NATURAL RESOURCES CONSERVATION SERVICE

SOUTH CAROLINA

OPERATION AND MAINTENANCE REQUIREMENTS

ANIMAL MORTALITY FACILITY

Composting – Swine – Nitrogen Adjustment

CODE 316

Land Owner/Operator_____

County_____ SWCD_____ Farm/Tract No. _____

Prepared By_____ Date_____

OPERATION AND MAINTENANCE ITEMS

A properly operated and maintained animal mortality facility is an asset to your farm. This composting facility was designed and installed for temporary storage, composting, and treatment of animal mortality. The estimated life span of this installation is at least 10 years. The life of this installation can be assured and usually increased by developing and carrying out a systematic operation and maintenance program.

This practice will require you to perform periodic operation and maintenance to maintain satisfactory performance. Your operation and maintenance program requirements include:

COMPOSTER OPERATION

For proper composting, correct proportions of carbon, nitrogen, moisture, and oxygen need to be present in the mix. A common carbon source is wheat straw. It is desirable because of its bulking ability, which allows entry of oxygen. Other carbon sources that could be used are peanut hulls, cottonseed hulls, sawdust, leaves, etc. If lab testing of the litter or experience indicates that the carbon/nitrogen ratio is adequate (20 - 35:1 ratio), then litter alone should be sufficient for composting mortality as long as desirable bulking ability is achieved and moisture is properly managed. Moisture management is critical and must be maintained between 40 and 55 percent (40% -does not leave your hand moist when squeezed, 55% - if more than two drops drip from your hand the material is too moist). The table below provides a typical recipe for composting.

The composting process will be more efficient if the nitrogen concentration in the mixture is adjusted. The table below shows the recipe for composting dead swine when poultry litter is used to adjust the carbon-to-nitrogen ratio. The C: N ratios of two mixtures above are 15:1 for sawdust and 17:1 for straw. These ratios are lower than typical composting C: N ratios of 25:1. However, they correspond with values for dead animal composting in the NRCS, Agricultural Waste Management Field Handbook (NRCS, 1992).

Loading sequence when composting with litter

1. A typical stage one composting bin is loaded using the following sequence and according to the prescribed mix:

2. One (1) foot of dry litter is placed on the floor of the bin to soak up excess moisture. This is not part of the recipe.
3. A 6-inch layer of carbon source/bulking agent is placed on top of the manure to aid aeration under the carcasses.
4. A uniform layer of carcasses is added on top of the carbon source with a minimum of 6 inches of litter added next to the sidewalls to keep the carcasses away from the sidewalls.
5. A minimum of 6 inches of litter is immediately added to cover the top of the carcasses.
6. The second and each subsequent combination of carbon source, carcasses, and liner (batch) starts with a layer of carbon source, then a layer of carcasses, and then a layer of litter added in proportion required in the prescribed mix. A minimum of four bins should be planned for proper sequencing of the composting process.
7. When the loading of the primary bin is completed an additional 6-inch cap of litter is added to the top of the compost mix. This 6-inches of litter is in addition to the litter that was added to the top of the last batch.
8. Mix for composting dead swine with broiler litter using sawdust/straw as a carbon source and bulking agent.

	Weight ratio	Volume ratio
Sawdust/straw	1.0/0 3	3.0/1.0
Litter	2.0	4.0
Water	0.7	0.5
Carcasses	1.0	1.0

Maintain the moisture content at 40 to 55 percent during the composting process (40% - does not leave your hand moist when squeezed, 55% will allow about one drop of water to be released when squeezed, > 55% - if more than two drops drip from your hand the material is too moist, therefore add sawdust or dry carbon source).

Temperature is the primary indicator to determine if the composting process is working properly. A minimum temperature of 130° F shall be reached during the composting process. A temperature of 140° F is optimum; however, temperatures may range up to 160° F. If the minimum temperature is not reached, the resulting compost shall be incorporated immediately after land application or recomposted by turning and adding moisture as needed. Compost managed at the required temperatures will favor destruction of any pathogens and weed seeds.

Good carcass compost should heat up to the 140° F range within a few days. Failure of the compost material to heat up properly normally results from two causes. First, the nitrogen source is inadequate (example wet or leached litter). A pound of commercial fertilizer spread over a carcass layer will usually solve this problem. Secondly, the compost fails when too much water has been added and the compost pile becomes anaerobic. An anaerobic compost bin is characterized by temperatures less than 120°, offensive odors, and black oozing compound flowing from the bottom of the compost bin. In this case a drier bulking / carbon amendment should be added to dry the mix. Then, the material should be remixed and composted.

It is possible, though unlikely, for the temperature to rise above the normal range and create conditions suitable for spontaneous combustion. If temperature rises above 170° F, the material should be removed from the bin and cooled, spread on the ground to a depth not to exceed six inches in an area away from buildings. Water should be added only if flames occur. If temperature falls significantly during the composting period and odors develop, or if material does not reach operating temperature, investigate piles for moisture content, porosity, and thoroughness of mixing.

After this first stage process, the material should be turned into a second bin and allowed to go through a second heat process. For larger animals, a third turning will be necessary for complete degradation. For swine the first stage will typically require 60 to 90 days. The second stage process will take approximately 30 to 60 days, and a third stage will take approximately 30 days. After the heat process, curing period of one to three months is usually required before the material is stable. Some large bones may remain. These will be brittle and can easily be broken. They are usually reinserted to a composting bin for further degradation.

Compost may be land applied after the secondary or tertiary composting. If any animal parts are still in the mix, the material must be incorporated. If immediate application is not possible the material should be stored using the same requirements as that of stored litter in the Stacking Shed O&M statement.

Inspect compost structure at least twice annually when the structure is empty. Replace any broken or badly worn parts or hardware. Patch concrete floors and curbs as necessary to assure water tightness. Examine roof structures for structural integrity and leaks. Inspections shall be documented on the attached worksheet.

The primary and secondary composters and the litter storage area should be protected from outside sources of water such as rain or surface runoff.

In order to assure desired operation of the composting facility, daily records should be kept during the first several compost batches. This can be helpful in identifying certain problems that may occur.

Additional Operation and Maintenance Requirements Specific to this Plan:_____