

When composting WWTS alone, a bulking agent of dry chipped wood (1/2 to 1 inch size) should be added to increase the C:N ratio. This will also lower the moisture level, by serving as a moisture absorbent, and increase large pores for adequate passive oxygen movement into the mixture. Dry leaves may also serve as an absorbent, help lower moisture content, and increase the C:N ratio, but provide only minimum help for increasing large pores.

Septage is a material removed by pumpers from septic tanks used by homeowners and small businesses. Septage has a low C:N ratio and can serve as a moisture source for drier materials. Since this material is a product of anaerobic digestion, it has the potential to be odorous. Septage can be spread over the windrow or in-vessel row and immediately mixed into the other materials to minimize odors. It is generally not suitable to be used in this manner with static pile composting unless it is premixed into the materials before forming the static piles. Odor will be more of a problem when using blowers as opposed to vacuum type systems where the odor can be trapped or further treated by bio-filters.

Temperature

When using WWTS or septage as a portion of the mixture for composting, the temperature must be maintained at 55^{o}C (131^{o}F) for 3 days when composting with the in-vessel or static pile system. With the windrow method, the WWTS or septage containing mixture is to be maintained at 55^{o}C (131^{o}F) or higher for 15 days or longer, and there shall be a minimum of 5 turnings of the windrow during this period. Achieving and maintaining these temperatures will require careful monitoring and recordkeeping of the composting

material. The turning will accomplish mixing of the outer layer into the mixture for more complete composting and pathogen reduction. This allows the entire mixture to reach the necessary temperatures during the specified length of time.

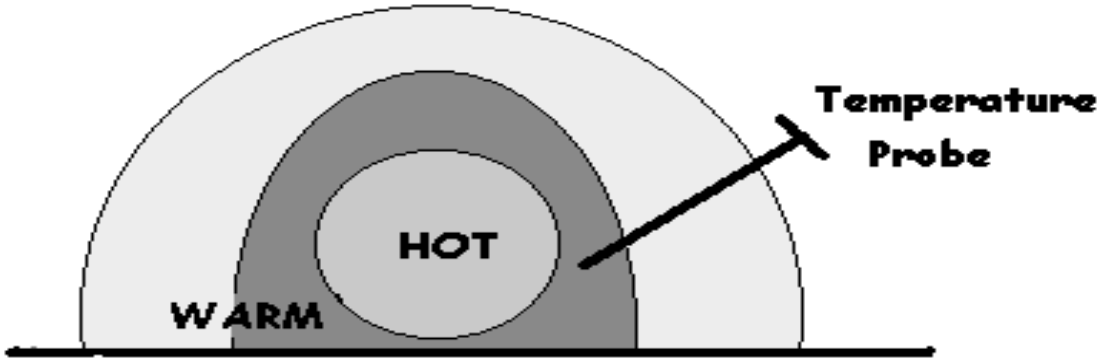


Figure 5-10 Windrow Temperature Profile

A commercial thermometer with a 3 to 4 ft probe is necessary to measure temperature. By keeping careful records, the operator can optimize turning as temperatures rise above those required, and greatly accelerate pathogen reduction and composting.

Aeration

Aeration during composting of mixtures containing WWTS or septage serves three main purposes:

1. Source of oxygen
2. Temperature control
3. Moisture removal

Use of bulking agents and thorough mixing will increase the movement of oxygen into the materials. With the initial high moisture content of sludge and fine particle size, resistance to airflow can be reduced by having 10 to 15% of the material as bulking agent. Subsequent mixing during turning of the composting material exposes fresh surfaces, speeds up the release of moisture, and re-establishes pore space.

Curing and Screening

Curing of compost containing WWTS or septage is a vital part of the whole process. The curing area should be located where the materials can be mixed from time to time to maintain aeration if not immediately marketed. In addition, the curing area should allow separation of compost lots for isolation to wait for any required pathogen or chemical analysis. In most cases, stationary screen systems are not suitable for screening sludge compost. Some type of rotating drum system is more desirable as the mechanical action will more clearly separate the finer sludge from the bulking agent.

Study Questions –Chapter 5

1. Six critical factors that must be considered that largely control the rate of composting are _____ , _____, _____, _____, _____, _____.

2. For the best results, the compost needs to be kept in the
   a. Anaerobic state.
   b. Aerobic state.
   c. Facultative state .
   d. Aeration prevention mode.

3. Paper bags are suitable for composting, as they will
   a. Not expose operator to deadly fumes during composting.
   b. Not catch fire during the dry season.
   c. Decompose along with other organic material.
   d. Last longer than plastic bags.

4. Levels of technology available for composting projects best suited to any particular community will depend primarily upon _____ , _____, _____, _____, _____, _____.

5. _____ greatly enhances the speed of decomposition and produces a more uniform and desirable end product.
   a. Sloping
   b. Grinding
   c. Separating
   d. Filtering

6. Ponding may also cause _____ _____ with mud holes developing in the ponded areas.
   a. Aerobic conditions
   b. Bat congregation
   c. Equipment problems
   d. Unsanitary conditions

7. The compost is kept in the aerobic state most often by placing the material in
   a. Windrows.
   b. Water.
   c. Piles buried underground.
   d. The highest elevated point at the facility.

8. Excessive moisture levels in compost leads to anaerobic conditions which cause the materials to become more acidic and cause
   a. Bleeding.
   b. Runoff.
   c. Odors.
   d. High temperatures.

9. With the windrow method, the Wastewater Treatment Sludge or septage containing mixture is to be maintained at _____, and there shall be a minimum of 5 turnings of the windrow during this period.
   a. 75°C (167°F) or higher for 30 days or less
   b. 75°C (167°F) or higher for 30 days or longer
   c. 55°C (131°F) or higher for 15 days or less
   d. 55°C (131°F) or higher for 15 days or longer

10. When the temperature reaches _____, turning should follow quickly to avoid the potential for spontaneous combustion or the elimination of favorable bacteria which will negatively impact the composting process.
   a. 150 to 155°F
   b. 160 to 175°F
   c. 142 to 172 °F
   d. 180 to 192 °F

11. Turning windrows allows _____ to escape and _____ levels to increase.
   a. Heat, aeration
   b. Heat, oxygen
   c. Moisture, aeration
   d. Moisture, oxygen

12. Composted sludge must meet the requirements of a process to further reduce
   a. Screening.
   b. Curing.
   c. Pathogens.
   d. Consumption.

13. A commercial thermometer with a _____ probe is necessary to measure windrow temperatures.
   a. 1 to 4 ft
   b. 2 to 4 ft
   c. 3 to 6 ft
   d. 3 to 4 ft

14. Compost is commonly used for incorporation into the soil as well as surface mulch to reduce _____, _____, _____.

Chapter 6: MONITORING, RECORDKEEPING & COMPLIANCE

Chapter 6 Learning Objectives

1. Understand the types of monitoring required for different types of compost materials.
2. Comprehend the recordkeeping requirements.
3. Explain the requirements for quarterly or annual reporting.
4. Understand your permitting requirements in order to maintain compliance.

Kentucky regulations require that composting facilities must be permitted. Some facilities that compost solid waste, that do not distribute the finished product may be exempt. As previously discussed, facilities that compost yard waste, manures, food processing wastes, etc., are required to have a SOLID WASTE COMPOSTING PERMIT. Facilities that compost water or WWTS are required to have a SPECIAL WASTE COMPOSTING PERMIT. Both types of permits are issued by the Kentucky Division of Waste Management. Regardless of the permit type, all permittees are required to have an understanding of the regulatory requirements for their facilities.

The regulations that govern both solid and special waste composting facilities specify that certain operational requirements be met. These include such items as:

- Monitoring, Sampling and Analysis
- Record Keeping
- Reporting
- EPS Compliance
- Distribution of Finished Products

Your permit (see sample solid waste permit in Appendix D) may also have additional operating requirements. This chapter is designed to assist you in understanding and complying with the regulatory and permitting requirements.

Monitoring, Sampling, and Analysis

Monitoring of the composting process aids in diagnosing potential problems and therefore increases the likelihood of producing a quality-finished compost. The careful monitoring (and control) of incoming materials, in order to prevent receipt and incorporation of prohibited materials, is recommended in order to ensure compliance. The regulatory requirements for monitoring differ as a function of the type of composting facility. Solid waste facilities do not require specific monitoring of temperature, aeration, etc., but failure to monitor these parameters may result in operational problems and noncompliance. Special waste facilities, on the other hand, are required by regulation to perform monitoring and are stipulated in the regulations.

Solid Waste Composting Facilities

The Division requires all solid waste composting facilities to submit a report. Your permit will specify whether your reporting is to occur on a quarterly or annual basis. In order to provide the required information, the following data about incoming material must be tracked:

- Amount
- Sources
- Types

A representative sample of the compost must be analyzed at least once per year in accordance with 401 KAR 48:200, Section 3(5) or your permit.

Special Waste Composting Facilities

Wastewater treatment solids (WWTS) composting requires monitoring to show the composted materials have met the process time and temperatures specified for a Process to Further Reduce Pathogens (401 KAR 45:100 Section 12). WWTS are also governed by federal regulations (40 CFR 503).

To comply with the federal regulations, compost must be analyzed for nine pollutants, six of which are already required by state regulation, vector attraction reduction, and pathogenic organisms. To meet both the state and federal compost quality monitoring requirements, a representative sample of the compost must be analyzed for the parameters listed in 401 KAR 45:100, Section 6 (20)(b) plus total arsenic, mercury, molybdenum, and selenium, and the density of fecal coliform or *Salmonella* bacteria. Samples must be collected and analyzed at least twice per year, and up to twelve times per year, depending on the volume of WWTS or size of the wastewater treatment plant, as stipulated by regulation and your specific permit.

Recordkeeping

It is essential that a composting site keep accurate records of the receipt and disposal of all materials. In addition, records need to be kept on processing activities relating to the materials. This will include information on:

- Types (and perhaps analysis) of material received
- Dates of grinding and mixing operations
- Dates for formation and turning of windrows
- Daily temperatures of composting materials as designated by 401 KAR 45:100 and 401 KAR 48:200.

The records for solid waste facilities must include the amount and time the materials spent in the active compost process, and the names and addresses of recipients of 20 cubic yards or more of compost. For information required by regulation, records must be kept on-site for no less than 3 years.

General daily weather observations (sunny, overcast, wind speed, wind direction, etc.), high and low temperature, and precipitation amounts should be recorded. Problems such as odors, runoff, and dust, should also be recorded. Documentation of all these items will assist in adapting operational procedures which will help prevent the reoccurrence of any problems.

Reporting

Reporting of information stipulated by regulations and your permit shall be accomplished using the required forms which are available from the Division of Waste Management (see sample in Appendix E). In addition to amount, type, and source of incoming materials, the report must include:

- Sampling and Analysis
    - laboratory analyses from the lab,
    - chain of custody documentation,
- Distribution Logs

EPS Compliance

As previously stated, all composting facilities—solid or special waste—are subject to the Environmental Performance Standards (EPS). During the permitting process, DWM staff evaluates the facility location and proposed operational procedures with respect to the EPS, however, the permittee is ultimately responsible for ensuring compliance with EPS.

The EPS requirements that are most likely to lead to noncompliance at a composting facility include:

- Odor
- Dust
- Vectors
- Surface Water
- Fires
- Karst

Distribution of Final Products

It is important to develop a distribution strategy for the end product.

- **Kentucky regulations state that <u>75%</u> of the finished product must be distributed or disposed of <u>within one year of completion of curing</u> (401 KAR 48:200 and 401 KAR 45:100).**
- Some communities give the compost to local residents as a method of distribution as well as a form of public relations for the composting project.

It is important for you to understand and know when and how to implement the elements presented in this chapter in order to stay in compliance with waste regulations. Don't hesitate to contact your regional Division of Waste Management office or the Solid Waste Branch whenever you have questions.

Study Questions –Chapter 6

1. Which of the following is not a recordkeeping item required by regulation for solid waste composting facilities?
   a. Names and addresses of recipients of 20 cubic yards or more of compost
   b. Daily weather observations
   c. Amount and types of materials received
   d. Time materials spent in active compost process

2. Which of the following is not an analysis requirement for special waste composting facilities?
   a. Fecal coliform or *Salmonella*
   b. A minimum of two samples analyzed annually
   c. Heavy metals
   d. Solvita test

3. Kentucky regulations state that _____ of the finished compost product must be distributed or disposed of within one year of completion of curing.
   a. 15%
   b. 25%
   c. 50%
   d. 75%

Chapter 7: PROBLEM PREVENTION AND FREQUENTLY ASKED QUESTIONS

Chapter 7 Learning Objectives

1. Recognize the issues that may develop at a composting facility and identify possible preventative strategies or remedies.
2. Identify safety issues associated with physical, chemical, and biological hazards for compost operators and list the types of hazards that may be present at composting sites.

