

# In-House Composting of Poultry Mortalities Due To Catastrophic Disease



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# Introduction

Complete depopulation of infected flocks is often required for highly virulent diseases such as Avian Influenza. Typical methods of disposal of poultry carcasses with highly virulent disease include:

- Composting
- Incineration
- Landfill disposal
- Rendering
- Burial

# Rationale

**Composting of mortalities on the farm appears to be the most acceptable because it:**

- **Averts potential groundwater pollution from burial**
- **Avoids high fuel costs and potential air pollution from incineration**
- **Prevents potential disease spread associated with carcass and litter removal from houses, transport to landfills or other disposal sites and the associated costs and fees**

# Rationale

Composting of the contaminated litter and carcasses destroys pathogens in poultry houses, thus reducing the potential for disease spread.

Previous research suggests that Avian Influenza virus can be inactivated at 140°F (60°C) in 10 minutes or 133°F (56°C) in 15 to 20 minutes (Senne et al. 1994).

# What Is Composting?

- Composting is a biological process that utilizes thermophilic microorganisms to degrade organic matter into humus-like material called compost.
- The proper amount of air, water, nutrients, and carbon must be balanced to allow the composting process to initiate and continue at a rate sufficient to produce enough heat to reduce the level of pathogens in the organic matter.
  - ~ Ideal compost temperatures average between 135° F (57° C) to 145° F (63° C), enough to kill Avian Influenza virus and other heat sensitive pathogens.

# Previous Research On Composting Catastrophic Poultry Mortalities

- Composting of catastrophic poultry mortalities has been utilized for non-infectious conditions like heat stress. (MD Coop. Extension Fact Sheet # 732)
- Composting of huge quantities of poultry carcasses has been done outside the poultry house by creating windrows instead of placing the carcasses in traditional composting bins.
- Methodologies for large-scale windrow composting inside poultry houses have been evaluated and documented for adoption. (Schwartz, personal communication, Murphy, 1992; Malone, et.al. 2003, 2004; Bendfeldt, et.al. 2005)

# In-House Composting Procedures

In case of outbreaks of highly infectious diseases that require depopulation, there is a need to dispose of poultry carcasses in a timely, cost-effective, environmentally friendly, and biosecure manner.

The following composting procedures will help the poultry industry when it experiences high poultry mortalities due to catastrophic diseases like Avian Influenza.

# Contact Proper Authorities

*In consultation with poultry company personnel, State Veterinarian and/or the state's emergency poultry disease team, obtain the procedures and/or request assistance on approved depopulation and sanitation procedures and conduct an initial assessment of the best method of carcass disposal based on the individual farm situation.*



# Conduct A Thorough Farm Evaluation

- Visit the farm to make an assessment in each house to determine if composting is an option and if additional sawdust will be needed.
- Consult with the composting expert and skid-steer operator on a “plan” of action that meets the composting needs and involves the least material handling and supplemental sawdust.
- The “plan” needs to consider all of the following: bird age, litter depth in each part of the house, litter moisture and condition, location of the dead, access to end door for sawdust and compost removal, ability to turn piles, and house ceiling height.

# Determine Litter Needs

Determine the total number of dead birds, their weight, house dimensions, and average litter depth in the house. Calculate the minimum litter required based on the following formula; 0.8 inch litter required per pound of broiler meat per square foot floor space; increase this ratio to 1.0 inch for large turkeys or when using the layering compost procedure.

If the amount of litter is inadequate, purchase sawdust or alternative low-cost carbon source such as wood chips.

# Examples of Calculating Litter Needs

A 40 ft. x 500 ft. house has 25,000 broilers weighing 4 lbs. and a 3 inch litter base.

This would be 100,000 lbs. of meat  $\div$  20,000 ft<sup>2</sup> = 5 lbs. meat/ft<sup>2</sup>. The 5 lbs. meat/ft<sup>2</sup>  $\times$  0.8 = 4 inches of litter required.

One additional inch or 1600 ft<sup>3</sup> [20,000 ft<sup>2</sup>  $\times$  0.08 (1 inch  $\div$  12 inches)] of additional carbon material would be required.

