

CONSERVATION PRACTICE STANDARD

COMPOSTING FACILITY

(No.)

CODE 317

DEFINITION

A facility to process raw manure or other raw organic by-products into biologically stable organic material.

PURPOSE

To reduce the pollution potential of organic agricultural wastes to surface and ground water.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where:

- Organic waste material is generated by agricultural production or processing.
- A composting facility is a component of a planned agricultural waste management system;
- A composting facility can be constructed, operated and maintained without polluting air and/or water resources;
- There is a need to improve air quality by reducing the emissions of odorous gases; and,
- The facility is operated as a component of an agricultural management system.

CRITERIA

General Criteria Applicable to All Purposes

Laws and Regulations. The planning, design, and installation of the composting facility shall comply with all federal, state and local laws, rules and regulations.

Safety. Safety and personal protection features and practices shall be incorporated into the facility and its operation as appropriate to minimize the occurrence of equipment hazards and exposure to or dispersal of harmful biological agents during the composting process.

Facility Siting. The composting facility shall be at least 100 feet from surface water bodies and open sinkholes, and where practical at least 100 feet down or cross gradient from a spring or well, or 200 feet up gradient. Whenever possible, compost facilities shall be located outside of the 100 year floodplain. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage.

The composting site shall be gently sloping with adequate space to allow windrow formation down the slope.

Locate compost facilities so prevailing winds and landscape elements such as building arrangement, landforms and vegetation minimize odors and protect the visual resource.

Seepage Control. The surface elevation of the composting facility shall be at least 4 feet above the seasonal high water table or bedrock and on soils with "moderately slow" to "moderate" permeability (0.2 to 2.0 in/hr).

If the soil is less than 4 feet deep or has a permeability higher than 2.0 in/hr or less than 0.2 in/hr, the facility shall be designed and installed in accordance with the criteria in PA561, Heavy Use Area Protection, for foundation and surface treatment with bituminous pavement, concrete, other cementitious materials, or with an aggregate surface no less than 4 inches thick.

Runoff Control. Direct upslope surface runoff from the 25 year, 24 hour storm away from the compost facility. Runoff from the composting facility shall be minimized by providing a roof, or by building and maintaining windrows or piles with a uniform, sloped cross section without depressions, or by composting in a closed vessel.

Runoff from compost facilities shall be directed to a waste storage facility (PA313), wastewater treatment strip (PA635), or constructed wetland (PA656).

Compost Mix. Develop a compost mix that encourages aerobic microbial decomposition and avoids nuisance odors.

Carbon-Nitrogen Ratio. The initial compost mix shall result in a carbon to nitrogen (C:N) ratio between 25:1 and 40:1. Compost with a greater carbon to nitrogen ratio can be used if nitrogen immobilization is not a concern.

Carbon Source. A dependable source of carbonaceous material with a high C:N ratio shall be stored and available to mix with nitrogen rich waste materials.

Bulking Materials. Add bulking materials to the mix as necessary to enhance aeration.

The bulking material may be the carbonaceous material used in the mix or a non-biodegradable material that is salvaged at the end of the compost period. If a non-biodegradable material is used, provision shall be made for its salvage.

Moisture Level. Provision may be made for maintaining adequate moisture in the compost mix throughout the compost period within the range of 40 to 65 percent (wet basis).

Care shall be taken to prevent excess moisture from accumulating in the compost. A roof or windrow covers may be needed to provide for a suitable product.

Temperature of Compost Mix. Manage the compost to attain and then maintain the internal temperature for the duration required to meet management goals.

When the management goal is to reduce pathogens, the compost shall attain a temperature greater than 130°F for at least 5 days as an average throughout the compost mass.

This temperature and time criterion may be achieved during either primary or secondary composting stages or as the cumulative time of greater than 130°F in both stages.

Turning/Aeration. The frequency of turning/aeration and the selected turning equipment shall be appropriate for the composting method used to attain the desired amount of moisture removal and temperature control while maintaining aerobic degradation.

Use Waste Treatment (629) as a companion practice, when needed to meet the intended purpose of composting facility.

Facility Type. Selection of the composting facility/method shall be based on the availability of raw material, the desired quality of final compost, equipment, labor, time and land available.

The surface of a windrow or static pile composting facility shall be firm throughout the seasons when compost is being mixed, turned, formed into piles or windrows, or otherwise handled by equipment. If an improved surface is needed, it shall meet the criteria for surface treatment as heavy use area protection, PA561.

Facility elements such as permanent bins, walls and roofs shall meet the structural design requirements of Waste Storage Facility, PA313. Concrete slabs that will be used to store manure, or other nutrient rich material that can produce leachate, shall meet PA313 criteria.

Acceptance of in-vessel and commercially available compost systems shall be based on the documented design and performance of such existing composter and certified as such by a registered professional engineer licensed in PA.