Facility Environment Considerations

The environment surrounding the compost facility is a key consideration and operations at the facility may be influenced by the following factors:

- Other Permitting Agencies
- Neighboring land use
- Transportation, network, or facility access
- Water management
- Security
- Facility considerations

Check 401 KAR 30:031 for waste site requirements. All composting facilities must comply with these environmental performance standards.

Other Permitting Agencies

The operation of a composting facility may require permits from the Division of Water for discharge to surface waters, Division of Air Quality for grinding equipment, or other additional state or local agencies. The Division of Waste Management does not regulate ordinances or zoning codes. However, a permittee must comply with any local ordinances or zoning codes. A permit from the DWM does not relieve the permittee from complying with any and all ordinances and zoning codes.

Composting facilities not operating under a roof must have a general stormwater permit from the KY Division of Water, unless all runoff from the facility is collected in a pond. If a pond is the selected method of water management, either a KPDES (Kentucky Pollutant Discharge Elimination System) permit or KNDOP (Kentucky No Discharge Operating Permit) is required.

Neighboring Land Use

Some type of buffer zone is needed around a compost site. While proper management will keep odors to a minimum, some odors will be developed, especially during the windrow turning operations. The noise and dust created by the truck and heavy equipment operations should also be considered in determining the buffer zone. A minimum of **500 feet** between the composting site and the nearest residence is recommended. A row of trees helps greatly in serving as a visual and sound screen for a compost site.

In-vessel composting will normally be less of a potential problem for the surrounding community, but even this system can produce undesirable odor and noise problems.

Transportation Network or Facility Access

Because of the large quantity of materials being delivered to a composting site, transportation is of major concern. For example, a 20,000 cubic yard operation may mean

that 600 truck trips could be needed if each trailer had a 30-35 cubic yard capacity. This number could increase to 1,000 to 11,000 tri-axle dump truck loads of 18-20 yard capacity. In addition, the end product must be marketed so additional trucking will be required. Because of this large volume of truck traffic, suitable all-weather roads must be available or budgeted for construction. If the marketing is to be through on-site sales to local customers, ease and convenience of access must also be considered. Therefore, close proximity to the local population but with a certain level of isolation is desired.

Water Management

Proximity of streams and other surface water bodies close to the facility may present challenges for the compost facility operator. Several options exist for managing water at a compost site:

- The ideal outdoor compost site should have a slope of 1-3% to reduce ponding
- The site should be located so no off-site water is allowed to run onto the site
- Some form of water containment will likely be required to prevent runoff of the site from entering streams, sinkholes, or other prohibited areas
- Use of roofs or other enclosed structures
- Holding or treatment ponds
- Impermeable pads and diversion berms (see Figure 7.2)

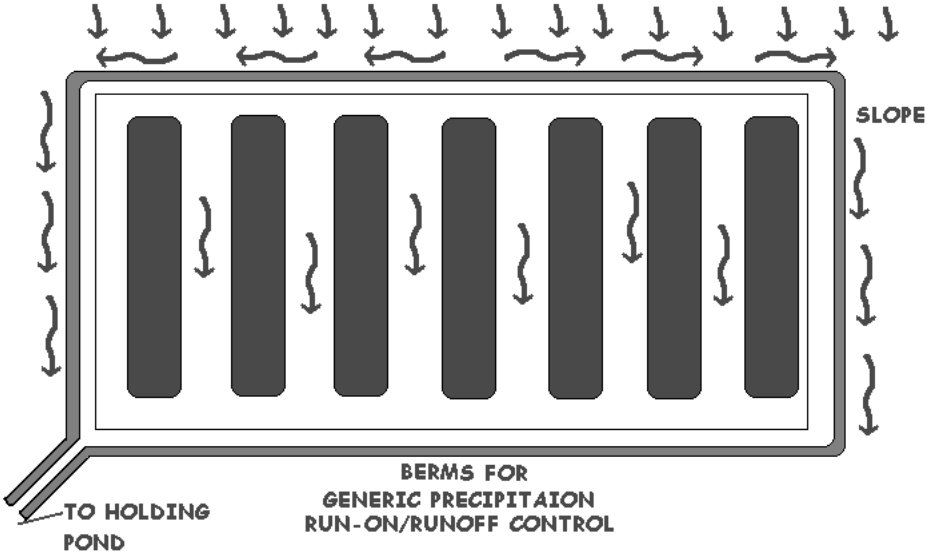


Figure 7-2 Generic Run-on/Runoff Site Plan

Security

Security at a compost site is not likely to be a major concern. However, some form of security *is* needed to prevent theft and vandalism to equipment and illegal dumping of unwanted materials. A secure building for equipment and a fence and gate with lock may be adequate. **Restriction of public access at compost facilities is required by state regulations.**

Facility Considerations: Size, Location, and Future Expansion

The exact size of a proposed site is difficult to determine but must be adequate to not only handle materials for the present but also be capable of future expansion. Many communities have found that, as public acceptance of composting develops, more material becomes available for composting. In addition, most urban communities are growing in area and population, thus expanding the number of households to be served. To allow for adequate space for receiving materials, equipment storage, compost windrows and related activities, the windrow or static pile composting system will require approximately one acre of land for every 3,500 to 5,000 cubic yards of material to be received. Therefore, a five-acre site would be needed for 14,000 to 20,000 cubic yards of material received each year. The in-vessel system will require less space but consultants may be needed in the determination of total space needed for buildings and service areas.

Safety

Safety should always be of major concern when working:

- around heavy equipment
- In areas with a combination of moisture and electricity
- Where automated equipment may be operating

All of these conditions may exist at a compost site. It is also a good safety practice to have two or more individuals at a site when equipment is being operated. A telephone or radio system at the site will add to the safety as well.

One should check with local safety officials during the planning stage of a compost site to assure that all appropriate safety features are built into the system. In addition, a continual monitoring and reporting system should be part of the overall safety program.

Compost Operation Safety Programs

The day-to-day operations at a composting facility can be developed by evaluating the hazards encountered in the normal workday, developing procedures to reduce those hazards, and implementing those procedures through a comprehensive safety program. We can generally divide associated hazards into three broad categories; these are **chemical**, **physical** and **biological**. We will examine the chemical hazard first.

1. Chemical Safety

The first step in developing a safety program is to identify all chemical hazards and to ensure that all employees are informed. This means that employees have the right to know:

- The identity of all hazardous chemicals they will encounter in the workplace
- Understand the health effects of exposure
- Know and understand how to work safely with those materials

This information must be provided in writing. Generally, there are not a great number of hazardous chemicals or materials on a composting site. However, a survey and inventory should be conducted to assure the proper Materials Safety Data Sheets are available.

Once information on the chemical hazard has been obtained, the employer and employee can select the proper personal protective equipment. Hazardous materials may enter the body by inhalation (most common), ingestion, absorption through the skin or eyes, or injection.

General guidelines for protection from chemical hazards include:

1. Following proper procedures and using personal protective equipment.
2. Adequate knowledge of the materials used.
3. Frequent decontamination of personnel and equipment.
4. Caution against consuming food, water, or smoking cigarettes contaminated by contact with gloves, equipment, or unwashed hands.

2. Physical Hazards

Physical hazards abound at compost operations from exposure to large equipment, as well as many relatively minor injuries such as cuts, strains, sprains, bruises and abrasions.

While these injuries are generally minor, **serious injuries or deaths** may result. Prolonged exposure to loud noises may permanently damage hearing. Exposure to heat and cold may cause heat stroke or frost-bite; and, can lead to indirect effects such as fatigue, dizziness, and confusion which in turn can lead to accidents, injuries, and death.

General guidelines for protection from physical hazards include:

1. Use proper protective equipment such as hearing protection, hardhats, steel-toed boots, safety glasses, and gloves.
2. Maintain equipment in safe working conditions
3. Keep guards properly adjusted and in place on rotating and moving equipment such as power takeoffs.
4. Practice good housekeeping by keeping the work area clean and free of debris and excess water.

3. Biological Hazards

Exposure to biological hazards is always a possibility; therefore, appropriate precautions *must* be taken. While a yard waste facility may seem, at first glance, free from the possibility of exposure, this may not be the case. Closer examination reveals materials such as glass, metals, used needles, and other sharp objects that may offer a significant risk of puncture to the skin, thus introducing pathogenic organisms into the body. These organisms may arise from human or animal sources that have contaminated the yard waste. Additionally, the process of composting may encourage the growth of a number of molds and fungi that act as allergens.

Wastewater composting operations represent an additional risk as the materials are of direct human origin and very likely to contain pathogenic organisms at large concentrations, especially during the beginning of the process.

It is important that all employees are aware of the possibility of exposure and that steps are taken to reduce risk factors. As with the risk from chemical and physical hazards, selection of the proper personal protective equipment and personal hygiene will greatly reduce the risk of biological exposure.

General guidelines for protection from biological hazards include:

1. Avoiding direct contact with suspect materials.
2. Wear latex or vinyl gloves, under work gloves, when in immediate contact with suspect materials.
3. Training for all personnel in blood borne pathogen protection.
4. Use of proper respiratory protection for personnel exposed to dust and debris in the processing of materials.
5. Employee availability to hand washing, shower and toilet facilities.

Troubleshooting

Every composting site will develop some problems. However, most of these can be avoided with proper facility:

- Site selection
- Design
- Operation
- Maintenance
- Good management practices

Unfortunately, many problems will get worse over time if no corrective measures are taken. Therefore, early detection and correction are important. Some of the more common problems associated with compost sites are as follows:

- Odors
- Erosion
- Dust
- Vectors
- Run-on & Run-off
- Litter
- Fire
- Noise

Odors

Undesirable odors are the *most common* and *serious problem* of composting. Odors may arise from:

- Content of the materials received
- Handling of the materials after receiving
- Management practices followed during composting

If materials with a high potential odor such as manure or sludge are likely to be stored and handled at the site, it is important to **isolate the site from residences** and to maintain wide buffers of trees and shrubs on the site.

Some materials hauled to the site may have been exposed to previous processes that tend to generate a high level of volatile compounds or odors. Alternatively, materials may have been mishandled to allow some decomposition that gives off odors. Some odors can be generated from improper handling or storage of the materials after they arrive at the compost site. If materials are stored outside and allowed to become wet, they can start to heat up or go anaerobic before being placed into the actual composting process. Many of these problems can be fixed by allowing only certain materials to be received at the site, or by being able to handle a variety of materials once they are received. For example, fresh grass clippings need to be incorporated or spread out and dried to avoid rapid decomposition and to keep them from going anaerobic. The latter will usually require more knowledge, space, equipment, and personnel for handling materials. This is why many composting sites have restrictions on what materials are composted.

It is important to understand the composting process in order to minimize potential odors at the site. In general, the site manager and personnel should focus on such factors as temperature, aeration, and moisture in maintaining good management practices. Scheduling turning to take advantage of favorable wind direction, when possible, may help in reducing odor complaints. Turning compost during the middle of a weekday, when nearby residents are inside or at work, may help as opposed to turning on Saturday or Sunday. Turning close to evening, when air tends to be moister and moves to lower areas of the landscape, will trap and move the odor causing more complaints.

Several chemicals have been evaluated to help reduce odors. Usually these need to be applied at the time of storage and after each turning of the compost. These multiple applications can add significant cost to the operation.

Run-on and Runoff

Proper site selection is by far the best solution to controlling water run-on and run-off. The site should be designed in such a manner that no outside water flows onto the site. Terraces or berms may be constructed to divert water around the site. Such terraces or

berms need to have gently sloping banks so they can be seeded with grass and mowed easily with large equipment. It is important to keep the site attractive.

Runoff from a site may need to be collected in a specially designed and constructed catchment basin. This water should not be allowed to enter streams, wells, or sinkholes. Runoff water that has come into contact with compost has the potential to contain high levels of suspended solids, be significantly low in dissolved oxygen, and have a high biochemical oxygen demand (BOD) due to the high organic content of the water. The combination of high suspended solids, low dissolved oxygen, and high BOD may adversely impact streams, ponds, and lakes resulting in the death of fish and other aquatic life. Therefore, some form of containment is often necessary (check permit requirements for details). The construction of:

- Terrace channels,
- Holding ponds, or
- Catchment basins to control runoff may satisfy this requirement.