# Develop or Obtain The Following

A pre-approved list of available assistance for:

- Personnel
- Equipment and Supplies



## ✓ Personnel

The number of people and time needed will depend on the number, size, age, and weight of the birds.

Personnel\* include:

- Skilled skid steer loader operator
- State, federal & poultry co. personnel and the producer
- Person experienced in composting procedure (company personnel, university rep., or consultant)
- Labor for composting procedure
- Personnel for cleaning and disinfecting poultry house and equipment

\*does not include depopulation team

# ✓ Supplies

- **Personal Protective Equipment** (Tyvek suits, boots, gloves, respirators)
  - **Hand Tools** (square point long handle shovels, pitchforks, long handle rakes and hoes, stick broom, drill with feeder winch attachment, ladder, hammer, crowbar and cutting pliers.)
  - **Personal Needs** (toilet facilities, cell phone, food, drinks, paper towels and disinfectant hand wipes.)
  - **Rodenticide and Insecticide**
  - **Composting Thermometers**
  - **Carbon Source** (litter, sawdust, etc.)\*
  - **Water Hose or Water Supply\***
  - **Warning Signs**
  - **Tarp, Poly or Fleece With Anchors \***
  - **Cleaning & Disinfectant Supplies, Large Garbage Bags, Bucket, Brush, Hand Sprayer**
  - **Poly Removal Supplies** (tow rope, fuel source, lighter, disposal approval) \*
- \* If necessary

# ✓ Equipment and Personnel

- **Midsize Skid-Steer Loader and Skilled Operator**  
(~ 1.25 - 1.5 Cubic Yard Bucket)

## *Minimum Requirements to Compost Market-Age Broilers in 8 Hours*

<u>#Houses</u>	<u>#Skid-steer</u>	<u>#Workers</u>
2	2	4
4	3	6
6	4	8
8	5	10

\*Requires 1 skid-steer and 2 workers 1.5 hrs/house to turn and cap



# ✓ Sanitation Equipment

A high pressure washer must be on site to clean and disinfect equipment and premises.



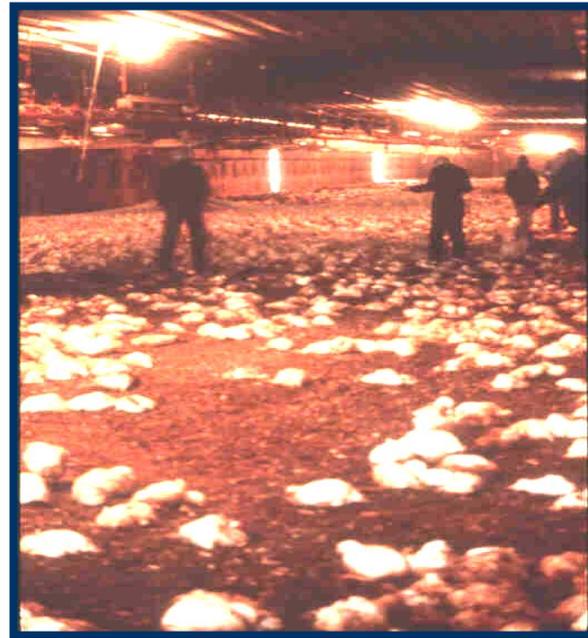
# Composting Methods

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- Layering
- Shredding and Piling
- Mixing and Piling

# Procedure For All Methods

- Let birds consume all feed
- Raise the feeder and drinker lines



# Procedure For All Methods

## Select Composting Method Based On Depopulation Procedure



If the depopulation procedure concentrates the carcasses in a small section of the house, the layering option may be appropriate.



Where carcasses are distributed more evenly over the litter surface, the mix and pile option is recommended.

# House Preparation for Composting

If poly is used as part of the depopulation procedure, the following are required:

- Attach a tow rope to the back corner of a poly section to start removal procedure.
- Use a farm tractor or skid steer loader to assist in removing the poly.
- Confine or deposit sections of poly outside of the house for ultimate disposal.



