NATURAL RESOURCES CONSERVATION SERVICE

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. All planned activities shall comply with all federal, state, and local laws and regulations. The Alabama Department of Environmental Management (ADEM) Rules require owners/operators of animal feeding operations and associated waste management systems to fully implement and regularly maintain effective best management practices (BMP's) that meet or exceed NRCS technical standards and guidelines to prevent discharges and to ensure groundwater and surface water quality. Detailed records shall be kept to document proper operation (including temperature and time elements) of the composter at all times.

All construction activities must implement adequate construction BMP's. In addition, to comply with the National Pollutant Discharge Elimination System rules, all construction activities involving one acre or more of land disturbance shall have and follow a construction best management practices plan prepared by a qualified credentialed professional until construction is complete and all disturbed areas are stabilized. All construction activities related to waste contact or containment, including design, installation, modification, and closure are to be certified by a professional engineer licensed in the state of Alabama.

A permit shall be obtained from the state veterinarian or animal industries office for an alternative solution if the mortality compost cannot be spread on the grower's premise.

Cultural Resources. Ground disturbing activities such as excavation and site preparation for animal waste facilities have the potential to affect significant cultural resources. A cultural resources review shall be completed prior to ground disturbing activities to assure that existing cultural resources will not be adversely impacted.

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 biological agents during the composting process.

Facility Siting. All composting facilities, including portable rotary drum composters, shall be located according to the minimum siting buffer distances contained in ADEM Administrative Code Chapter 335-6-7, as amended (AFO/CAFO Rule).

The bottom elevation of the composting facility shall be above the seasonal high water table and on soils with an acceptable permeability that does not allow materials to contaminate the ground water. Production swine and poultry in-vessel composters shall have a 4-in. minimum thickness concrete pad under the primary and secondary bins. Evaluate other site-paving needs in terms of effects of equipment operation on wearability, soil compaction,

and the potential for contamination from compost and petrol products.

Ideally, compost facilities should be located outside of floodplains. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 25-year flood event, or larger.

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

Runoff. Divert surface runoff from outside drainage areas around the compost facility. Collect runoff from the compost facility and utilize or dispose of it properly. Evaluate the effects of changed infiltration conditions on groundwater recharge, and evaluate changes in volumes and rates of runoff caused by the location of the operation. Properly manage movement of organic material, soluble substances, and substances attached to solids carried by runoff.

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

Select carbonaceous material that, when blended with the nitrogenous material, will result in the desired pH. The blended material should have a pH at or slightly below neutral for best odor control. Where odors do not present a problem, a pH of 8 to 9 is acceptable, but strong ammonia and amine related odors may be present during the first 2 weeks.

Carbon-Nitrogen Ratio. Calculate the amounts of the various ingredients to establish the desired carbon-nitrogen ratio (C:N) of the mix to be composted. The initial compost mix shall result in a 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 or if composting organic materials that decompose at a high rate (or are highly unstable) with associated high odor production.

Where more than two ingredients are to be blended, the two main ingredients are to be used in the analysis for the desired C:N and mixed accordingly. Adding up to 50 percent by weight of other ingredients to improve workability and air movement is permissible as long as the C:N of the added ingredient does not exceed the target C:N of the compost.

Carbon Source. A dependable source of carbonaceous material with a high C:N 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.

Mortality Composting. When composting the carcasses of animal mortalities, all body parts must be covered with least 6 in. of carbonaceous material at all times. This applies to any stage of any composting process, except rotary drum composters. For rotary drum composters, follow the criteria given herein.

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

Facility structural elements such as permanent bins, concrete slabs, and roofs shall meet the requirements of Alabama NRCS conservation practice standard Waste Storage Facility, Code 313.

Facility Size. Establish the number and size of the composter units on the basis of locally determined normal animal loss rates and the amount of raw material planned for active composting plus space required for curing.

Moisture. Provision shall be made for maintaining adequate moisture in the compost mix throughout the compost period within the range of 40 to 65 percent (wet weight basis). The composting process may become inhibited when moisture falls below approximately 40 percent. Water used for moisture control must be free of deleterious substances.

Mortality composting shall be done under a cover to prevent excess moisture from accumulating in the compost and contamination of runoff by the composting material.

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. These temperature and time criteria 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 shall be appropriate for the composting method used and to attain the desired

amount of moisture removal and temperature control while maintaining aerobic degradation.