The USDA Natural Resources Conservation Service can help in construction design specifications. Terrace channels and pond banks should be constructed to facilitate mowing and maintenance.

The use of 50-75 foot vegetative buffer strips above the channels and holding ponds will act as a filter to remove most suspended solids and nutrients. Proper control of suspended solids and nutrients will prevent silting in the holding pond and help control eutrophication of the pond and downstream receiving waters. Eutrophication is the process by which a body of water becomes rich in dissolved nutrients, thereby encouraging the growth and decomposition of oxygen-depleting plant life and resulting in harm to other organisms.

Water collected in the holding ponds may be allowed to evaporate or be recycled back into the composting process. If the water is to be discharged into a receiving stream, a Kentucky Pollution Discharge Elimination System Permit (KPDES) from the Kentucky Division of Water KPDES Branch may be required. If the constructions of terraces, berms, or ponds take place in or near the floodplain, prior permission from the Kentucky Division of Water Floodplain Management Section will be required.

Erosion

Surface erosion is best controlled by proper site selection. Sites should be selected with a 1-3% slope (1 to 3 feet drop per 100-ft. horizontal distance) to facilitate controlled drainage. While it will not be possible to maintain vegetative cover on the working area, a well-established vegetated buffer should be established around the perimeter of the site. This will help minimize the flow of water across the site, and therefore, erosion. In seasons where no composting activity is taking place, compost can be used as surface cover to restrict surface water flow and help reduce erosion.

Litter

Wind blowing most yard waste is normally a minor problem. Even leaves delivered to a compost site tend to stay in one place quite well. Once material has been ground and mixed, it is even more stable. Proper handling of incoming materials or the installation of a fence around the site will reduce problems with escaping materials.

Paper is more prone to movement by wind and may develop into somewhat of an eyesore if not handled correctly. It may be necessary to restrict the grinding of paper to an indoor site, grind only on windless days, or mix with materials that have a very high moisture content.

Dust

Dust may become a problem from two sources:

- Trucks creating dust as they travel the roads leading to the site
- Dust developed at the site during composting activities

Dust from the roads can be best corrected by providing improved surfaces. It is important that traffic be able to enter and exit the site during all types of weather. Blacktop, asphalt, or a densely compacted surface is essential. Sprinkler trucks may be needed to control dust during periods of heavy traffic flow or on dirt and gravel roads.

Dust from the operation may arise if the materials are allowed to dry below the recommended moisture concentrations. It is essential to have water available to add to the compost and wet the working area. It may also be necessary to restrict operations due to windy conditions. Proper site section will also help control and prevent dust problems.

Fire

As with dust, the danger of fire is greatly reduced if the materials received at the compost site are high in moisture content. Temperatures reached during the composting process are not adequate to produce spontaneous combustion if the proper moisture content and management practices are followed. Even after taking these precautions, steps must be taken to prepare for the possibility of fire.

- All transportation and process equipment should be equipped with fire extinguishers
- A water source should be available for fire suppression
- Communication by telephone or radio to the local fire service is a necessity.
- It is also recommended that the local fire service visit the facility to become familiar with the layout of the operation
- Proper maintenance of equipment, including frequent removal of leaves and debris from engines and exhaust systems, will also greatly reduce the possibility of fire

- Maintaining proper distances between windrows will allow for operation of equipment to isolate hot spots in case of fire.
- Additionally, a **no smoking policy**, access control to prevent vandalism, and keeping the buffer zones and perimeters well mowed will reduce the potential of fire.

Vectors

A vector is an organism that can carry and transmit disease from one point to another. Vectors around a compost site are seldom a problem if proper management is maintained. Some materials such as food waste, animal manures, and wastewater biosolids may require additional care to control vectors such as insects and rodents.

Immediate incorporation of these materials or covering the materials with sawdust or mature compost, or placing them in containers will help reduce problems. Materials not suitable for composting should be separated and disposed of immediately to reduce habitat and food for rodents and insects.

Limiting standing water at the site will control the breeding of mosquitoes and transmission of the diseases they carry. Removal and proper disposal of old tires, barrels, and other containers will further eliminate mosquitoes breeding habitats. Attention must also be given to catch basins and holding ponds. The use of natural control systems, such as frogs and fish or commercially available environmental friendly pesticides in water catchments, may help in controlling mosquitoes. If the water will be re-circulated into the composting system, always make sure the pesticides will not harm the compost microbial population and will maintain no residual in the final product.

Noise

The noise created by heavy trucks, loaders, and other large equipment can become a significant problem if the composting site is improperly located. Screening the site with trees will absorb much of the sound. All equipment should be kept in good working condition with mufflers in place. Timing operations to avoid early morning, late evening, and weekend operations may help reduce complaints. All operators and other employees should be provided with appropriate hearing protection devices. A very common complaint by neighbors is about the incessant “backup warning beeps” of loaders and other equipment.

Study Questions – Chapter 7

1. The ideal outdoor compost site should have a slope of 1-3% in order to reduce
   a. Odors.
   b. Blowing litter.
   c. Ponding of water.
   d. Transportation costs.

2. Diversion of site runoff to sinkholes is an acceptable option to improve site drainage.
   a. True b. False

3. Which is not a benefit of creating a buffer zone around a compost site?
   a. Reducing noise
   b. Providing a visual screen
   c. Reducing odors
   d. Fewer accidents

4. Which of the following is not a reason to have security at a compost site?
   a. Preventing theft and vandalism
   b. Preventing illegal dumping
   c. Improving traffic flow
   d. Complying with state regulations

5. Which of the following is a good option for reducing workers' exposure to dust and other air contaminants?
   a. Taking frequent breaks
   b. Keeping personnel up-wind from equipment
   c. Keeping the compost saturated with water at all time

6. Which of the following is not a way to reduce odor problems at a composting facility?
   a. Designing the site with wide buffers
   b. Restricting the types of materials accepted at the site
   c. Quickly incorporating raw materials into the compost
   d. Turning materials on the weekends only

7. Runoff water has the potential to contain high levels of dissolved solids and high biochemical oxygen demand.
   a. True b. False

8. Which of these is not good fire prevention or fighting strategy for a composting site?
   a. Having fire extinguishers for each piece of equipment
   b. Maintaining adequate space between windows
   c. Having a water source at the site
   d. Only accepting sewage sludge as a source material

9. An organism capable of spreading or transmitting disease is called a
   a. Heavy metal.
   b. Buffer.
   c. Vector.
   d. Substrate.

10. Which of the following is not a method to reduce physical hazards?
   a. Using proper protective equipment like steel-toed shoes and hardhats
   b. Perform regular maintenance on equipment
   c. Wearing gloves when working with solvents
   d. Keep the working area clean and free of excess water

11. Because of large truck traffic, composting facilities should have
   a. All-weather roads.
   b. Signage.
   c. Speed bumps.

12. The ideal outdoor compost site should have a slope of 1-3% in order to reduce
   a. Odors.
   b. Blowing litter.
   c. Ponding of water.
   d. Transportation costs.

13. Diversion of site runoff to sinkholes is an acceptable option to improve site drainage.
   a. True b. False

14. Which is not a benefit of creating a buffer zone around a compost site?
   a. Reducing noise
   b. Providing a visual screen
   c. Reducing odors
   d. Fewer accidents

15. Which of the following is not a reason to have security at a compost site?
   a. Preventing theft and vandalism
   b. Preventing illegal dumping
   c. Improving traffic flow
   d. Complying with state regulations

16. Which of the following is a good option for reducing workers' exposure to dust and other air contaminants?
   a. Taking frequent breaks
   b. Keeping personnel up-wind from equipment
   c. Keeping the compost saturated with water at all times

Appendix A: CONTACTS BY TOPIC

Contacts by Topic

The Division of Compliance Assistance is now responsible for the implementation of the landfarm certification. The Division of Waste Management is still responsible for the permits, annual review and reporting requirements. The information below offers the reader a contact person for various areas of assistance.

Division of Compliance Assistance

Phone Number: 502-564-0323 *Fax Number: 844-213-0549*

Certification (training, testing & fees)	Veronica Roland
Compliance Assistance	Kari Johnson
Open records requests related to certification	DEP.KORA@ky.gov
Regulations related to certification	Jessica Wilhoite

Division of Waste Management

Phone Number: 502-564-6716 *Fax Number: 502-564-3492*

Technical assistance on permits	Danny Anderson
Landfarming, Composting & Beneficial Reuse	Robin Green
Annual review assistance	Mike Willis Jon Durbin
Solid Waste Landfills	Danny Anderson Ken Melton Charles Higginbotham
Forms and fees not related to certification;	Jamie Nielsen
Bonding and reporting requirements	Lawrie Green John Arnett Rachel Martin
Open records requests related to facilities	DEP.KORA@ky.gov
Regulations related to facility requirements	Jason Monarch
Complaints	Brian Osterman
Facility inspections	Jon Maybriar
Enforcement	Jeff Cummins

DWM Field Offices

Field Offices	Phone Number	Office Supervisor
Bowling Green	270-746-7475	Barbara Hankins
Columbia	270-384-4735	John Rogers
Florence	859-525-4923	Michael Fant
Frankfort	502-564-3358	Richard Thomas
Hazard	606-435-6022	Alex Sandlin
London	606-330-2080	Chase Whitis
Louisville	502-429-7120	Duke York
Madisonville	270-824-7532	Larry Tichenor
Morehead	606-783-8655	Karen Hall
Paducah	270-898-8468	Margie Williams

Appendix B: GLOSSARY

Glossary

AERATED PILE COMPOSTING: See Static Pile Composting

AEROBIC COMPOSTING: Decomposition of organic materials by microbes in the presence of oxygen.

ANAEROBIC DIGESTION: Decomposition of organic materials by microbes in the absence of oxygen.

BUFFER ZONE: Area of land between the composting facility and homes or other sensitive land uses, which shields these adjoining uses from the impact of the operation. The buffer zone should include vegetation.

COMMERCIAL SOLID WASTE: All types of solid waste generated by stores, offices, restaurants, warehouses, and other service and non-manufacturing activities, excluding household and industrial solid waste.

COMPACTION: Compressing of waste to reduce its volume. Compaction allows for transport that is more efficient.

COMPOST: Materials resulting from biological decomposition of organic waste.

COMPOSTING FACILITY: A facility that produces compost using some organic materials from a waste stream.

COMPOSTING PAD: An area within the composting site with a surface upon which the organic materials are processed.

CONTAMINANT: A substance capable of polluting a primary material by contact or mixture.

CUBIC YARD: The standard measure of waste volume, which roughly assuming an average rate of compaction.

CURING: The final stage of compost processing, after much of the readily metabolized material has been decomposed, in which the compost material further stabilizes.

DISEASE VECTOR: All insects, birds, rodents or other organisms capable of transmitting pathogens (disease causing organisms).

EPHEMERAL STREAMS: A stream that flows only in direct response to precipitation (rain, or melting snow and ice) in the immediate watershed and has a channel bottom that is always above the local water table.

EUTROPHICATION: The enrichment of nutrients in water leading to excessive algae or plant growth, followed by death, subsequent decomposition and depletion of oxygen in the water.

FRONT-END LOADER: A tractor or other vehicle with power-driven loading equipment at the front. This equipment is sometime referred to as a bucket loader.

GRINDER: A mechanical device used to breakup waste materials into smaller pieces. Grinding devices include hammermills, shears, drum pulverizers, wet pulpers and rasp mills.

GROUNDWATER: Water contained in the zone of perennial saturation (phreatic zone). It is differentiated from water held in the soil in chemical or electrostatic bonds in the perennially unsaturated zone.

HEAVY METALS: Metallic elements with atomic weights greater than sodium (23) such as lead, mercury, cadmium, and zinc that tend to be toxic to humans, plants, and animals at relatively low concentration and tend to bioaccumulate.

HOUSEHOLD SOLID WASTE: Solid waste, including garbage and trash generated by single and multiple family residences, hotels, motels, bunkhouses, ranger stations, crew quarters and recreational areas such as picnic areas, parks and campgrounds.

INDUSTRIAL SOLID WASTE: Solid waste generated by manufacturing or industrial processes that is not a hazardous waste or a special waste as designated by KRS 224.868, including, but not limited to, waste resulting from the following manufacturing processes: electric power generation; fertilizer or agricultural chemicals; food and related products or by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone, glass, clay, and concrete products; textile manufacturing; transportation equipment; and water treatment.