# House Preparation for Composting

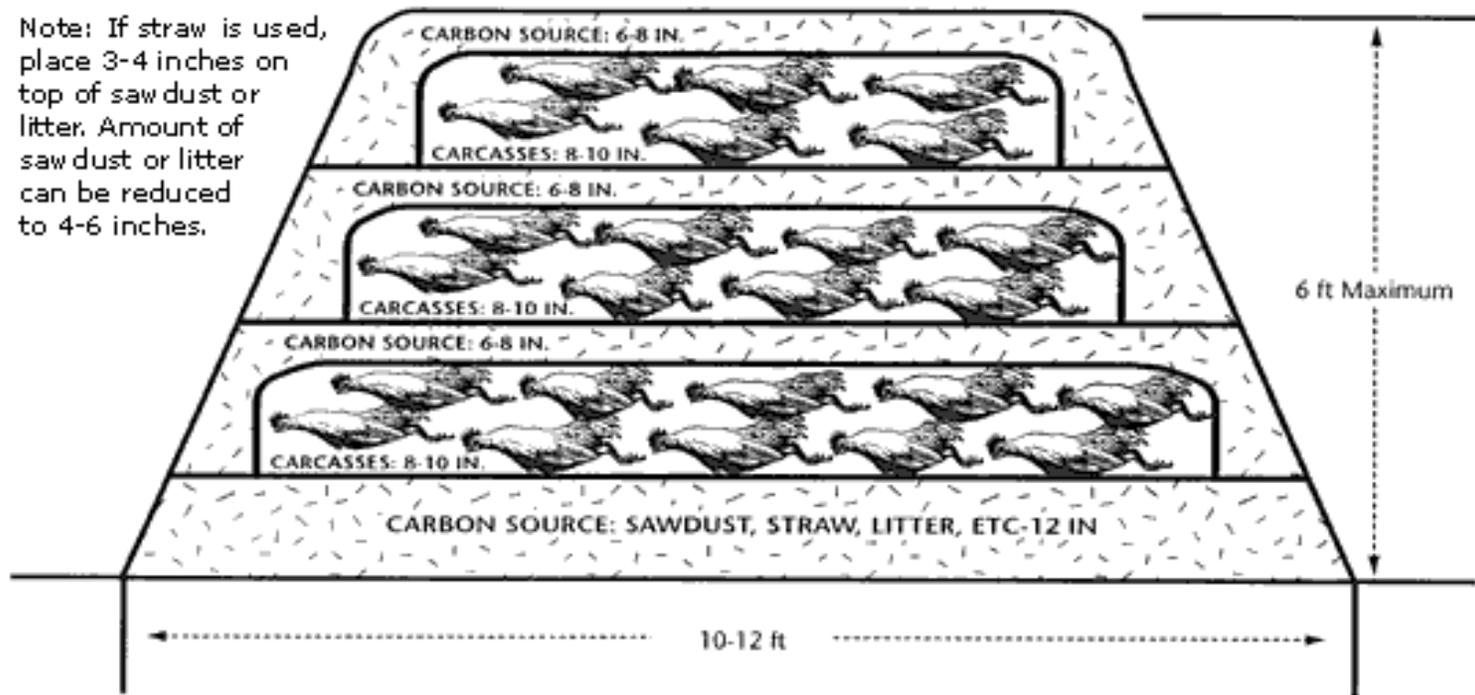
If carcasses are confined to a portion of the house and caking is extensive, tilling litter may enhance the composting process.



Courtesy of VA Tech and VA DEQ

# Layering Method

Note: If straw is used, place 3-4 inches on top of saw dust or litter. Amount of saw dust or litter can be reduced to 4-6 inches.



CARCASSES COMPOSTING WINDROW X-SECTION

# Layering Method

1. Create a litter windrow that has a 10 to 12 ft. wide base.



# Layering Method

2. Scoop the dead birds with the loader and lay them on top of the litter windrow base.



# Layering Method

3. Spread the carcasses evenly with a rake or pitchfork until they are about 8 to 10 inches thick.



# Layering Method

4. Repeat the layering procedure as needed until the pile is 6 feet high.\*

\* If the height of the poultry house prevents a 6 foot high windrow, make only two layers which will be approximately 3 to 4 feet high.

