
Using Container Composters for Disposal of Poultry Mortality

Contents:

- Introduction
- [Mortality disposal in the state of Georgia](#)
- [The Composting Process](#)
- [Microbiological Evaluation of Material in Drum Container Composters](#)
- [Conclusions](#)
- [Best Management Practices for Container Composters](#)
- [Troubleshooting](#)

With any form of animal production, some naturally occurring deaths are expected, and an occasional disease outbreak can result in elevated mortalities. Regardless of the cause, poultry producers must have a mortality disposal plan in place.

The expected mortality rate in poultry production depends on the type of production system that a grower operates, but an accepted rate for broiler production is 3%–4% over a 7-week period. For layer facilities, the rate is 1% per month over a 65–70 week lay cycle, while for broiler breeder facilities, the mortality rate is 7%–8% for a 65-week period. Of course, these numbers are variable, and producers should implement best management practices to reduce these numbers.

To increase the environmental sustainability of poultry production practices, producers should carefully consider the methods of disposal they employ on their farm.

Mortality Disposal in the State of Georgia

In the state of Georgia, several methods are approved for the handling and processing of daily mortalities. Depending on the location of the poultry production facilities, a producer may utilize incineration, burial pits, rendering, and composting. Incineration is fuel-intensive and costly. Burial pits, while convenient, are not effective in rapid carcass decomposition and are not permitted in the southern region of Georgia because of the high water table. There currently are no rendering plants in the state that will take daily poultry mortality. Bin composting has been utilized for many years, but does require attention to detail to ensure that the composting process is proceeding properly.

Producers can use an in-vessel container composter as a safe, easy-to-use, and effective alternative to bin composting for daily mortality. In-vessel container composters are operated with electricity and are equipped with control panels that can be adjusted to the size of the operation and volume of mortality (Figure 1).



Figure 1. A container composter, 60 ft in length.

Container composters have been proven to reduce carcasses into an appropriate end product quickly, efficiently, and effectively. Temperature changes may occur at different points within the drum during the composting process, and the time that is required to fully compost the carcasses depends on their age and size.

The Composting Process

All composting requires four basic components: a carbon source, a nitrogen source, oxygen, and moisture. The process is driven by thermophilic aerobic microbes (organisms that thrive in high-temperature, oxygenated environments) which require these four components to multiply and, in doing so, decompose the carcasses.

The carbon source should be an absorptive material, typically the chicken litter coming from the growing houses or storage. This litter material works very effectively in the composter drum. With any type of composter, if a proper carbon balance isn't achieved, the fluid generated from the decomposing carcasses may begin to leak at the bottom of the bins (see Figure 2).



Figure 2. Fluid seeping from the bottom of a bin.

The basic concept of layering a compost bin also is followed when using container composters—i.e., one layer of carbon material followed by one layer of carcasses—repeating the process until all the carcasses are placed in the drum and then topped off by a layer of carbon material. As with the bin composter, the first layer of carbon should be at least two times the amount of the first layer of mortality. This extra carbon material serves to absorb the fluids that come from the carcasses and ensure an appropriate carbon-to-nitrogen ratio. The drum is programmed based on the number of carcasses, the weight of the carcasses, and the size of the drum.



Figure 3. Layers of 15-week-old broiler breeder pullet mortality (A) and carbon material (B) placed inside a composting drum.



Figure 4. Composted 4 lb broiler

breeder pullet carcasses after 1 week in a composter.

Research has shown that container composters can effectively compost broiler breeder pullets at 15 weeks of age with average body weight of 4.2 lb. (Figure 3). The resulting material at the end of the process was a well-composted product with only the larger bones and some feathers remaining (Figure 4). In this study, the composting process took approximately 7 days with the highest temperature (131 °F) observed in the drum on Day 2.

The moisture content of the finished product that was observed in the study was 36%, up from the 30% found in the original carbon source. As was previously mentioned, an issue that can occur from composting mortality is that of seepage from the decomposing carcasses. This can occur if there is not enough carbon source in a compost bin or container composter. The composted end product is expected to have a moisture content up to 40%, therefore it's important to choose the correct carbon material for the compost drum.

Different materials have been evaluated in container composters, such as fresh peanut hulls, pine shavings, poultry litter, and straw. Of these materials, straw—because of its structure and dry nature—is difficult to break down within a 1-week period, and therefore straw is not a recommended carbon material for container composters.

Container composters have been proven to work effectively and efficiently on commercial poultry farms, where they have been observed to completely compost mortalities weighing up to

9.5 lb within a 10-day period. With these carcass weights, it is imperative that the drum is loaded first with the carbon material (twice the volume of the carcasses for the first layer) followed by the carcasses (Figure 5).

The number of turns the drum is programmed to make each day depends on the size of the operation and the size of the carcasses. On large commercial farms, front-end loaders typically are used to load the container composters. In one example of an eight-house broiler farm with birds grown for 8 to 9 weeks, the drum was turned four times per day. However, the composter controller can be set to automatically turn up to 12 times each day based on the volume of material within the drum.