INORGANIC: Solid matter in which there are no carbon-to-carbon bonds, such as minerals, which will not undergo biological decomposition.

LEACHATE: Any liquid including suspended or dissolved components in the liquid that has percolated through or drained from waste.

LEAVES: Seasonal deposition from deciduous or coniferous trees, shrubs, bushes and other plants contained in yard waste.

MUNICIPAL SOLID WASTE (MSW): Garbage, refuse, trash and other solid waste from residential, commercial and community activities.

NON-COMPOSTABLE: Materials that will not decompose biologically or whose decomposition products are toxic.

N:P:K RATIO: Refers to the ratio of nitrogen to phosphorus to potassium in a compost product.

ORGANIC WASTE: Waste composed of materials which contain carbon-to-carbon bonds and are biodegradable, including paper, wood, food waste and yard waste.

PATHOGENS: Organisms capable of producing infection or disease often found in waste materials. The high temperature sustained in the composting process reduces pathogens.

PERCOLATION: Downward movement of water through the pores or spaces in rock and soils.

pH: The measure of how acidic (pH less than 7) or basic (pH above 7) a materials is. A pH of 7 is considered neutral.

PUTRESCIBLE: Susceptible to rapid decomposition by bacteria, fungi, or oxidation sufficient to cause nuisances such as odors, gases, or other offensive conditions.

RESOURCE RECOVERY: A term used to describe the extraction of economically useful materials and/or energy from solid waste. Often refers to the burning of waste for energy.

RUN-OFF: Any rainwater, leachate, or other liquid that drains overland or into the groundwater from any part of a facility.

RUN-ON: Any rainwater, leachate, or other liquid that drains onto any part of the facility.

SCREENING: The process of passing compost through a screen or sieve to remove large organic or inorganic materials and improve the consistency and quality of the end product.

SHREDDER: "See Grinder".

SOIL AMENDMENT/SOIL CONDITIONER: Means any substance which is intended to improve the physical characteristics of the soil, except commercial fertilizers, agricultural

liming materials, unmanipulated animal manures, pesticides and other materials exempted by regulation.

SOLID WASTE: Any garbage, refuse, sludge, and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining (excluding coal mining waste, coal mining by-products, refuse and overburden), agricultural operations, and from community activities, but does not include those materials including, but not limited to sand, soil, rock, gravel, or bridge debris extracted as part of a public road construction project funded wholly or in part with state funds, recovered materials, special wastes as designated by KRS 224.868, solid or dissolved material in domestic sewage, manure, crops, or crop residue, or a combination thereof which are placed on the soil for return to the soil as fertilizers or soil conditioners, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880), or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923).

SPECIAL WASTE: Those materials of high volume and low hazard which include but are not limited to mining waste, utility wastes (fly ash, bottom ash, scrubber sludge), sludge from water treatment facilities and wastewater treatment facilities, cement kiln dust, gas and oil drilling mud, and oil production brines. Other waste may be designated special waste by the cabinet.

STATIC PILE COMPOSTING: A method of composting in which oxygen and temperature levels are mechanically controlled by passive or forced aeration.

SUBSTRATE: The organic material, on which the decomposing microorganisms live and feed.

VOLUME REDUCTION: The processing of waste materials to decrease the amount of space they occupy. Compaction, shredding, composting and burning are all methods of volume reduction.

WINDROW: An elongated compost pile, usually about 6 to 12 feet high and up to hundreds of feet long.

WINDROW COMPOSTING: The composting of organic materials in a series of elongated piles. The windrows are turned periodically to aerate and mix the waste materials to speed up decomposition and reduce odor.

YARD WASTE: Debris such as grass clippings, leaves, garden waste, brush and trees.

Appendix C: OPERATOR CERTIFICATION REGULATIONS

Solid Waste Operator Certification Regulations

401 KAR 45:090. Special waste operator certification.

RELATES TO: KRS 224.01, 224.10, 224.40, 224.50

STATUTORY AUTHORITY: KRS 224.10-100, 224.40-100, 224.40-305, 224.40-605, 224.50-760

NECESSITY, FUNCTION, AND CONFORMITY: KRS Chapter 224 requires the cabinet to adopt administrative regulations for the management, processing, and disposal of special wastes. KRS 224.40-305 requires persons who establish, conduct, operate, maintain or permit the use of a waste site or facility to obtain a permit. This chapter establishes the permitting standards for special waste sites or facilities, and the standards applicable to all special waste sites or facilities. This administrative regulation establishes the program for education, testing, and certification of operators of special landfarming sites or facilities in accordance with KRS 224.40-605.

Section 1. Applicability. (1) The requirements of this administrative regulation apply to all special waste landfills, landfarms, and composting facilities operating under formal permits, as identified in 401 KAR 45:020, Section 2(1)(a) and (b).

(2) The owner or operator shall ensure that all technical operations at the special waste site or facility are conducted by or under the direction of an individual with a valid certification under this administrative regulation. The landfill, landfarming, or composting operator shall be reasonably available at the site or facility during operation.

(3) The certified operator shall ensure that all operations are conducted in compliance with this chapter.

(4) A special waste site or facility permit may be revoked or subject to other enforcement actions upon violation of the requirements of this administrative regulation.

Section 2. Transition of Certification. (1) Persons holding a valid certification for landfill manager, landfill operator, and landfarming operator under 401 KAR 47:070 shall be deemed to hold a valid certification under this chapter until the certification expires. At the time a certification expires, the certificate holder shall obtain special waste certification under this administrative regulation.

(2) Persons operating a special waste landfill who were not previously certified to operate a residual landfill under 401 KAR Chapter 47 shall obtain certification under this chapter within one (1) year of the effective date of this administrative regulation.

(3) Persons operating a special waste composting or landfarming site or facility shall obtain certification within one (1) year of the effective date of this administrative regulation.

Section 3. General Provisions for Landfills. (1) Each special waste landfill shall have a landfill operator certified in accordance with this administrative regulation.

(2) No special waste landfill shall operate in the absence of a certified operator without the appointment of an interim operator in accordance with Section 11 of this administrative regulation.

Section 4. General Provisions for Landfarming and Composting Facilities. (1) Each landfarming or composting facility shall have an operator certified in accordance with this administrative regulation.

(2) No landfarming or composting facility shall operate in the absence of a certified operator without the appointment of an interim operator in accordance with Section 11 of this administrative regulation.

Section 5. Application for Certification. (1) Persons desiring to be certified shall submit an application at least thirty (30) days prior to the scheduled training class. Applicants for training and examination shall use form DEP 6031 entitled "Application for Certification" (March 1992). The requirements contained in the application for certification are incorporated in this administrative regulation by reference. The application may be obtained from the Division of Waste Management, 14 Reilly Road, Frankfort, Kentucky 40601, (502) 564-6716, between the hours of 8 a.m. to 4:30 p.m., Eastern Time, Monday through Friday.

(2) The cabinet shall review applications and supporting documents, determine the eligibility of the applicant for examination, and notify the applicant of the determination.

(3) No person shall be eligible for examination for certification unless that person completes the appropriate training course provided by the cabinet, unless an alternative training program is accepted by the cabinet in accordance with Section 6 of this administrative regulation.

Section 6. Training Course Requirements. (1) The cabinet shall provide training courses for individuals desiring to become certified. All applicants for certification shall be required to attend a training course provided by the cabinet, unless alternate training is accepted under subsection (3) of this section.

(2) The training course shall address the technical and legal aspects of the facility type for which operator certification is sought.

(a) The training course for landfill operators shall include:

1. Permit application requirements for special waste landfills, including technical and administrative requirements;

2. Waste characterization;

3. Chemical and biologic reactions associated with the waste;

4. Hydrogeologic and engineering factors associated with the facility;

5. Operational requirements and achieving compliance with 401 KAR 30:031;

6. Duties and responsibilities associated with landfill management;

7. Requirements of this chapter as they apply to facility operation, including environmental monitoring, operations requirements, and maintaining compliance with 401 KAR 30:031;

8. Evaluating site suitability to receive wastes;

9. Environmental considerations in preventing violations of this chapter;

10. Maintaining equipment; and

11. Facility safety.

(b) The training course for landfarm and composting operators shall include:

1. Requirements of this chapter as they apply to facility operation and management;

2. Wastewater treatment processes;

3. Waste characterization;

4. Chemical and biological reactions associated with the waste;

5. Landfarming design and management;

6. Permit application requirements for special waste landfarms;

7. Environmental considerations in preventing violations of this chapter;

8. Achieving and maintaining compliance with 401 KAR 30:031;

9. Evaluating site suitability to receive waste;

10. Maintaining equipment;

11. Facility safety; and

12. Duties and responsibilities associated with operating a landfarm.

(3) The cabinet may accept alternate training courses, provided they result in a level of competence equivalent to that of participation in the cabinet's training course. It shall be the applicant's responsibility to submit documentation as the cabinet requires for an equivalency judgement of the alternate training course. This information shall contain at a minimum the following specifics: the course name; sponsoring agency; the date, location, and beginning and ending times of the course; a summary of the course content of sufficient detail to determine relevance and quality of the course; and a copy of the certificate received.

Section 7. Training and Examinations. (1) After training is complete, time shall be set aside for the purpose of examinations to determine the knowledge and ability of the applicant.

(2) Separate examinations shall be prepared to cover basic differences in the duties and responsibilities for the operation of each category of special waste site or facility.

(3) Applicants who fail to pass an examination may reapply for the examination at a regularly scheduled examination or by appointment with the cabinet. The cabinet shall require the applicant to attend the training session again if the applicant fails to pass the examination in three (3) attempts.

Section 8. Education and Equivalencies. (1) All applicants shall be evaluated by the cabinet as to education and experience as related to the appropriate category of special waste site or facility.

(2)(a) Applicants for landfill operator shall have completed high school, by graduation or by obtaining an equivalency certificate, and shall have a minimum of one (1) year of experience at a landfill facility.

(b) If an applicant for landfill operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a

landfill or experience in a related field such as heavy equipment operator, road construction, surface mining.

(3)(a) Applicants for landfarming or composting operator shall have completed high school, by graduation or by obtaining an equivalency certificate, and shall have a minimum of one (1) year of experience at a landfarming or composting facility.

(b) If an applicant for landfarming or composting operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfarming facility or experience in a related field such as wastewater treatment or water treatment in determining eligibility for examination on a year-for-year basis.

Section 9. Issuance of a Certificate. (1) Certification may be issued to individuals upon meeting the minimum education requirements, work experience, and the course work requirements of this administrative regulation and passing the examination in accordance with Section 5 of this administrative regulation.

(2) Certification shall not be valid if obtained through fraud, deceit, or the submission of inaccurate data.

Section 10. Issuance of Certificate. (1) A certification shall be issued for a period of five (5) years, at the end of which the certification shall expire, unless renewed. Renewal procedures and requirements shall be the same as those for a new certification.

(2) The certification of an operator whose employment at a special waste site or facility terminates shall remain valid until expiration or revocation of certification.

(3) Certificates shall be carried on the person of the certified operator during working hours at the facility, or shall be prominently displayed at the facility office.

(4)(a) The cabinet may revoke the certification of an operator if the operator:

1. Has practiced fraud or deception;

2. Has failed to perform his duties under this chapter;

3. Has failed to use reasonable care and judgement in performance of his duties under this chapter; or

4. Has knowingly or willfully violated the requirements of this chapter.

(b) Individuals who have had their certification revoked shall be ineligible for future recertification.

Section 11. Interim Operators. (1) The permittee shall be responsible for actions of an interim operator. The permittee shall notify the cabinet in writing if the special waste site or facility will not have a certified operator for more than fourteen (14) consecutive operating days.

(2) Consecutive operating days, as used in subsection (1) of this section, shall be determined as any days:

(a) When the special waste site or facility accepts waste, operates equipment, or otherwise performs the business of special waste management; and

(b) That occur in sequence, regardless of whether nonoperating days such as weekends or holidays fall in between.

(3) The notification required by subsection (1) of this section shall be provided at least ten (10) days prior to an anticipated absence, and immediately upon discovery of an unanticipated absence. The notification shall contain:

(a) The name, address, and qualifications of the interim operator;

(b) The length of time for which the permittee seeks to have an interim operator rather than a certified operator; and

(c) Reasons for replacement of the certified operator with an interim operator.