# Layering Method

5. Deposit a 6 to 8 inch layer of litter/sawdust "cap" over the birds with a foot overlap on the sides. **Leave no carcasses or bird parts exposed.**



# Shredding & Piling Method

Involves shredding carcasses and tilling them into the existing litter base followed by windrowing the mixture.

This method may be beneficial for composting large carcasses such as roasters or turkeys. It also does not require the addition of water as moisture from the shredded carcasses will be adequate to support the composting process.

# Shredding & Piling Method

1. Remove carcasses one bucket-width wide from along the side walls and spread them evenly in the center of the house.

(With adequate litter depth the litter along the side walls can be used to cap the windrows.)



# Shredding & Piling Method

2. Shred the carcasses using a tiller attached to a skid steer loader or a 3-point hitch, PTO driven unit for farm tractor.



- ~ make at least 2 passes to ensure adequate shredding
- ~ use sharp tines and high rpm
- ~ use the best angle and direction of rotation for shredding

# Shredding & Piling Method

3. An alternative to shredding is crushing carcasses with a rubber tire loader.



Courtesy of VA Tech and VA DEQ

# Shredding & Piling Method

4. Roll the carcasses into the litter/sawdust windrow.



# Shredding & Piling Method

5. Pile the shredded carcass/litter mixture into a properly shaped windrow (12 to 14 ft. wide and 3 to 5 ft. high). Cap the windrow with litter to cover exposed carcasses.



# Mixing & Piling Method

Involves mixing carcasses into the existing litter base and forming windrows.

\*This method involves the least time, labor and materials.



# Mixing & Piling Method

1. Remove carcasses one bucket-width wide from along the sidewall and spread them evenly in the center of the house.

If litter is inadequate and supplemental sawdust is required, this step is not necessary.



# Mixing & Piling Method

2. Starting with a 3 inch minimum litter base, use the feed line as a guide and mix the carcasses with the litter to start the formation of the windrow. Continue to roll the materials from along the sides together to form a windrow 10 - 12 feet wide in the center of the house.



# Mixing & Piling Method

3. As with all methods the pile must be covered with a layer of litter or sawdust 4 to 6 inches thick. All carcasses must be covered!



# All Methods Require Proper Composting of Contaminated Litter

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Any surplus litter not used in the composting process should also be placed in windrows to inactivate pathogens.

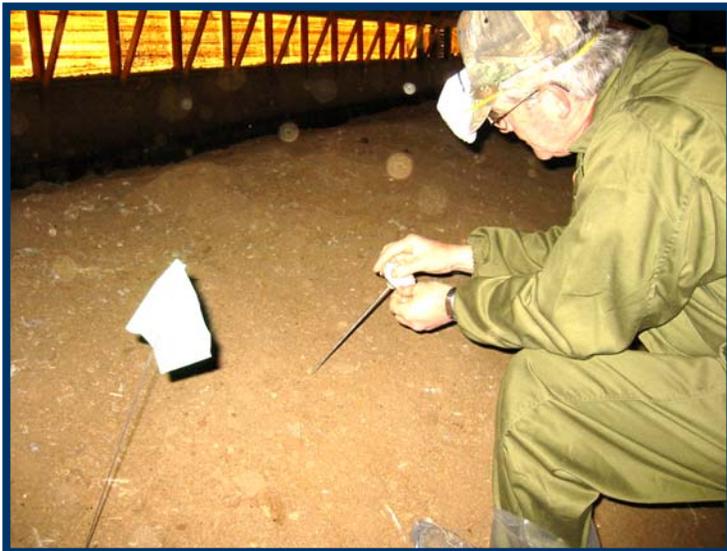
# All Methods Require Proper Sanitation Procedures

All tools and equipment should be removed from the house after forming windrows and properly sanitized.



# All Methods Require Temperature Monitoring

Use a long-stem composting thermometer or a digital recording thermometer to check temperatures. The temperature should reach a minimum of 135°F (57°C) within 5 days after compost formation.



Need to monitor and record temperatures in multiple locations by placing the tip of the thermometer in contact with a poultry carcass inside the compost windrow.

# All Methods Require Turning

After 10 to 14 days, the compost temperature will decline. As it drops below  $\sim 125^{\circ}\text{F}$  ( $52^{\circ}\text{C}$ ), turn the windrows.