Pile Configuration. Compost piles for windrowed and static piles should be triangular to parabolic in cross-sectional form with a base width to height ratio of about 2 to 1. Increased surface area favorably affects evaporation and natural aeration and increases the area exposed to infiltration.

Composting 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 may involve primary and secondary composting as required to achieve these characteristics.

Visual inspection and temperature measurements will provide needed evaluation of compost status. If raw body parts remain after a composting cycle, the material should be turned, covered with at least 6 in. of the carbonaceous material, and allowed to undergo another composting cycle. Test the finished compost as appropriate to assure that the required stabilization has been reached.

Storage. Provide properly designed storage facilities sized for the appropriate storage period. Protect composted material from the weather by roofs or other suitable covers. Structures must meet the requirements of Alabama NRCS conservation practice standard Waste Storage Facility, Code 313.

Use of Finished Compost. Land application of finished compost shall be in accordance with Alabama NRCS conservation practice standards Nutrient Management, Code 590; and Waste Utilization, Code 633.

Additional Criteria for Poultry

Process. The composting process uses a simple mixture of dry poultry manure, poultry carcasses, wheat straw, and water. (Other carbon sources such as peanut hulls, cotton seed hulls, etc., may be used in place of straw. Poultry manure cake has also been found to be an acceptable material in lieu of dry poultry manure and wheat straw.) The components of the mixture must be added according to guidelines to ensure proper growth of the bacteria and fungi needed for decomposition. Litter used for composting should be managed to ensure adequate bacterial counts and temperatures are present. Guidance for operation and maintenance (O&M) of poultry compost facilities can be found in Alabama NRCS guide sheet Composting Poultry Mortality, AL 317.

Design. For meat-producing poultry (broilers, Cornish hens, etc.) the volume required for each stage of multiple stage composting units is:

$$\frac{Nb \times M \times Wb \times VF}{Nd} = \text{Vol (CF)}$$

Where: Nb = number of birds in flock
M = mortality rate as a decimal
Wb = weight of birds at maturity
VF = volume factor (2.5 for two-stage composters, 3.75 for single-stage and mini-composters)
Nd = number of days of flock life

This formula gives reasonable results for a flock life up to 75 days. For a flock life over 75 days, provide primary bin volume for at least 30 days of mortality each with a minimum of two primary bins. Provide secondary volume as needed for the storage period required. The resource engineer should be contacted for guidance in these situations.

Single-staged composters and mini-composters may be used only for flocks of up to 45,000 roasters, 60,000 broilers, or 120,000 Cornish hens without approval of the state conservation engineer. Single-stage composters and mini-composters will not be used for any birds of 5 lbs. or more.

Table 1 provides suggested values to use for various types of birds and provides the design factors used to determine first stage volume of multiple stage composting units. The design factor is multiplied by the number of birds initially placed on farm to find first stage volume. Anticipated mortality is included in this factor.

The total volume is divided by the volume of an individual composting bin to determine the number of bins required.

$$\text{No. of bins} = \frac{\text{Total 1st stage volume}}{\text{Volume of single bin}}$$

Bins for multiple stage composting are typically 5 ft. high, 5 ft. deep, and 10 ft. across the front. However, depth and width may be adjusted to accommodate the equipment on hand. The volume required in the second stage will be equal to the first stage, as minimum. In north Alabama, the second stage should have at least twice the first stage volume to provide winter storage, unless additional storage is otherwise provided.

Table 1. Poultry Data and Multiple Stage Composter Design Factors

(a) Poultry Type	(b) Loss Rate (%)	(c) Flock Life (wks.)	(d) Cycles Per Yr.	(e) Avg. Mkt. Wgt. (lbs.)	(f) Multiple Stage Composter Design Factor* (cu.ft./bird)
Broiler	4.5-5.5	6-7	5.5-6	4.2	0.0125
Roaster					
Females	3	6	4	4.0	0.0071
Males	8	10	4	7.5	0.0214
Laying Hens	14	60-65	0.9	4.5	0.0035
Breeding					
Hens	10-12	60-65	0.9	7-8	0.0048
Males	20-25	40-45	1.1	10-12	0.0238
Turkey					
Female	5-6	13-14	3	14	0.0196
Turkey Lg. Tom	9	16-16.5	3	24	0.0468
Feather Prod.	12	18-18.5	2.5	28-32	0.0741

*[(b) as decimal / (c) (days)] x (e) x 2.5 = (f)
Volume of 1st Stage = (f) x No. of animals

Table 2. Number of First Stage Composter Bins Required for Broilers Using 5 ft. x 5 ft. x 10 ft. bins.