(4) The cabinet shall evaluate the qualifications of the designated interim operator and shall notify the permittee of the cabinet's determination in writing within thirty (30) days of receipt of the permittee's notice. The determination shall:

(a) Approve, conditionally approve, or deny the permittee's request for designation of the interim operator;

(b) Identify the length of time an interim operator may operate the special waste site or facility; and

(c) Specify conditions as appropriate to the site and the interim operator's qualifications.

(5) An interim operator shall obtain certification under this administrative regulation within fifteen (15) months of becoming an interim operator.

(6) The cabinet may revoke the appointment of an interim operator in accordance with Section 10(4)(a) of this administrative regulation. Revocation shall render the person ineligible for operator certification under Section 10(4)(b) of this administrative regulation.

Section 12. Fees. (1) Fees for application for certification shall be:

(a) $125 for application for certification as a landfill operator;

(b) $125 for certification as a landfarming or composting operator;

(c) Fifty (50) dollars for certification by reciprocity for all categories of operator; and

(d) $100 dollars for attendance at the certification training without taking the examination.

(2) Fees shall accompany applications and shall not be returned to those who do not qualify for a certificate. (18 Ky.R. 3094; Am. 3440; eff. 6-24-92.)

401 KAR 47:070. Operator certification.

RELATES TO: KRS 224.01, 224.10, 224.40, 224.43, 224.46, 224.70, 224.99

STATUTORY AUTHORITY: KRS 224.10-100, 224.40-605

NECESSITY, FUNCTION, AND CONFORMITY: KRS Chapter 224 requires the cabinet to adopt rules and administrative regulations for the management, processing or disposal of wastes. KRS 224.40-605 requires the cabinet to promulgate administrative regulations that establish standards and a certification program for operators of waste sites or facilities. This chapter establishes the permitting standards for solid waste sites or facilities, the standards applicable to all solid waste sites or facilities, and the standards for certification of operators. An overview of the permit program is found in Section 1 of 401 KAR 47:080. This administrative regulation establishes the program for education, testing, and certification of facility operators of solid waste sites or facilities.

Section 1. Definitions. The following are definitions as used in this administrative regulation:

(1) "Category of solid waste site or facility" means inert, residual, construction demolition debris, residential or contained landfill and includes landfarming facilities receiving Class I, II and III sludges or wastes.

(2) "Certificate" means a written document issued by the cabinet stating that the operator has met all requirements for certification.

(3) "Certified operator" means a solid waste site or facility operator who holds a valid certificate. The following are categories of certified operators:

(a) "Landfarming operator" means a certified operator who is the individual responsible for ensuring compliance with all permit conditions at a landfarming facility in accordance with 401 KAR 48:200, and who is reasonably available to the site;

(b) "Landfill operator" means a certified operator who is the individual responsible for the daily operating requirements identified in 401 KAR 47:120, 48,060, 48:090, or 48:170;

(c) "Landfill manager" means a certified operator who is the individual with primary responsibility for management and operation of the residential or contained or construction/demolition debris sanitary landfill to assure compliance with all permit conditions including direct responsibility for providing guidance to the landfill operator, or the permittee and the authority to commit financial resources allocated for proper operation; or

(d) "Interim operator" means the individual identified by the permittee as the replacement landfarming operator, landfill operator, or landfill manager in accordance with Section 12 of this administrative regulation.

Section 2. Applicability. (1) The requirements in this administrative regulation apply to all solid waste sites or facilities except as subsection (2) of this section provides otherwise. Each solid waste site or facility shall have at least one (1) operator certified in accordance with Section 3 (sanitary landfills) or Section 4 (landfarming facilities) of this administrative regulation, as appropriate to the category of solid waste site or facility.

(2) Residual landfills and facilities operating under a registered permit-by-rule or a permit-by-rule are excluded from the requirements of this administrative regulation, unless the cabinet requires operator certification as a condition of the permit. In deciding whether to require operator certification at a residual landfill, a site or facility with a registered permit-by-rule or a permit-by-rule, the cabinet shall consider:

(a) The characteristics of the waste stream;

(b) The characteristics of the site, including geology and hydrology; and

(c) The experience and qualifications of the operator.

(3) It shall be the responsibility of the permittee to ensure that the solid waste site or facility complies with the requirements of this administrative regulation.

Section 3. General Provisions for Landfills. (1) Each construction/demolition debris, residential and contained landfill shall have a certified operator who is a landfill operator and a landfill manager. The requirements of this subsection may be fulfilled by:

(a) One (1) individual who has been certified in accordance with Section 6 of this administrative regulation for both categories of certified operator (provided this individual meets the qualifications in Sections 1(3) and 11 of this administrative regulation); or

(b) Two (2) individuals who have been certified in accordance with Section 6 of this administrative regulation in each category of operator such that one (1) individual is certified as a landfill operator and one (1) individual is certified as a landfill manager.

(2) As provided in Section 2 of this administrative regulation, the cabinet may require as a permit condition that a residual landfill or a site or facility with a permit-by-rule or registered permit-by-rule shall have a certified operator who is a landfill operator or a landfill manager or both. The permit condition imposed shall reference all applicable operating administrative regulations and requirements for the specific category of sanitary landfill.

(3) In the event the certified operator who is the landfill operator is not physically at the facility during operating hours, either the landfill manager or an interim operator shall be designated responsible for daily site operation and shall be physically located on site. If an interim operator assumes responsibility for daily operation of the landfill, the requirements in Section 12 of this administrative regulation shall be met.

(4) In carrying out its responsibilities, the cabinet shall examine the qualifications of applicants for certification and maintain records of certification and a register of certified operators.

(5)(a) Except as provided in Section 2 of this administrative regulation, no landfill shall continue operation in the absence of a landfill operator on site for more than ten (10) consecutive operating days without appointment of a qualified interim operator in accordance with Section 12 of this administrative regulation or written approval from the cabinet.

(b) Except as provided in Section 2 of this administrative regulation, no landfill shall continue operation in the absence of a landfill manager for a period longer than thirty (30) consecutive operating days without appointment of a qualified interim operator in accordance with Section 12 of this administrative regulation or written approval from the cabinet.

Section 4. General Provisions for Landfarming Facilities. (1) Each landfarming facility shall have a landfarming operator certified in accordance with Section 6 of this administrative regulation.

(2) No landfarming facility shall continue operation in the absence of a landfarming operator for a period longer than five (5) consecutive working days without appointment of a qualified interim operator in accordance with Section 12 of this administrative regulation or written approval from the cabinet.

Section 5. Application for Certification. (1) An individual desiring to be certified shall file an application on a form provided by the cabinet at least thirty (30) days before beginning training for a scheduled examination.

(2) The applicant shall submit all information needed to determine eligibility of the applicant for examination and certification.

(3) The cabinet shall review applications and supporting documents, determine the eligibility of the applicant for examination and notify the applicant of the determination.

(4) No person shall be eligible for examination for certification unless that person completes the appropriate training class or classes provided by the cabinet, unless an alternative training program or certification program is accepted by the cabinet in accordance with Section 7(6) of this administrative regulation.

Section 6. Training Classes and Examinations. (1) The cabinet will provide training classes for the certified operator.

(2) Training sessions will be held at least annually at places and times set by the cabinet. The last day of each training session will be set aside for the purpose of examinations to determine the knowledge and ability of the applicant.

(3) Certification shall be conditioned on successful passage of a written examination, unless an alternative examination process is accepted by the cabinet.

(4) Separate examinations will be prepared to cover basic differences in the duties and responsibilities for the operation of each category of solid waste site or facility and each category of certified operator.

(5) Applicants who fail to pass an examination may reapply for the examination at a regularly scheduled examination or by appointment with the cabinet. The cabinet shall require the applicant to attend the training session again if the applicant fails to pass the examination in three (3) attempts.

(6) In the event an applicant fails to meet the requirements for certification, he may petition the cabinet for a one (1) time only "temporary hardship certification." The cabinet will then conduct an informal hearing at which evidence shall be presented by the applicant to support his hardship request. Each temporary hardship certification request shall be considered on a case-by-case basis under the following guidelines:

(a) Failure of the applicant to receive certification would leave a significant area of the state without adequate waste disposal service.

(b) The applicant has shown a good faith effort by attending all required training sessions and met all requirements except the applicant has failed in three (3) attempts to pass the examination.

(c) The applicant has shown, through cabinet inspections, a capability for satisfactory operation of the solid waste site or facility.

Section 7. Training Course Requirements. (1) All applicants for certification shall be required to attend a training course provided by the cabinet in accordance with KRS 224.844.

(2) The training course provided by the cabinet shall be designed to provide information as appropriate to the category of certified operator. At a minimum, the training course shall provide information which enables the certified operator to perform his duties in a knowledgeable and competent manner.

(3) Landfill managers shall be trained on:

(a) The requirements for permit application for the applicable category of sanitary landfill including ownership, zoning, chapter 109 district boards, geologic and hydrologic information and specific design details;

(b) Characteristics of the waste stream; the physical, chemical and biological reactions including the hydrogeologic interactions of a landfill; and measures that shall be employed to meet the environmental performance standards in 401 KAR 47:030 and all other regulatory requirements; and

(c) Specific duties expected to be performed by individuals who are wholly responsible for the requirements associated with the operation of the applicable category of sanitary landfill permitted by the cabinet. These actions include at a minimum, the commitment of resources, oversight of operating personnel, and verification that site operation is in accordance with all provisions of the permit including technical documents.

(4) Landfill operators shall be trained on the requirements contained in the solid waste administrative regulations as they apply to daily site operation duties. These duties include judging indicators regarding a site's ability to receive wastes; judging waste characteristics for disposal acceptability; employing site equipment to maintain waste compaction, cover, and surface water management on a daily basis; maintaining equipment; maintaining site safety; and generally assuring compliance with the administrative regulations.

(5) Landfarming operators shall be trained on the Kentucky waste management program as it applies to landfarming; wastewater treatment processes; the nature and characteristics of sludges; the physical and chemical properties of sludges; landfarming design and management; environmental considerations; and the Kentucky waste management permit process. The permit process includes requirements for application, conditions for maintaining a permit in compliance with the application and administrative regulations, and amendments to the landfarming activity and associated permit.

(6) The cabinet shall provide the training course to applicants for certification. However, the cabinet may consider alternate training courses or certification programs provided they are equivalent to the content prescribed by the cabinet's training course. It shall be the applicant's responsibility to submit such documentation as the cabinet requires for an equivalency

judgment of the alternate training course. This information shall contain at a minimum the following specifics: the course name; sponsoring agency; the date, location and the beginning and ending times of the course; a summary of the course content of sufficient detail to determine relevance and quality of the course; and a copy of the certificate received.

Section 8. Issuance of Certificates. (1) Upon passage of the examination the cabinet will issue a certificate to the applicant which will indicate the category of solid waste site or facility and the category of certified operator for which the operator is certified.

(2) Certified operators shall be recertified every five (5) years.

(3) Certificates will be issued to holders of certificates of another state if the training requirements of the issuing state are deemed comparable as specified in Section 7(6) of this administrative regulation and if the operator passes the cabinet's examination.

(4) The certificates of operators who terminate their employment at a solid waste site or facility will remain valid until expiration or revocation of the certificate.

(5) Certificates shall be carried on the person of each certified operator during working hours at the facility or prominently displayed on site.

Section 9. Compliance Dates. (1) An operator who is not an appropriately certified operator and who assumes the responsibility of a certified operator shall immediately comply with the requirements in Section 12 of this administrative regulation; and

(2) Comply with the requirements in Section 6 of this administrative regulation within fifteen (15) months of assuming the responsibility.

Section 10. Revocation of Certificate. (1) The cabinet may revoke the certificate of an operator, following a cabinet hearing, when it determines that the operator has practiced fraud or deception, or that the operator has failed to perform an operator's duties including, but not limited to, failure to comply with permit conditions.

(2) The cabinet may revoke a certificate whenever the holder fails to use reasonable care and judgment in the performance of an operator's duties. No certificate shall be valid if obtained through fraud, deceit, or the submission of inaccurate data on qualifications.

(3) Individuals who have had their certificate revoked by the cabinet shall be ineligible for future recertification.

Section 11. Operator Qualifications: Education and Equivalencies. (1) All applicants shall be evaluated by the cabinet as to education, and experience as related to the appropriate category of solid waste site or facility.

(2)(a) Applicants for landfill operator shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have a minimum of one (1) year of experience at a landfill similar to the category of landfill for which certification is sought.

