In-House Composting Field Exercise for Broiler Breeders

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Abstract. *During the US HPAI outbreak of 2015, composting was the main carcass disposal method with 85% of the impacted farms implementing this method to manage their animal carcasses. Even with the successful use of composting at many different types of operations across the country, questions still existed about its applicability for broiler breeder operations. The design and placement of equipment within these operations led many to believe that in-house composting was not practicable on these farms. In fact, in-house composting hasn't been used in the United States at a broiler breeder operation. In-house composting has been used at broiler breeder operations in Canada; however, Canadian broiler breeder housing and equipment designs are more conducive for this practice. Most of the farms impacted by the avian influenza outbreaks in the southeastern United States in 2017 were broiler breeder farms. Due to the challenges of composting within broiler breeder houses and the lack of experience with this method, on-site burial was selected to dispose of the carcasses, feed and manure from these infected farms. To address the questions surrounding the application of in-house composting at broiler breeder operations we collaborated with Virginia's broiler breeder industry to conduct a field exercise. The project proved successful and Virginia's broiler breeder industry intends to utilize in-house composting for future outbreaks of avian influenza.*

Keywords. avian influenza, composting, carcass disposal, broiler breeder

Introduction

The most commonly implemented mass poultry mortality management method during the U.S. 2015 highly pathogenic avian influenza (HPAI) outbreak was composting. The purpose of mass mortality composting was to use biological heating processes to naturally degrade poultry carcasses, inactivate the avian influenza virus, control odors and reduce fly exposure in a safe, biologically, and environmentally sustainable manner.

By definition, composting is a controlled biological decomposition process that converts organic matter into a stable, humus-like product. Composting poultry carcasses is characterized by microbial breakdown of a centralized nitrogen source, the carcasses, which are surrounded by carbon material. The carbon provides energy for microorganisms while the carcass tissues and fluids supply nitrogen for microbial protein synthesis. Typically a base layer (10-15 inches thick; 12-15 feet wide) of sufficiently porous and absorbent carbon material is constructed on the ground. Carcasses, manure and other infected organic material (eggs, feed, etc.) are then placed onto the base layer. The mixture is then capped with 8-12 inches of carbon material. The process begins with an initial breakdown of carcass soft tissue by naturally present microorganisms which produce heat, carbon dioxide, ammonia and volatile organic compounds as by-products. Following soft tissue decomposition, thorough mixing of the carbon material, carcasses and manure promotes a more ideal blend of carbon and nitrogen for optimum composting. Appropriately chosen carbon material traps leachate and odors produced during the process, therefore acting as a biofilter between the carcass and the environment. The continuous high temperatures (> 131°F) achieved through proper composting will destroy most pathogens including the avian influenza virus (Kalbasi et al., 2005). Microorganisms will eventually degrade the carcass leaving only a few remaining bones. Compost that has meet both design and temperature criteria may be approved for release by the appropriate official. This valuable by-product is often land applied as a fertilizer source, recycling nutrients and organic matter to the soil.

Composting mass poultry mortalities is a procedure that can be implemented on most commercial poultry farms. This method requires guidance from a trained composting expert, proper equipment, experienced operators, sufficient carbon, water and an adequate footprint for the compost windrow, either within the poultry house or on the premises. During a disease outbreak, indoor composting is preferred to outdoor composting. When possible, composting inside the poultry house minimizes biosecurity risks and access by scavenging animals. To date, most indoor mortality composting has occurred on commercial turkey farms. Commercial turkey houses are typically built on soil pads. Equipment, such as feeder and drinker lines, can be raised allowing sufficient space for equipment to perform composting procedures. Commercial broiler breeder houses may be built on soil pads, concrete pads or a combination. The houses contain not only feeder and drinker lines, but also manure pits, slats and nest boxes that create both space constraints and equipment maneuvering challenges. Because of these challenges, questions exist concerning the feasibility of indoor composting on broiler breeder farms.

During the 2017 U.S. HPAI and low pathogenic avian influenza (LPAI) outbreaks commercial broiler breeder operations were largely affected. Due to the perceived challenges and the lack of experience with in-house composting, on-site burial was selected to dispose of the carcasses, feed and manure from these infected farms. To address the questions surrounding the application of in-house composting at broiler breeder operations, a field exercise was conducted in collaboration with Virginia's broiler breeder industry. Both depopulation and in-house composting of a broiler breeder flock were part of the exercise. The objective of the field exercise was to determine the feasibility of in-house composting on a commercial broiler breeder operation.

Methodology

The field exercise was conducted on a commercial broiler breeder operation located in Virginia. The demonstration broiler breeder house was 40 feet by 200 feet in dimension with a 12 foot concrete center scratch area. There were a total of 4,400 hens and roosters in the house at 62 weeks of age (end of production cycle). The birds totaled 38,200 pounds of live weight. Manure and litter were estimated to total 150,000 pounds.

All birds were humanely euthanized via CO_2 gasification under the direction of a licensed veterinarian. Following euthanasia, slats were manually moved from one side of the house to the opposite side. Using skid steers, carcasses and litter were moved from the center scratch area to the manure pit.