No. of Broilers	Lbs. dead/day On day 42* --------lbs.-------	Volume in 1st Stage** ------cf.------	No. of bins in 1st Stage***
20,000	100	250	1
40,000	200	500	2
60,000	300	750	3
80,000	400	1,000	4
100,000	500	1,250	5
120,000	600	1,500	6
140,000	700	1,750	7
160,000	800	2,000	8
180,000	900	2,250	9
200,000	1,000	2,500	10

*Assumes mature weight of 4.2 lbs.; flock loss of 5%.
**(Total weight loss near maturity) x (2.5 cf/lb. dead wgt) = cu.ft. of storage required.
***Bin dimensions: 5 ft. x 5 ft. 10 ft. or 250 cf.

NRCS, AL

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Mini-composters are to be 4 feet x 4 feet x 4 feet. Each bin of the mini-composter shall be built with ½ in. space between each horizontal board. Commercially supplied single-stage units may be up to 5 ft. in one horizontal dimension.

Alabama engineering form, AL-ENG-25F, provides details on the methodology used in sizing facilities and may be used for other types of poultry. Table 2 provides a quick summary of the number of bins required in the first stage of a multi-stage broiler composting unit using 5 ft. x 5 ft. x 10 ft. bins.

Additional Criteria for Swine

Process. Composting of swine involves larger carcasses and bones which are harder to degrade than poultry. Composting times will be longer and the compost mix more critical to give good results. Guidance for operation and maintenance for an in-vessel swine compost facility can be found in Alabama NRCS guide sheet Composting Swine Mortality, AL 317A. The suggested recipes in the guide sheet shall be carefully followed until it is determined that the process is working well. All composting operations should be prepared to dispose of catastrophic mortality according to Alabama NRCS guide sheet Emergency Disposal of Dead Animals, AL 316.

Design. To allow for catastrophic mortality, additional capacity should be allowed. The following design parameters are suggested as the minimum requirements with carefully managed bins:

- One cubic foot of primary composter should accommodate about 5 to 8 lbs. of swine carcass at any given time. Nursery pigs and small feeder pigs can be loaded into a bin at 7 to 8 lbs. per cubic foot. Heavy feeders and sows should be loaded into primary bins at about 5 lbs. per cubic foot.
- The secondary bin size should not be less than the primary volume, and should be twice the primary volume for winter storage in north Alabama, unless additional storage is otherwise provided.
- Properly managed primary bins loaded with small pigs and lightweight feeder carcasses can be turned into the secondary bin in 60 days or less after the last carcass is placed in the bin. Allowing 90 days per cycle for filling and composting, each bin can be filled 4 times per year with the lighter carcasses.
- Heavy feeders and sows may have to stay more than 60 days in the primary bin. Allowing 120 days per cycle for filling and composting, each bin can be filled no more than 3 times per year.
- Volume recommendation - Provide 1 cu.ft. of primary composter bin space per 30 lbs. of annual mortality for pigs up to about 100 lbs. - stacked 5 ft. deep. This equals 1 sq.ft. of primary bin floor space per 150 lbs. of annual mortality.
- Volume recommendation - Provide 1 cu.ft. of primary composter bin space per 20 lbs. of annual mortality for pigs heavier than 100 lbs. - stacked 5 ft. deep. This equals 1 sq.ft. of primary bin floor space per 100 lbs. of annual mortality.
- Average bin size = 10 ft. x 6 ft. x 5 ft. deep = 60 sq.ft. or 300 cubic feet. Properly managed, this should handle about 2,250 lbs. of lightweight carcasses per compost cycle or 9,000 lbs. per year (4 cycles). For heavier feeders, sows, boars, or gilts, it may handle only 1,500 lbs. per cycle or 4,500 lbs. per year (3 cycles).