(b) If an applicant for landfill operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a

landfill or experience in a related field (i.e., heavy equipment operator, road construction, surface mining, etc.) in determining eligibility for examination on a year-for-year basis.

(3)(a) Applicants for landfill manager shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have:

1. A minimum of two (2) years administrative experience in a related field (i.e., waste management, wastewater treatment, etc.); or

2. A minimum of two (2) years of postsecondary education; or

3. A minimum of two (2) years of a combination of experience in a related field and postsecondary education.

(b) If an applicant for landfill manager does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the qualifications of the applicant on a case-by-case basis.

(4)(a) Applicants for landfarming operator shall have completed high school (by graduation or by obtaining an equivalency certificate) and shall have a minimum of one (1) year of experience at a landfarming facility.

(b) If an applicant for landfarming operator does not meet the requirements of paragraph (a) of this subsection, the cabinet may consider the number of years of experience in operating a landfarming facility or experience in a related field (i.e., waste water treatment, water treatment, etc.) in determining eligibility for examination on a year for year basis.

Section 12. Interim Operators. (1) In accordance with the requirements in subsection (2) of this section, the permittee shall notify the cabinet in writing of the extended absence of a certified operator ten (10) days prior to an anticipated absence and immediately upon discovery of an extended absence due to an emergency or unanticipated circumstances. The notice from the permittee shall provide the cabinet with the following information:

(a) Name and qualifications of the individual intended to replace the certified operator; and

(b) The length of time for which the permittee seeks to have the interim operator fulfill the obligations of the certified operator.

(2) The permittee shall notify the cabinet of the extended absence when the operator or manager shall be absent for:

(a) More than ten (10) consecutive operating days for a landfill operator;

(b) More than thirty (30) consecutive operating days for a landfill manager; and

(c) More than five (5) consecutive operating days for a landfarming operator.

(3) Consecutive operating days as used in subsection (2) of this section shall be determined as any days:

(a) When the solid waste site or facility accepts waste, operates equipment or otherwise performs the business of solid waste management; and

(b) Which days occur in sequence regardless of whether nonoperating days such as weekends or holidays fall in between.

(4) The cabinet shall evaluate the qualifications of the designated interim operator and shall notify the permittee of the cabinet's determination in writing within thirty (30) days of receipt of the permittee's notice. The determination shall:

(a) Approve or deny the permittee's request for designation of the interim operator;

(b) Identify the length of time the interim operator may operate the solid waste site or facility; and

(c) Specify conditions as appropriate to the site and the interim operator's qualifications.

Section 13. Permit Condition. As specified in Section 2 of this administrative regulation, every solid waste site or facility requiring a permit shall be operated by the operator certified pursuant to this administrative regulation. Pursuant to Sections 2 and 3 of this administrative regulation, maintaining the certified operator(s) shall be considered a permit condition, and the permit may be revoked, or penalties for permit violations sought as appropriate, upon violation of the requirements and duties established by this administrative regulation.

Section 14. Fees. (1) Fees for application for certification shall be:

(a) $125 for application for certification as a landfill operator;

(b) $125 for application for certification as a landfill manager;

(c) $150 for application for certification as both a landfill operator and a landfill manager when the application is made for certification for both categories at the same training session;

(d) $125 for application for certification as a landfarming operator; and

(e) Fifty (50) dollars for certification by reciprocity for all categories of operator.

(2) Fees shall accompany applications and will not be returned to those who do not qualify for a certificate. (Recodified from 401 KAR 2:111, 3-1-83; Am. 10 Ky.R. 172; eff. 12-2-83; 13 Ky.R. 913; 1228; eff. 1-13-87; 16 Ky.R. 1642; 2174; eff. 5-8-90.)

Appendix D: GROUNDWATER PROTECTION PLANS

Groundwater Protection Plans

Revised January 25, 2012

Effective August 24, 1995, anyone engaged in activities that have the potential to pollute groundwater is required to develop and implement a Groundwater Protection Plan (GPP). This applies to all commercial businesses, municipal, county, and federal governments, and private citizens. Activities associated with composting operations and the land application of solid and special waste also require the development and implementation of a GPP.

A GPP identifies activities being conducted at your site that have the potential to pollute groundwater and states the protective practices (BMPs) that you will use to protect groundwater. The regulation requires the person responsible for implementing your GPP to review the entire GPP every three years. If no changes have occurred in activities or BMPs, the GPP may be recertified by signing and dating another Certification Statement. If changes have occurred the plan must be revised to address the modifications. The revised GPP must also have a newly signed Certification Statement. Be sure to keep your GPP updated as a DEP inspector can issue a Notice of Violation (NOV) if you are implementing an out-of-date GPP.

GPPs do not have to be approved to be implemented. In fact, GPPs are not required to be submitted for review and approval unless (1) they are called in by a Department for Environmental Protection (DEP) inspector, (2) they are called in by the Groundwater Section staff or GPP Program, or (3) they are required as part of an Agreed Order (Enforcement). GPPs can be voluntarily submitted to the Groundwater Section for review. Anyone from the public or DEP may ask to review your GPP. However, official approval of the GPP can be issued only by the Groundwater Section's GPP Program.

The GPP Program is operated out of the Groundwater Section of the Watershed Management Branch of the Kentucky Division of Water, 4th Floor, 200 Fair Oaks Lane, Frankfort KY 40601. The program coordinator may be contacted at (502) 564-3410.

Kentucky Administrative Regulation 401 KAR 5:037, The Groundwater Protection Plan Regulation, was promulgated in August 1994 as required by Kentucky Revised Statute 224. The guidance for developing a GPP for land application of solid and special waste or the mini-guidance for composting operations are included in this manual. They also may be downloaded, along with the regulation, from the program web site at http: //water.ky.gov. Click on Programs and the following links: Groundwater, Groundwater Protection, and Groundwater Protection Plans.

GROUNDWATER PROTECTION PLANS

ACTIVITIES SUBJECT TO 401 KAR 5:037 THAT COMMONLY OCCUR AT COMPOSTING FACILITIES

January 25, 2012

- Aboveground Storage Tanks (AST's)
- Water well
- Septic system
- Storage and Disposal of Vehicle Fluids
- Loading and Unloading of Compostable Materials
- Land treatment of waste

This listing is by no means complete, and some of the above activities may not apply to your site. Be sure to read Section 2 of the regulation thoroughly to assure that all regulated activities that occur at your facility are included in your Groundwater Protection Plan (GPP).

The GPP must include information about the capacity and contents of your AST's. Secondary containment for AST's includes use of double walled tanks, and structures to contain a spill. If the AST contains fuel for refueling heavy equipment or other vehicles, describe the surface over which the refueling occurs. Any spills associated with fueling equipment or vehicles must be cleaned up immediately if they occur over ground surface or may run off to the ground. A spill clean up kit should be available near the fuel tank and employees trained to avoid over-filling their vehicles.

If a water well or septic system is in use, the protective practices provided in the cabinet-written generic GPP for Domestic Water Wells or for Residential Septic Systems may be adapted to your facility GPP. Instructions may be downloaded from the GPP web site.

If maintenance on heavy equipment or light vehicles is conducted on site, the GPP must contain information on storage locations for:

1. 55-gallon or larger containers of new oil, coolants, hydraulic fluid or transmission fluid.
2. Any size containers of waste oil, used coolant, used hydraulic fluid and transmission fluid.

Provide a specific explanation regarding how these pollutants are disposed (i.e., recycler picks up, burn for heat).

If maintenance is conducted in a building, check for floor drains. If present, determine where they go. If you can't determine where the floor drain goes, or if the floor drain in this area

discharges to a septic tank, plug the drain **immediately**! Only sanitary wastewater may drain into the septic tank.

If any spills occur over the ground surface while loading or unloading compostable materials, they should be cleaned up as soon as possible.

The Groundwater Section of the Watershed Management Branch strongly recommends that all composting be conducted on an impermeable surface such as a concrete pad that directs any run off to a containment structure. Under no circumstances should any run off or compost material be allowed to flow into a sinkhole or nearby water body.

The GPP must include the certification numbers of all certified operators, and a signed statement that the site is operated in compliance with the environmental performance standards in 401 KAR 47:030 and 401 KAR 30:031.

The Groundwater Protection Plan regulation, guidance document, generic GPPs, and other information may be downloaded at the GPP Web site: http://water.ky.gov, then Programs, Groundwater, Groundwater Protection, Groundwater Protection Plans. The Program Coordinator may be contacted at (502) 564-3410 for paper copies or for assistance with developing your GPP.

PREPARING A GROUNDWATER PROTECTION PLAN FOR LAND APPLICATION OF SOLID OR SPECIAL WASTE

Revised January 25, 2012

The Groundwater Protection Regulation, 401 KAR 5:037, requires anyone who conducts an activity having the potential to pollute groundwater to develop a Groundwater Protection Plan (GPP). A Groundwater Protection Plan identifies the activities being conducted at your site that have the potential to pollute groundwater and states the practices you will use that will prevent groundwater pollution. Section 2 of the regulation identifies the activities that require a GPP. Land application of sewage sludge is one of the activities identified under Section 2.

(1)(e) "Land treatment or land disposal of a pollutant," and

(1)(f) "Storing, treating, disposing, or related handling of hazardous waste, solid waste, or special waste in landfills, incinerators, surface impoundments, tanks, drums, or other containers, or in piles."

Your GPP must include **all** the activities occurring at your sites that are subject to 401 KAR 5:037. Read Section 2 thoroughly to determine if there are any regulated activities other than the two above. If so, include them in the GPP. The regulation may be downloaded at http://water.ky.gov/. Click on Programs, Groundwater, Groundwater Protection, Groundwater Protection Plans.

USING THE GUIDANCE

Follow the Guidance Format.

Follow the format provided in this guidance to develop your GPP. Using this format will assure that most, if not all, of the information necessary for adequate review is included. It also organizes the information so that anyone from the general public can follow your plan without needing additional explanation.

Use all Headings and Subheadings as stated in the Guidance.

Do not make up your own headings or subheadings. Use the headings and subheadings in the order provided in the guidance. Do not leave out headings.

Provide all Information requested in the Guidance, where applicable.

Be sure that you have provided the information requested. The review process is delayed when necessary information has been left out.

Contact the GPP Program if you need assistance or have any questions.

Call the Program Coordinator at (502) 564-3410.

WHEN YOU HAVE COMPLETED THE GPP

When you have completed your plan, review the draft to be sure that the GPP has addressed **all** the activities occurring at your site that are covered by the Groundwater Protection Regulation and that you have provided **all** the information, where applicable, for each section.

Implement your GPP!

To be in compliance with 401 KAR 5:037 the GPP must be implemented **immediately** following development. This applies to **all** GPPs, even if your GPP is in review by the Groundwater Section. Implementation is not dependent upon approval of the plan. If your GPP is in review, continue to implement the practices in the submitted GPP. If changes are required, then the new practices should be implemented.

Submitting the GPP

Submittal of a GPP for review by the Groundwater Section, Watershed Management Branch, is optional unless:

1. required as part of an Agreed Order.
2. stated by a DEP inspector as a requirement in a Notice of Violation
3. requested by letter by the Groundwater Section.

To submit a GPP for review, send one (1) copy of the GPP to Watershed Management Branch, Kentucky Division of Water, 300 Sower Blvd., Frankfort, Kentucky, 40601. You will receive a letter stating that the Watershed Management Branch has received your plan.

Your initial GPP submittal and any further drafts **will not** be returned. Be sure you keep a copy of each draft so that required changes can be made. The approved draft will be retained in the Division of Water (DOW) files. You will receive a letter stating the GPP has been approved.

It is not necessary to include the Groundwater Protection Regulation or this guidance document with the GPP when submitting it to the Groundwater Section for review.

FORMAT FOR GPP

SECTION A. GENERAL INFORMATION

1. Name (if there is one) and Address of Land Application Facility

   --Name of street, or route number (NOT mailing address).
   --Latitude and longitude location of land application facility entrance. If you need to obtain latitude and longitude of your site, go to http://www.batchgeocode.com/lookup. Insert your address as directed.
   --Name of County.

2. Person Developing GPP

   --Name
   --Address (business address, not home address unless business operates out of the home)
   --Telephone Number (business phone, not home phone unless business operates out of the home).