Figure 1. Center scratch area following euthanasia.

Figure 2. Cleared scratch area.

Carbon material, consisting of 150 cubic yards of hardwood mulch, was delivered outside the poultry house. Mulch was transported inside to the center scratch area to form an 8 foot wide section of base material. A mixture of carcasses, manure, litter and mulch were then placed on top of the base material. Mulch was used as capping material upon the completion of each section. Additional completed windrow sections were developed moving backward from the egg room to the end doors.

Figure 3. Building compost windrow one section at a time.

Figure 4. Illustration of windrow base, core and cap.

The final windrow dimensions were approximately 11 feet by 200 feet. Only pit manure from one side of the house was used due to space limitations. Pit manure from the opposite side of the house remained undisturbed until turning. Windrow temperatures were monitored daily using long-stem thermometers

Figure 5. Completed in-house windrow.

After 14 days, slats were moved from one side of the house to the opposite side. The compost windrow material was mixed with the remaining undisturbed pit manure and moved outside forming a final windrow. The windrow was capped with mulch and allowed to compost for an additional 14 days. Temperatures were monitored daily.

Figure 6. Completed outdoor windrow.

Results and Discussion

The entire euthanasia process from set-up to completion took 2.5 hours. Manually moving slats from one side of the house to the other side required 50 minutes. Clearing the scratch area of birds and litter, mixing compost material and completing the final in-house windrow took 5 hours. Based on the experience gained during this exercise, process completion times could be drastically shortened.

Average daily windrow temperatures (day 0 to 14) are illustrated in Figure 7.
On day 4, temperatures reached 126°F and then ranged between 125°F and 131°F. Temperatures were slightly lower than the USDA Mortality Composting Protocol for Avian Influenza Infected Flocks target of ≥131°F for 3 consecutive days (Miller et al., 2015). This is most likely due to the large amount of wet, nitrogen-rich manure that was added to the windrow along with the carcasses. With less manure, the carbon to nitrogen ratio would have been more in balance for proper composting. The wet manure may have also contributed to increased anaerobic conditions within the windrow. Temperatures would have likely been higher with less manure addition. It is important to note that these birds were 62 weeks old and at the end of their production cycle. A younger flock would have had less manure to compost.

Figure 7. Average daily windrow temperatures (day 0 to 14).