Growing-Finishing Unit. Assumptions:
Mortality Averages 3%
Growout from 40 lbs. to 240 lbs. per hog
2.75 batches per year (17 weeks in, 2 weeks out)

Average death loss per batch:
2,625 lbs. of carcass per 625 animals finished
4,200 lbs. of carcass per 1000 animals finished

Average death loss per year:
7,220 lbs. of carcass per 625 head capacity
11,550 lbs. of carcass per 1000 head capacity

Number of standard size primary bins:
2 bins minimum, regardless of facility size
1.6 bin per 625 head capacity
2.6 bins per 1000 head capacity

Middle or P2 Unit. Assumptions:
Mortality averages 3%
Growout from 10 lb. to 60 lb. per hog
7 batches per year (6 weeks in, 2 weeks out)

Average death loss per batch:
1,680 lbs. of carcass per 1600 animals finished

Average death loss per year:
11,760 lbs. of carcass per 1600 head capacity

Number of standard size primary bins:
2 bins minimum, regardless of facility size
1.3 bins per 1,600 head capacity

Farrowing Unit. Assumptions:

Sow and boar mortality averages 3%
Average weight all sows, boars, and gilts = 375 lbs.
19 live pigs born per sow/gilt per year
2 dead pigs born per sow/gilt per year
Pig mortality averages 3%
Pig weight = 3 to 40 lbs.

Average death loss per year per 100 sows:
1200 lbs. sows, boars, gilts
600 lbs. fetus
1200 lbs. pigs

Number of standard size primary bins:
2 bins minimum, regardless of facility size
1 bin per 150 sow capacity

Additional Criteria for Rotary Drum Composting

Process. Rotary drum composting uses a drum partially filled with composting material that can be rotated by mechanical means. As organic material is added to the drum, the drum is rotated to mix the new ingredients and add oxygen to the existing ingredients. This results in a faster composting process than with other methods. Due to the short cycle time required when used for production poultry, it is critical that the compost mix be managed for optimum temperatures.

Design. Rotary drum design capacity is determined by the actual weight of mortalities during the cycle divided by the design drum loading rate of 3 lbs. of mortality per gallon of total drum capacity. When used for poultry, the actual weight of mortalities can be determined from producer records, or the following formula may be used for determining composter capacity:

$$\frac{Nb \times M \times Wb \times WF}{3} = \text{Vol (Gal)}$$

Where: Nb = number of birds in flock
M = mortality rate as a decimal
Wb = weight of birds at maturity
WF = weight factor (use 0.25 for birds with Wb of 4.5 lbs. or less, 0.33 for larger birds)

This design capacity may be used to select the size and number of rotary drum units required. Actual volume requirements for a specific flock can vary greatly from this design volume. In case of larger than normal losses, excess material may be removed from the rotary drum, stockpiled on a concrete pad, and covered with at least 6 in. of carbonaceous or bulking material. The material shall be protected from rain, and will then finish the composting process as a static pile.

Operation. The rotary drum composter shall be operated and maintained in accordance with the manufacturer's instructions. On initial start-up, the drum is filled to one-fourth capacity with carbonaceous material. Mortalities and an approximately equal volume of carbonaceous material are added and the drum rotated until the contents are thoroughly mixed. The drum shall not be filled above approximately 75% of its total height in order to insure a thorough and complete mixing of the contents when the drum is rotated. The moisture content and temperature of the compost should be monitored daily during the composting period. Appropriate steps should be taken as needed to maintain the moisture content and temperature at the required levels.

Additional Requirements. The state veterinarian will issue a permit for the use of a rotary drum composter in Alabama, and the following are required during its operation:

- A daily worksheet shall be kept showing date, age of birds, number of dead birds added, pounds of dead birds added, temperature inside composter as well as outside temperature,
- After the flock is sold, final mortality shall be placed in composter and rotated each day for three days, and then it shall rest for three days. If the internal temperatures have been sufficient (above 130°F), compost can then be spread, and
- The rotary drum composter itself must be maintained either under a suitable shelter or on a minimum 4 in. thick concrete pad extending 4 ft. in front and back of the unit, or both.

The state veterinarian's office may be contacted to obtain the permit application form and worksheets.

Additional Criteria for Other Animals and Food Processing Wastes

Other animals and food processing wastes from agricultural operations can successfully be composted. Guidance from the state environmental engineer on design criteria shall be used in the design.

CONSIDERATIONS:

Types. Four types of composting operations are covered in this standard: aerated windrows, static piles, in-vessel, and rotary drum. Aerated windrows are more suited to large volumes of organic material that are managed by power equipment used to turn the composting material periodically.

Periodic turning re-aerates the windrows, promoting the composting process.

Organic material in static piles is initially mixed to a homogeneous condition and not turned again throughout the composting process. Static pile material must have the proper moisture content and bulk density to facilitate air movement throughout the pile. Forced air might be necessary to facilitate the composting process.