Facility Size. Size the compost facility to accommodate the amount of raw material planned for active composting, the length of the compost period, plus space required for

curing and storage of finished compost product if planned for the site.

Dimensions selected for elements of the compost facility shall accommodate equipment used for loading, unloading, and aeration.

Compost Period. Continue the composting process long enough for the compost mix to reach the stability level where it can be safely stored without undesirable odors. It shall also possess the desired characteristics for its use, such as lack of noxious odor, desired moisture content, level of decomposition of original components and texture. The compost period shall involve primary and secondary composting as required to achieve these characteristics.

Test the finished compost as appropriate to assure that the required stabilization has been reached.

Use of Finished Compost. Land application of finished compost shall be in accordance with Nutrient Management (PA590) and Waste Utilization (PA633).

CONSIDERATIONS

Develop an initial compost mix with a carbon to nitrogen ratio of at least 30:1 to reduce most offensive odors.

Minimize odors and nitrogen loss by selecting carbonaceous material that, when blended with the nitrogenous material provides a balance of nutrients and porous texture for aeration.

Compost moisture content and runoff control can be improved by covering the windrow or pile with a breathable geotextile blanket or a 6 inch layer of fine organic material such as sawdust or mature compost.

An improved (paved) surface will provide year round access and improve the quality of the compost product by minimizing the soil and stone content. This should be weighed against the potential for additional runoff to be stored or treated.

Bio-security concerns should be addressed in all aspects of planning, design, and installation of a composting facility. Traffic

patterns and runoff paths between animal production facilities and the composting facility, especially across or adjacent to feeding areas and young stock housing, should be considered in selecting the site and designing the facility.

A chemical neutralizing agent should be used if structural components do not provide adequate odor reduction.

Maximize solar warming by aligning windrows north to south configured with moderate side slopes. A south facing aspect should be utilized wherever possible.

Protect compost facilities from the wind if composting during the winter.

PLANS AND SPECIFICATIONS

The construction specifications for Waste Storage Structure (313) and /or Heavy Use Area Protection (561) provide guide specifications for this practice.

Plans and specifications shall be prepared in accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended use.

OPERATION AND MAINTENANCE

A site specific operation and maintenance plan, consistent with the purposes of this practice and the life of the composting facility, shall be prepared for and reviewed with the operator.

The operation and maintenance plan shall state that composting is a biological process. It requires a combination of art and science for success. Hence, the operation may need to undergo some trial and error in the start-up of a new composting facility.

Safety and bio-security requirements for operation of the composting facility shall be provided.

The plan shall address both the composting process and the facility, and shall include, but not be limited to the following items.

Process. Address the specific type of composting to be practiced, the types of

material to be composted and the sequence that they are to be layered and mixed.

Temperature - The material should remain at or above 110°F throughout the composting period. If the temperature falls significantly and odors develop, or if the material does not reach operating temperature, then investigate piles for moisture content, porosity, and thoroughness of mixing. Closely monitor temperatures above 165°F. Take action immediately to cool piles that have reached temperatures above 185°F.

Aeration - Periodically turning aerated windrows or operating forced air systems on static piles, and avoiding excess moisture levels will normally provide adequate aeration.

Nutrients - Keep compost well aerated to minimize nitrogen loss by denitrification. Keep pH between 6 and 8 to avoid nitrogen loss by ammonification.

Odor - Maintaining the proper pH and oxygen content will minimize odors.

Testing Needs - Test compost materials for carbon, nitrogen, moisture, and pH if the compost fails to reach the desired temperature or if odor problems develop. The compost product should be tested for stability and maturity to prevent phytotoxicity in crops or vegetation receiving the compost.

Facility. The operation and maintenance plan for the composting facility shall be consistent with and may include the operation and maintenance plan(s) for other conservation practices designed as part of the facility.

Use Areas - The areas of the facility designed for storage of raw and finished product, and for composting and curing, should be clearly defined. The operation and maintenance of each of the areas shall be explained.

Orientation - Windrows should be oriented up-and-down slope.

Work Surface - The composting area should be kept clear of excess material between

the windrows. The surface should be maintained and kept free of puddles.

Runoff - The runoff water from the compost facility must be handled as intended in the design.

REFERENCES

1. Agricultural Composting of Manures, a Supplement to Manure Management for Environmental Protection, PA - DEP Bureau of Water Quality Protection, 1997.
2. Agricultural Waste Management Field Handbook, USDA Soil Conservation Service, Revised 1991.
3. Manual for Economic and Pollution Evaluation of Livestock Manure Management Systems, PA - DER Bureau of Soil and Water Conservation, 1990.
4. Municipal Yard Waste Composting Reference Manual, PA - DER Bureau of Waste Management, 1991.
5. On-Farm Composting Handbook, NRAES-54, Northeast Regional Agricultural Engineering Service, 1992.