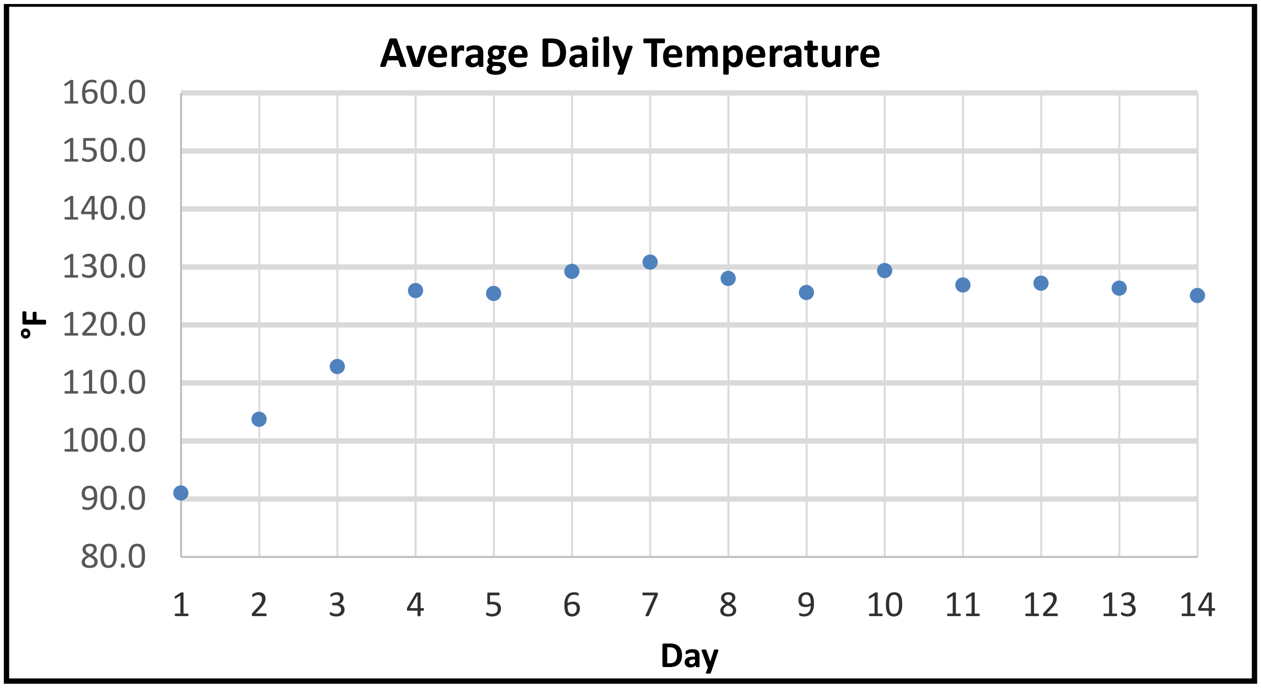
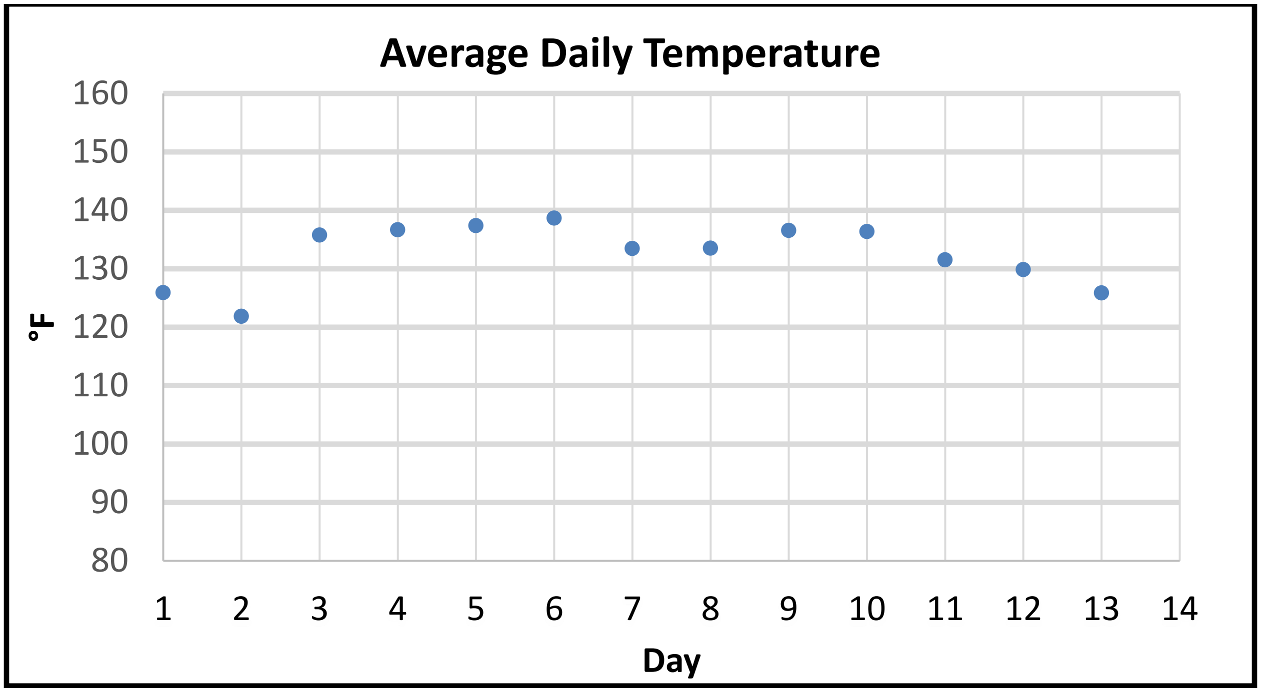


Figure 8 shows average daily windrow temperatures from days 15 to 27. Upon turning and aerating the windrow, temperatures increased to 136°F on day 17 and then ranged from 139°F to 126°F. Temperatures did reach the target of ≥131°F for 3 consecutive days. Mixing and aerating the compost material generally results in an increase in windrow temperatures.

Figure 8. Average daily windrow temperatures (day 15 to 28).



At the 14 day turn, undisturbed pit manure from inside the barn was mixed with the compost windrow material and then moved outside forming a new windrow. In retrospective, a more efficient approach would have been to form a separate outdoor windrow with the remaining manure and fresh carbon material.

Conclusions

The preliminary findings from this field exercise indicate that in-house composting can be successfully implemented on a commercial broiler breeder operation. Suggested modifications to the protocol include leaving more of the pit manure undisturbed until the turn date (day 14). The manure can then be moved outside and composted in a separate windrow with fresh carbon material. This procedure would allow the in-house mortality compost windrow to not become overwhelmed with wet, nitrogen rich manure.

Acknowledgements

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References

Kalbasi, A., S. Mukhtar, S.E. Hawkins and B.W. Auvermann. 2005. Carcass composting for management of farm mortalities: A review. *Compost Science & Utilization*. 13(3):180-193.

Miller, L.P., G.A. Flory, R.W. Peer, E.S. Bendfelt, M.L. Hutchinson, M.A. King, B. Seekins, G.W. Malone, J.B. Payne, J. Floren, E. Malek, M. Schwarz, and J. Bonhotal, 2015. Mortality composting protocol for avian influenza infected flocks. United States Department of Agriculture, Animal and Plant Health Inspection Service. Washington, D. C. Available at: https://www.aphis.usda.gov/animal_health/emergency_management/downloads/hpai/mortalitycompostingprotocol.pdf