Example of Daily Temperature Log



# For All Methods, Decide Turning Options

- Turn the windrow inside the house

OR

- Relocate the stockpile outside, place in shed or windrow and cover it with fleece or poly



# For All Methods After Turning

Scrape along the edges of the turned windrow and deposit material on the pile.



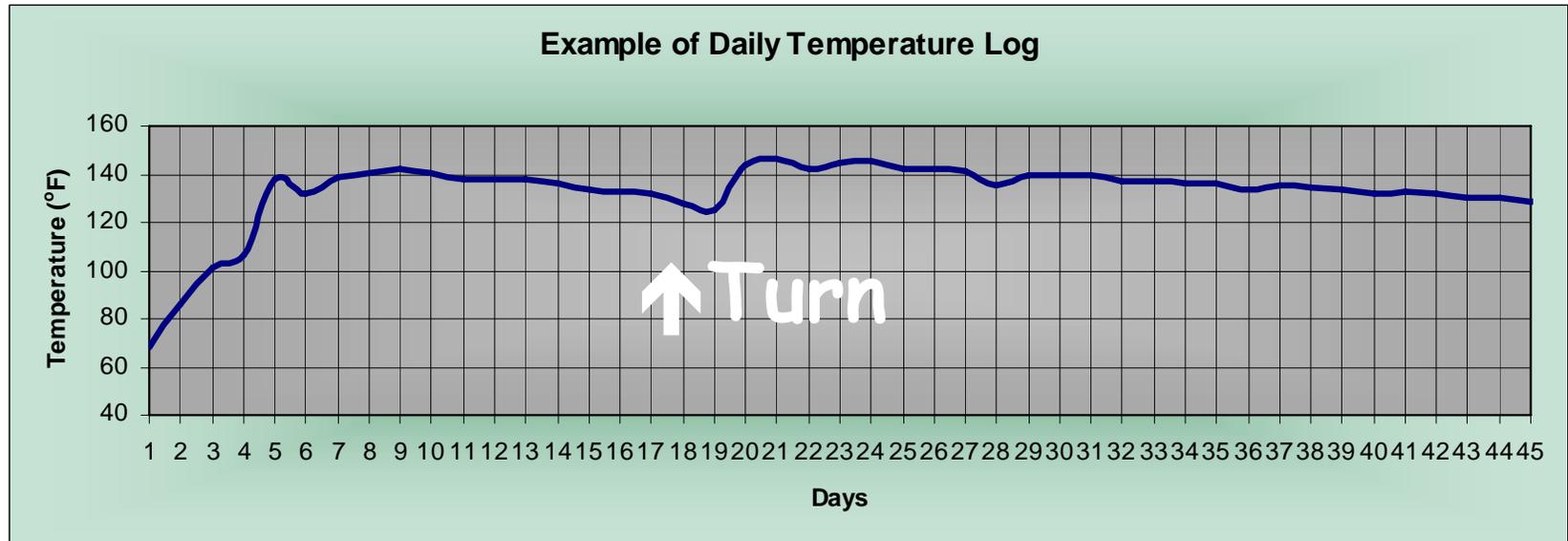
# For All Methods Cap The Turned Windrow

Cap the new windrow with a minimum of 4 inches of litter or sawdust to cover any exposed tissue on the surface.



# For All Methods, Monitor Temperatures After Turning

After turning the compost windrow, the temperature should equal or exceed that in the initial windrow. Monitor and record temperatures.



# Land Apply Compost

After an additional 2-3 weeks, the compost material may be land-applied.



# Summary

- In-house composting is a viable, biosecure and practical option for the disposal of catastrophic poultry mortalities.
- All three compost methods produce acceptable compost temperatures. The mix & pile method involves the least labor and cost (~50% less than fees associated with landfilling).
- If circumstances allow, an exercise on a non-emergency situation to try out the procedure is highly recommended.
- In-house composting may tie up the poultry house no more than 4 weeks, but as little as 2 weeks, if the windrows are stockpiled outside after the initial turning.
- Avian Influenza virus was not detected in the active compost windrows during the 2004 Delmarva Avian Influenza outbreak.

# References

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