In-vessel composting in a totally enclosed structure is performed on a blended organic material under conditions where temperature and air flow are strictly controlled. In-vessel composting also includes naturally aerated processes where organic materials are layered in the vessel in a specified sequence. Layered, in-vessel materials are usually turned once to facilitate the process. Vessel dimensions must be consistent with equipment to be used for management of compost.

Rotary drum composting uses a round, enclosed drum which can be mechanically rotated. The unit may be stationary or portable for direct field spreading. Rotation of the drum aids in aeration and mixing of the material and facilitates the composting process. If properly managed, this method results in faster decomposition and a smaller volume of compost than other methods.

Process. Composting is accomplished by mixing an energy source (carbonaceous material) with a nutrient source (nitrogenous material) in a prescribed manner to meet aerobic microbial metabolic requirements. The process is performed under specific moisture and temperature conditions for a specified period of time. Correct proportions of the various compost ingredients are essential to minimize odors and to avoid attracting flies, rodents, and other small animals.

Carbon Source. A dependable source of carbonaceous material must be available. The material should have a high carbon content and high carbon to nitrogen ratio (C:N). Wood chips, sawdust, peanut hulls, straw, corn cobs, bark, peat moss, and well-bedded horse manure are good sources of carbon.

Moisture Control. Large amounts of water are needed during the composting process because operating temperatures evaporate water. A source of water should be available for compost pile moisture control from start-up through completion. Proper moisture facilitates the composting process and helps control odors. A mixture that is too wet will become anaerobic, creating potentially offensive conditions.

Equipment Needs. Appropriate equipment should be available for mixing, turning, and hauling composted material and carbonaceous material.

Bulking Materials. Bulking materials may be added to enhance air flow within the composting material. This will result in higher composting temperatures and a more efficient composting process. Piles that are too compact will inhibit the composting process. The carbonaceous material can be considered as a bulking agent. Where it is desirable to salvage carbonaceous material, provisions for removing the material, such as screening, should be made.

Management. Composting operations require close management. Management capabilities of the operator and availability of labor should be assessed as part of the planning and implementing process.

Economics. Benefits associated with the ultimate use of the composted material should be compared to the capital expenditure and operating costs of the composting operations. In addition to cost return, benefits can include environmental protection, improved handling, disposal of dead poultry and other farm animal mortalities, odor control, and reduced need for storage volume.

Effects of Composting on Water Quality. Composting should improve water quality by eliminating alternative methods of disposal that could pollute surface and ground water. Also, since poultry compost is higher in organic nitrogen than broiler litter, the potential for leaching and loss in surface runoff will be reduced. The bacteria and viruses associated with the carcasses and the manure are essentially destroyed during proper composting, making finished compost a safer fertilizer than plain broiler litter. Caution must still be taken to prevent spreading near surface waters because the high level of organic matter, if allowed to enter water, could cause oxygen depletion problems.

Rotary Drum Composting. Protect the compost within the unit from excess moisture during rainfall by providing some form of cover for the unit.

Consider the equipment required to operate a portable unit during both the composting process and the land application of the compost.

Consider the type and availability of material to be used in the composting recipe. Maintain a “hot litter” pile to facilitate the process.

Consider the method to be used to uniformly spread the compost from a stationary rotary drum unit.

Facility Siting. All composting facilities, including portable rotary drum composters, should be located according to the Minimum Distance Requirements for Waste Storage Facilities in Alabama NRCS conservation practice standard Waste Storage Facility, Code 313.

General. 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.

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

Maximize solar warming by aligning piles north to south configured with moderate side slopes.

Uncovered outdoor composting, other than mortality composting which is not allowed, may require collecting runoff water from the area for storage and land application. Storage structures must meet the requirements of Alabama NRCS conservation practice standard Waste Storage Facility, Code 313. In order to prevent ponding and sogginess, do not locate piles (windrows) across the slope.

PLANS AND SPECIFICATIONS

Plans and specifications for organic composting facilities shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications include construction plans, drawings, job sheets, construction specifications, narrative statements in conservation plans, or other similar documents. For single-stage and mini-composters, the conservation plan will include a statement indicating that the owner/operator has been advised of possible problems with this type of system, including fly and odor problems, consolidation and difficulty of removal of the material, high manual labor requirements, and rain entering the system. A written operation and maintenance plan shall be developed with full knowledge and input of the owner-operator and included with the documents provided to the owner-operator. The Construction Specification for Alabama NRCS conservation practice standard Waste Storage Facility, Code 313 will be utilized for the construction of a compost facility.