3. Person Responsible for Implementing GPP

   --Name
   --Address (business address, not home address unless business operates out of the home).
   -Telephone number

4. Location of Land Application Sites on Topographic Map

   --Draw boundaries of sites on 8 ½ x 11 copy of the U.S. Geological Survey topographic quadrangle map. Only a United States Geological Survey topographic map will be accepted. Copy the 8 ½ x 11-inch section of the map that contains the location of the land application sites. Do **not** enlarge or reduce the size of the map. If that section does not have the name of the topographic quadrangle, please write it on the map.

SECTION B. ACTIVITIES THAT HAVE THE POTENTIAL TO POLLUTE GROUNDWATER

List all the activities performed in the storage of solid or special waste and the land application process that may possibly pollute groundwater. Some examples of the activities are:

- Storing waste in tank or lagoon prior to land incorporation.

- Unloading wastes from truck to storage tank or lagoon.
- Applying waste onto land surface or incorporating into soil.

List any other activities that require a GPP that are conducted at the site that are not part of the land application process.

SECTION C. PRACTICES SELECTED TO PROTECT GROUNDWATER

1. Provide protective practices for tanks or lagoon storing waste. What is done to prevent and detect leaks?

2. Provide protective practices for cleaning up spills that may occur during the unloading of wastes from truck to storage tank.

3. Provide name(s) of Certified Landfarming Operator(s).

4. Provide certification number of operator(s).

5. This activity is regulated by permit from the Kentucky Division of Waste Management. Provide permit number(s).

6. The Groundwater Section recognizes that requirements of 401 KAR 45:100, Section 6 is protective of groundwater. Therefore, the practices required by this regulation may be incorporated by reference.

   Type the statement below as it is written.

   All certified operators must sign the statement.

   I ____(typed name)_____certify that the operation of this landfarm is in compliance with 401 KAR 45:100, Section 6.

   Signature(s)
   Date

SECTION D. IMPLEMENTATION SCHEDULE

The GPP must be implemented immediately. Implementation **does not** depend upon approval of the GPP.

If you are already using the protective practices, just state so. If not, state the date by which you plan to use them.

If you must order protective equipment or build secondary containment structures, and the cost is not part of your business's budget, the Groundwater Section will work with you on an acceptable time frame for completing the project. List what is to be done and give an estimated date when the project will be completed.

SECTION E. EMPLOYEE TRAINING

If you have employees working for you at the disposal site, they must be trained to follow the management practices listed in 401 KAR 45:100, Section 6, and any other protective practices in the GPP to prevent surface water and groundwater pollution.

Briefly describe how you train the employees, when they receive the training, and how often they receive refresher training. Be specific. For example, state initially on hire and twice a year or once a year after that. Stating "when needed" or "frequently" is not acceptable.

SECTION F. INSPECTION SCHEDULE

The purpose of inspections is to insure that all the management practices are being followed and are working to prevent groundwater pollution.

The application site must be inspected to determine that the management practices are working. Inspection records must be kept to show that you are implementing your Groundwater Protection Plan (GPP). The records should be in the form of a checklist.

The checklist must include:

--the management practice.
--observations.
--is the management practice working? (yes, no)
--actions taken (If management practice was not working, note was done to correct the problem.).
--date, and
--place for person doing the inspection to sign his/her name.

You must also state how often inspections will take place. Again, be specific. State an exact time interval. Saying "when needed" or "frequently" is not acceptable.

SECTION G. CERTIFICATION STATEMENT

The person who can make the managerial and/or financial decisions required to implement your plan should be the one signing the certification statement.

Use the following statement just as it is:

I (typed name) certify that this Groundwater Protection Plan complies with the requirements of 401 KAR 5:037. I have read the plan and will implement its provisions.

Signature (hand signed)
Date

SECTION H. REVIEW LOCATION FOR GROUNDWATER PROTECTION PLAN

Section 4(7) of 401 KAR 5:037 provides for public inspection of Groundwater Protection Plans.

GPPs must be retained and implemented at the site for which they are developed. However, landfarms as a rule are not occupied 8 hours every day. The Groundwater Section recommends that you keep a copy of the GPP in the vehicle you use to access the landfarm. However, you must provide a place where the public may review your plan.

Even though approved GPPs are retained in the DOW files, you are not required to use the DOW in Frankfort as your site for public review. In fact, the Groundwater Section recommends that you use your office or place of business. This eliminates the requirement to send a recertified GPP every three years to the Ground-water Section. This does not mean, however, that you need not update your GPP.

The regulation requires you to review your entire GPP every three years. If no changes have occurred in responsible personnel, activities, or protective practices (BMPs), you may recertify your plan by signing and dating another certification statement under Section G. You must revise your plan at the time any changes occur, even if it has been less than three years since the last review. Contact Watershed Management Branch when your GPP has been recertified or revised. If you must submit a revised plan, send it to Program Coordinator, Groundwater Protection Plan Program, Watershed Management Branch, Kentucky Division of Water, 300 Sower Blvd., Frankfort KY 40601.

If you have any questions about these matters, contact the Program Coordinator at (502) 564-3410.

Appendix E: SAMPLE Solid Waste Composting Permit

Kentucky Energy and Environment Cabinet
Department for Environmental Protection
Division of Waste Management

PERMIT

Facility: **Good Guys Composting**
1171 Soil St
Anytown, KY 40333

Permittee: **Good Guys Composting**
123 Big St
Big City, KY 40555

Agency Interest: **Good Guys Composting**
1171 Soil St
Anytown, KY 40333

The Division has issued the permit under the provisions of KRS Chapter 224 and regulations promulgated pursuant thereto. This permitted activity or activities are subject to all conditions and operating limitations contained herein. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits, licenses or approvals required by this Division or other state and local agencies.

No deviation from the plans and specifications submitted with your application or any condition specified herein is allowed, unless authorized in writing from the Division. Violation of the terms and conditions specified herein may render this permit null and void. All rights of inspection by representatives of the Division are reserved. Conformance with all applicable Waste Management Regulations is the responsibility of the permittee.

Agency Interest ID #: **1234567**

Solid Waste Permit #: **sw09900001**

County: **County Name**

Permitted Activities:

Subject Item	Activity	Type	Status
ACTV001	Composting-Solid Waste-RPBR/09900001	Registered Permit by Rule	Active

First Operational Permit Effective Date: 06/10/2009

Permit Effective Date: 06/10/2009

Permit Expiration Date: Life of the Facility

Permit issued: 6/10/2009

Danny Anderson
Manager, Solid Waste Branch

Permit Conditions:

Subject Items
ACTV0001 - Composting-Solid Waste-RPBR
Standard Requirements:
1. General: The owner or operator of a solid waste site or facility shall comply with KRS Chapter 224 and 401 KAR Chapters 30 construction and operation of solid waste facilities. [KRS 224.40-305]
2. General: For construction and operation of the compost facility, the owner or operator shall comply with KRS Chapter 224.40 and the approved permit application(s). [401 KAR 48:200]
3. Recordkeeping: Each composting owner or operator shall submit the annual report to the cabinet before February 19 of ea operator shall submit DEP 7108, Annual Report for a Solid Waste Composting Facility. [401 KAR 48:200 Section 8(19)]
Variances, Alternate Specifications and Special Conditions:
1. Operation: The permittee shall operate this solid waste composting facility in accordance with the requirements of 401 KAR 3 and the application submitted for this permit. [401 KAR 30:031, 401 KAR 47:110, 401 KAR 48:200]
2. Operation: The permittee shall maintain adequate storage areas for finished compost and bulk materials. Sufficient storage ar accommodate incoming materials in the event the composting process is interrupted by equipment failure or other problems. distribution shall be kept separate from incoming materials and shall be located in a manner that prevents contact with leachate Product not suitable for distribution, or bulk materials in excess of available storage, shall be properly disposed in a permitte otherwise managed appropriately. [401 KAR 47:120 Section 2]
3. Operation: The permittee shall erect a sign indicating the type of facility, permit number, operation hours, and emergency phone shall display a copy of this permit at the office of the facility. [401 KAR 47:120 Section 2]

4. Operation: The permittee shall restrict unauthorized access to the facility, including a gate or cable kept locked when the facility KAR 30:031 Section 10(3)]

5. Operation: The permittee shall ensure a certified composting facility operator or interim operator is available during operating ho Section 8(2), 401 KAR 47:120 Section 2]

6. Operation: The permittee shall ensure distributed mulch or compost is free of sharp contaminants, including screws, nails or oth other recognizable potentially hazardous materials. [401 KAR 47:120 Section 2]

7. Operation: The permittee shall ensure no chemically treated, contaminated, or painted lumber or other inappropriate materi ingredients of compost or mulch produced by this facility. [401 KAR 47:120 Section 2]

8. Operation: The permittee shall comply with the requirements of the Kentucky Division of Water and the Division of Air Qual operation of this facility. The permittee shall have a groundwater protection plan prepared in accordance with 401 KAR 5:037. [40 2]

9. Operation: The permittee shall submit a revised registration to the cabinet prior to any change in the type of waste received, and capacity, changes in the processing of waste, or change of ownership or operator. [401 KAR 47:110 Section 3(1)]

10. Operation: The permittee shall incorporate putrescible waste, including yard waste that is primarily grass clippings, into the activ proper mix ratio, within 48 hours of receipt at the facility. [401 KAR 30:031 Section 11, 401 KAR 47:120 Section 2]

11. Operation: The permittee shall keep, and have available for inspection, the following records: A log of recipients who receive cubic yards in any one-month period; A record of the amount of solid waste composted, the date composting completed; A record of distribution sufficient to show at least seventy-five (75) percent of finished compost is used or distril completing the curing process. [401 KAR 48:200 Section 15(3)]

12. Operation: The permittee shall submit to the Division annual reports. Annual reports shall include amounts, sources, types, finish compost dates, volumes prepared for distribution, volumes distributed, recipients of 20 cubic yards in one month, and analyse reports). [401 KAR 47:110 Section 2(3)(b)]

13. Operation: The permittee shall notify the cabinet at the time of closure and cessation of operation at this facility. The permittee removing all waste prior to granting of closure by the cabinet. The cabinet will accept closure of this facility and termination of th rule upon inspection by and determination from the cabinet that no solid waste has been improperly disposed at the facility, the fac revegetated as necessary, and no soil, surface water, or other monitoring is required. [401 KAR 47:120 Section 2]

County Sources - The owner or operator may accept waste as authorized by the cabinet pursuant to KRS 224 and/or 401 KAR Chapte counties:

Kentucky: County 1, County 2

Approved Applications - The owner or operator shall comply with applicable statutes and regulations and the following approved applica

1. 06/10/2009 - Registered Permit-By-Rule for Solid Waste Composting - ARP20090001

Appendix F: SAMPLE Review Form for SOLID WASTE

ENERGY AND ENVIRONMENT CABINET

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
200 FAIR OAKS, 2ND FLOOR
FRANKFORT, KY 40601
TELEPHONE NUMBER (502) 564-6716

Annual Composting Review
Form DEP 7048A (3/92)

GENERAL INFORMATION

1. **ASSISTANCE – Questions regarding this form may be directed in writing to the Division of Waste Management, Solid Waste Branch at the address listed above, or by calling (502) 564-6716.**

2. **SUBMISSION – Please type or print legibly in permanent ink. Submit the original of the completed form to the Division of Waste Management at the address listed above. The document must be free of errors.**

Kentucky UNBRIDLED SPIRIT

SPECIAL WASTE COMPOSTING ANNUAL REVIEW

Permit Name_____Permit Number_____

Address_____

City_____State_____Zip Code_____

County_____Year_____Months(FROM TO)_____

Type of special waste composted_____

Total volume accepted this reporting period (cu.yds. or tons)_____

Total volume composted and acceptable for distribution this period (cu.yds. or tons)_____

Waste Classification: _____Type AA _____Type B. (Provide copies of actual analysis.)

TONS PER MONTH ACCEPTED

SOURCE	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL

LOG

DISTRIBUTION OF FINISHED COMPOST

Make additional copies of this log sheet as necessary.

Recipient	Address	Amount Received	Dates Composted Start-Finish	Date Received

CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true accurate, and complete. I am aware that there are significant penalties to submitting false information, including the possibility of fine and imprisonment for such violations."

Signature of Authorized Agent_____Date_____

Name of Authorized Agent_____

Title_____

Appendix G: SAMPLE Form for SPECIAL WASTE

Form DEP 7094D (5/92)

ENERGY AND ENVIRONMENT CABINET

DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
200 FAIR OAKS, 2ND FLOOR
FRANKFORT, KY 40601
TELEPHONE NUMBER (502) 564-6716

Application For A Special Waste Composting Facility Permit DEP 7094D (5/92)

GENERAL INFORMATION

1. **USE OF THIS APPLICATION** - This application form must be completed and submitted to the Cabinet by persons who compost special waste for distribution.