Figure 5. A front-end loader loads the carbon material (A) and the carcasses (B) into a composter.

After the final load of mortality is placed in the drum, the carcasses are topped off with a final layer of carbon material. When the procedures of loading the drum are followed correctly, the composting process will work efficiently. After 1 day in the composter (Figure 6), the temperature in the drum should rise quickly, with a goal of reaching at least 131 °F, the temperature required to destroy most pathogenic microbes.



Figure 6. Composter contents 1 day after the drum is loaded.



Figure 7. The temperature on the display panel corroborates temperature-probe readings.

After 4 days in the drum, the carcasses are mostly broken down, with little flesh material remaining. Temperatures within the drum should have exceeded the minimum target threshold of 131 °F (Figure 7).

After 10 days, the material exits the drum (Figure 8A); the target moisture content is less than 40%. One issue that has been observed when composting larger carcasses is the production of “balls” (Figure 8B) in the final material. These balls are composed of “cooked” breast meat. Because of this issue, all material from the container composter should go through a secondary heating phase to complete the composting process before it is considered finished.



Figure 8. Composter exit materials after 10 days (A). Balls of “cooked” breast meat (B).

Evaluation of Material in Drum Container Composters

Microbiological evaluations have been conducted on container composters to determine the efficiency of the drums to kill pathogenic microbes. In a study conducted at UGA, samples were collected on Days 0, 5, and 10 of the composting process.

Pathogenic microbes from *Salmonella* and *Klebsiella* species were isolated on day 0 of the compost process. These gram-negative microbes can cause a number of infections in humans as they are highly infectious and are resistant to many antibiotics. Samples taken after 1 day of composting revealed no *Salmonella* isolates, while moderate growth of *Enterobacter cloacae* was observed. It is important to note that in this particular study, after 5 days in the drum, none of the pathogens of interest (*Salmonella*, *E. coli*, *Klebsiella* or *Enterobacter*) were found in the compost material.

The temperature of the material sampled on Day 5 was 148 °F. At Day 10, when the material exited the drum, *E. coli* was isolated from the samples, while no other pathogens were found in culture. This positive *E. coli* isolation could happen if a section of the material in the drum did not achieve the minimum temperature (131 °F) for a duration of time that is required to kill pathogenic microbes. This emphasizes the importance of a secondary heat cycle. This secondary heat cycle will complete the breakdown process of bones or ligaments that may still be in the composted material and again achieve temperatures that will kill remaining pathogens.

Conclusions

The incorporation of a container composter in the dead-bird disposal plan of a poultry farm could reduce the time spent by the operator for mortality disposal as the machine speeds up the process with mechanical turning. However, composting mortality properly with a container unit also will require a secondary heat process.

During the secondary phase, the compost is aerated and the remaining materials (mainly bones and feathers) continue to decompose until the material ultimately turns into a humus product.

This is true regardless of the type of composter used in order to ensure that the end product is effectively cured. The end of the secondary phase is marked by the internal pile temperature remaining in the range of 70–90 °F with a lack of unpleasant odors.

Regardless of the type of composting process used on a poultry farm, the end product of the compost process can be useful as a soil amendment that can add nutrients and organic material to soils, improving the nutrient profile and soil structure. Commercial poultry producers are looking for ways to improve their environmental impact and also to increase their profitability. Using container composters as a method of daily mortality disposal can be a viable option. Container composters are environmentally friendly compared to the incineration of carcasses, which can result in the emission of atmospheric particulates and greenhouse gases.

Best Management Practices for Container Composters



Figure 9. Material is too wet, resulting in seeping of fluids from the drum. This could attract flies and scavengers.

As with all farm management practices, there can be problems associated with day-to-day mortality management. Improper handling and loading of carcasses can result in less-than-favorable performance of a container drum. For example, the incorrect carbon-to-nitrogen ratio can result in the mixture being too wet and result in leakage from some types of container drums (Figure 9).

The following troubleshooting chart describes a list of problems that an operator can encounter using a drum composter, their probable causes, and how these issues can be resolved to maximize the full potential of the container composter.

Troubleshooting Container Composters		Issue	Probable causes	S
	Improper temperature		Too dry	A
			Too wet	A
			Improper C:N ratio	E a
	Failure to decompose		Improper C:N ratio (too many carcasses for volume of carbon)	A
	Odor (rotting carcass, ammonia, and/or sulphur smell)		Too wet/anaerobic conditions	A th
			Improper C:N ratio Low composting temperature	E a A
	Flies around the drum		Leaching from the drum	A tu
			Failure to reach proper temperature	A
	Lumps of carcass in finished material		Overloading of the drum	S th

		Too short of time in the drum	R tu
--	--	-------------------------------	---------