OPERATION AND MAINTENANCE

The O&M Plan. An O&M plan shall be developed that is consistent with the purposes of this practice, and the life of the composting facility. Recipe ingredients and sequence that they are layered and mixed shall be given in the plan.

Safety requirements for operation of the composting facility shall be provided.

The O&M 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.

Temperature. A long stem thermometer (minimum 20 inch) or other temperature measuring device should be available for monitoring the temperatures during the composting process. For best results, operating temperatures of the composting material should be 130°F to 170°F once the process has begun. Operating temperatures should be reached within about 7 days and remain elevated for up to 14 days to facilitate efficient composting. The material should remain at or above 110°F for the remainder of the designated composting period. For best results, temperatures inside a rotary drum composter should be maintained above 130°F during the composting process.

Desired operating temperatures may be reached quicker if a “hot litter” pile is maintained. This is done by mixing various carbonaceous and bulking materials at the proper moisture in a pile outside the composter so that it preheats to 120°F or more before being added to the composter. See Alabama NRCS guide sheet Composting Poultry Mortality, AL 317, for more details.

If temperatures fall significantly during the composting period and odors develop, or if the material does not reach operating temperatures, investigate piles for moisture content, porosity, and thoroughness of mixing. Compost managed at the required temperatures will favor destruction of any pathogens and weed seeds.

Excessive temperature in the composted material of 190°F or more can indicate the potential for a fire to develop. To prevent fires in litter or compost piles, follow the recommendations in Alabama NRCS guide sheet Preventing Fires in Litter Storage Structures, AL 313.

Aeration. Heat generated by the process causes piles to dehydrate. As the process proceeds, material consolidates and the volume of voids through which air flows decreases. Materials selected for the composting mix should provide for

adequate air movement throughout the composting process. Periodically turning the piles and maintaining proper moisture levels for windrows and static piles will normally provide adequate aeration.

Nutrients. Keep compost well aerated to minimize nitrogen loss by denitrification. Keep pH at neutral or slightly lower to avoid nitrogen loss by ammonification. High amounts of available carbon will aid nitrogen immobilization. Phosphorus losses will be minimized when the composting process is managed according to the requirements of this standard. Include compost nutrients in nutrient management plans and determine the effects of use and management of nutrients on the quality of surface and ground water as related to human and livestock consumption.

Testing Needs. Test compost material for carbon, nitrogen, moisture, and pH if compost fails to reach desired temperatures or if odor problems develop. The finished compost material should be periodically tested for constituents that could cause plant phytotoxicity as the result of application to crops. Composted materials that are prepared for the retail market will require testing for labeling purposes.

Maintaining the Structures. The compost structure should be inspected at least twice each year when portions of the facility are empty. Replace any damaged wooden parts or hardware. Roof structures should be examined for structural integrity. Walls of composters that are constructed with lumber treated to a 0.25 pcf retention level may need replacing during the life of the structure.

Land Applying the Compost. Compost should be analyzed for nutrient content and land applied in accordance with Alabama NRCS conservation practice standard Nutrient Management, Code 590.

Other Animal and Food Processing Wastes. The operation and maintenance of composting facilities for other dead animals and for food processing wastes from agricultural operations can be similar to those for poultry and swine. Engineers should receive guidance from the state environmental engineer for specific operation and maintenance requirements.

REFERENCES

ADEM Administrative Code Chapter 335-6-7, as amended (AFO/CAFO Rule).

Alabama NRCS Conservation Practice Standards
- Nutrient Management, Code 590
- Waste Storage Facility, Code 313
- Waste Utilization, Code 633

Alabama NRCS Guide Sheets
- Composting Poultry Mortality, AL 317
- Composting Swine Mortality, AL 317A
- Emergency Disposal of Dead Animals, AL 316

Alabama NRCS Engineering Forms
- AL-ENG-25E - Worksheet to Determine Litter Production and Storage Requirements for Poultry Operations.
- AL-ENG-25F - Worksheet to Determine Size of Dead Bird Composter/Incinerator

Alabama Poultry Waste Management - Waste Utilization and Facilities Design Workbook.

Arkansas Swine Composting Guidelines.

National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook (AWMFH), Appendix 10D

Northeast Regional Agricultural Engineering Service, Cooperative Extension "On-Farm Composting Handbook", NRAES-54.

NRCS Cultural Resources Handbook