2. **PREPARATION ASSISTANCE** – Questions regarding this form may be directed in writing to the Division of Waste Management, Solid Waste Branch at the address listed above, or by calling (502) 564-6716.

3. **SUBMISSION** – Please type or print legibly in permanent ink. Submit the original and three (3) copies of the completed form to the Division of Waste Management at the address listed above. If an item is not applicable to your facility write "N/A" in the space provided.

4. **LAWS AND REGULATIONS** - Applicants are expected to understand and comply with all laws and regulations applicable to special waste composting. Reference 401 KAR 45:100.

Type of permit application: ____ New Application ____ Modification

Kentucky UNBRIDLED SPIRIT

APPLICATION FOR A
SPECIAL WASTE COMPOSTING
FACILITY PERMIT

DEP 7094D (5/92)

A. *General Information*

B. *Ownership and Past Performance*

C. *Waste Information*

D. *Facility and Operating Information*

E. *Surface Water, Groundwater, and Corrective Action*

F. *Public Notices*

G. *Certification*

DEP 7094D (5/92)

PERMIT NUMBER: _____ (FOR AGENCY USE ONLY)

A. GENERAL INSTRUCTIONS

WASTE CLASSIFICATION: TYPE A _____ TYPE B _____

1. Name of Applicant _____

Address _____

City _____ State _____ Zip Code _____

Telephone Number (___) _____-_____

Contact Person _____

2. Location of Facility _____

Address _____

City _____ State _____ Zip Code _____

Telephone Number (___) _____-_____

Contact Person at Facility _____

3. Provide the following information concerning the person preparing this application if different from above:

Name _____

Address _____

City _____ State _____ Zip Code _____

Telephone Number (___) _____-_____

4. Designate the individual to whom correspondence concerning this application should be addressed:

Name _____

Address _____

City _____ State _____ Zip Code _____

B. OWNERSHIP AND PAST PERFORMANCE INFORMATION

1. Indicate by checking the appropriate blank, the legal organizational structure of the applicant.

_____ Proprietorship

_____ Partnership _____ General _____ Limited

_____ Corporation

_____ Joint venture

_____ Governmental agency. Type_____ (City, County, State, Federal)

_____ Other. Describe:_____

_____

2. If the owner is a corporation, is it registered with the Kentucky Secretary of State?

_____ Yes _____ No

3. For the applicant and each person meeting the definition of key personnel, provide a Past Performance Information form as required by KRS 224.40-330 (1) and (3). The Cabinet has developed form DEP 7094J for submittal of this information. Complete this form and include it as part of this application as Attachment 9.

NOTE: DEP Form No. 7094J may be obtained by contacting the Division of Waste Management at the address specified on the "General Instructions" page of this application.

C. WASTE INFORMATION

1. Indicate waste source if differenct from above, or additional sources:

a. Name _____

Address _____

City _____ State ____ Zip Code _____

Telephone Number (___) ____-_____

Contact Person _____

Waste to be Received _____

b. Name _____

Address _____

City _____ State ____ Zip Code _____

Telephone Number (___) ____-_____

Contact Person _____

Waste to be Received _____

c. Name _____

Address _____

City _____ State ____ Zip Code _____

Telephone Number (___) ____-_____

Contact Person _____

Waste to be received _____

d. Name_____

Address_____

City_____State_____ Zip Code _____

Telephone Number (___)_____-_____

Contact Person _____

Waste to be Received_____

2. State the daily design capacity of the waste source if a wastewater treatment plant:

a. _____(MGD)

b. _____(MGD)

c. _____(MGD)

d. _____(MGD)

3. State the approximate amount of waste generated each year:

a. _____Tons

b. _____Tons

c. _____Tons

d. _____Tons

4. Does the wastewater treatment plant(s) have an approved pretreatment program?

a. Yes_____ No_____

b. Yes_____ No_____

c. Yes_____ No_____

d. Yes_____ No_____

5. List the current method of sludge disposal below:

	TYPE OF PERMIT	PERMIT NUMBER	DATE APPROVED
a.			
b.			
c.			
d.			

6. Special waste to be composted shall be classified as either Type A or Type B, in accordance with 401 KAR 45:100. Analyses must include the following parameters: pH, % Total Solids, % Volatile Solids, Total Kjeldahl, Nitrogen, Ammonium Nitrogen, Total Phosphorus, Total Potassium, Cadmium, Copper, Lead, Nickel, Zinc, and PCBs. Provide the actual laboratory analysis as Attachment 1.

7. Provide a copy of the actual TCLP laboratory analysis of the waste as **Attachment 2**, showing the waste will pass the Toxicity Characteristic Leaching Procedure.

Note: You may omit this analysis or specific parameters of this analysis based on your knowledge of the waste pursuant to 40 CFR 262.11. If you elect to do this a certified statement accepting responsibility is required. Polychlorinated Biphenyls (PCBs) may also be omitted from this standard sludge analysis under a similar certification. Label the certified statement as Attachment 2.

D. FACILITY AND OPERATING INFORMATION

---

1. Provide, as Attachment 3, an enlarged topographic map of a scale one (1) inch equals four hundred (400) feet clearly marking the proposed layout and the boundary of the composting site.

2. Provide, as Attachment 4, a detailed narrative describing the following:

   (a) The proposed composting system including the manufacturer's performance data for mechanical systems;

(b) The process design that describes the following:

1. Use of bulking agents, moisture control, or feed amendments;

2. Temperature ranges and residence times;

3. Storage of compost during curing after the primary composting operation; and

4. Provisions for additional drying and screening;

(c) Description of closure procedures for the site.

3. Provide, as Attachment 5, a marketing and distribution plan; and specifications for the final product.

Note: If any fertilizer value or soil conditioning claims are made concerning the final product, you must notify the Division of Regulatory Services, College of Agriculture, University of Kentucky, Regulatory Services Building, Lexington, Kentucky 40546, in accordance with KRS Chapter 250.

4. Provide, as Attachment 6, a description of the methods that will be employed to ensure compliance with the environmental performance standards of 401 KAR 30:031.

5. Provide, as Attachment 7, (if Type A Facility) a description of the closure plan including a cost analysis for the posting of financial assurance in accordance with 401 KAR 45:080.

6. Provide, as Attachment 8, a groundwater quality assurance plan for the proposed facility.

7. Applicants requesting a Type A permit shall comply with the public information procedures as required in 401 KAR 45:050.

8. Describe how the composting process qualifies as a "Process to Further Reduce Pathogens" in accordance with 401 KAR 45:100.

E. SURFACE WATER, GROUNDWATER, AND CORRECTIVE ACTION

1. Submit as Attachment 9, a Surface Water Monitoring Plan as required by 401 KAR 45:110 and 401 KAR 45:160. At a minimum, the plan must include:

   a. The proposed locations of the monitoring points shown on the site plans.

   b. A written description of how the monitoring point locations ensure that sampling will characterize the quality of water unaffected by the composting facility, as well as determining if water leaving the composting facility as surface drainage is contaminated with leachate.

   c. A description of sampling protocol and analytical parameters.

   d. A monitoring schedule and list of analytical parameters.

   e. A sample form for reporting results of the analyses to the Division.

   f. Documentation that the applicant currently holds or has applied for a K.P.D.E.S. permit for all structures to be used to control stormwater run-off and all point source discharges.

g. Provide the information requested in Attachment 9A, concerning location of the monitoring points.

2. Submit as Attachment 10, a Groundwater Monitoring Plan that meets the requirements of 401 KAR 45:110 and 401 KAR 45:160. At a minimum that plan must provide the following information:

a. A list and description of the specific aquifer(s) proposed for monitoring.

b. The number, location, and depth of proposed monitoring points. Show the locations of the monitoring points on the site plans.

c. Provide a brief discussion of the groundwater quality that currently exists based on the Groundwater Quality Characterization required in 401 KAR 45:160.

d. Provide a Groundwater Sampling and Analysis Plan which describes the procedures and techniques designed to accurately measure groundwater quality upgradient and downgradient of the waste disposal area. Include a discussion regarding the chain of custody, as well as field and lab quality assurance and quality control.

e. Provide a monitoring schedule and list of analytical parameters in accordance with 401 KAR 45:160 Section 8.

f. Provide monitoring well construction sepcifications which meet the requirements of 401 KAR 45:160 Section 3.

g. Is the proposed special waste disposal site located in karst terrain? _____Yes _____No

If yes, the groundwater monitoring plan must include dye trace studies to determine the nature and extent of karst drainage beneath the site and proposed monitoring locations.

h. Provide the information requested in Attachment 10A, concerning proposed well locations and depth.

F. PUBLIC NOTICES

Public notices are required for a new site or a significant expansion to an existing site in accordance with KRS 224.40-310. Draft notices are found in Attachments 11 and 12. Complete the public notice forms; however, only those applicants notified by correspondence from the Cabinet may publish the notices.

G. CERTIFICATION

"I certify that this document and all attachments were prepared under my direction or supervision. The information submitted is, to the best of my knowledge and belief, tru, accurate, and complete."

Signature of Authorized Agent_____ Date_____

Name of Authorized Agent_____
(TYPE OR PRINT)

Title_____

Subscribed and sworn to before me by_____

this the _____day of _____, 19_____.

Notary Public Signature_____

My Commission Expires_____

ATTACHMENT 9A

SURFACE WATER MONITORING PLAN

Provide the information requested below:

Monitoring Station I.D.	Location Description	Latitute	Longitude
—			

DEP 7094D (5/92)

Attachment 10A

GROUNDWATER MONITORING WELL

LOCATION AND DEPTH

Provide the information requested in the chart below:

MONITORING STATION I.D.	LATITUDE	LONGITUDE	STATION TYPE WELL OR SPRING	AQUIFER	ELEVATION OF SPRING OR TOP OF WELL CASING	DEPTH OF WELL	DEPTH OF WATER

DEP 7094D (5/92)

Attachment 11

PUBLIC NOTICE

Pursuant to application no. _____

The Energy and Environment Cabinet, Division of Waste Management has received a special waste composting facility permit application from:

Name of Applicant _____

Name of Facility _____

Address _____

City _____ State ____ Zip Code _____

This application, if approved, would allow the construction of the composting facility to accept the following types of waste and the following activities: _____

_____

_____

_____

The proposed facility may be accessed from _____

by traveling _____

_____

_____

Additional information regarding this application may be obtained from:

Contact Person _____

Address _____

City _____ State ____ Zip Code _____

Phone No. (____) _____ - _____

DEP 7094D (5/92)

The permit application is being processed at the following location:

Division of Waste Management
Solid Waste Branch
200 Fair Oaks
Frankfort, KY 40601

Within thirty (30) days of the publication of this notice, any person who wishes to comment on the application may submit written comments, and, if desired, request from the Cabinet a public meeting.

Please refer to Application No. _____ on all correspondence.

Publication pursuant to KRS 224.40-310.

DEP 7094D (5/92)

Attachment 12

PUBLIC NOTICE

Pursuant to application no. _____

The Energy and Environment Cabinet, Division of Waste Management has received a special waste composting facility permit application from, and has prepared a draft permit for:

Name of Applicant _____

Name of Facility _____

Address _____

City _____ State ____ Zip Code _____

This application, if approved, would allow the construction of the composting facility to accept the following types of waste and the following activities: _____

_____

_____

_____

The proposed facility may be accessed from _____

by traveling _____

_____

_____

Additional information regarding this application may be obtained from:

Contact Person _____

Address _____

City _____ State ____ Zip Code _____

Phone No. (____) _____ - _____

DEP 7094D (5/92)

All data submitted by the applicant and other documents concerning this application are available for public inspection during normal business hours at the following location:

Office _____

Address _____

City _____ State ____ Zip Code _____

The permit application is being processed at the following location:

Division of Waste Management

Solid Waste Branch

200 Fair Oaks

Frankfort, KY 40601

A public hearing has been scheduled to receive public comments and will be conducted at the following location and time:

Place _____

Address _____

City _____ State ____ Zip Code _____

From _____ to _____

Any person who wishes to comment on the draft permit decision for this special waste site or facility may file comments with the Cabinet and, if desired, request a public hearing with thirty (30) days of the publication of this notice pursuant to Section 6 of 401 KAR 45:050.

Please refer to Application No. _____ on all correspondence.

Publication pursuant to KRS 224.40-310.

This page left blank intentionally.