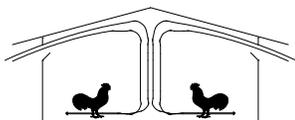




The University of Georgia

College of Agricultural and Environmental Sciences
Cooperative Extension



Poultry Housing Tips

Comparing Radiant Heating System Floor Heating Patterns

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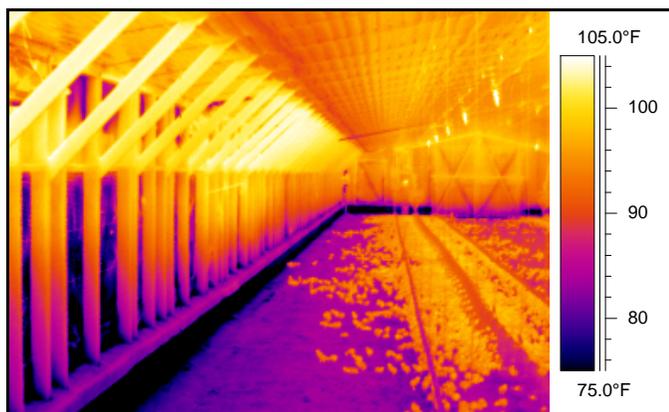


Figure 1. Chicks in house using forced air furnaces.

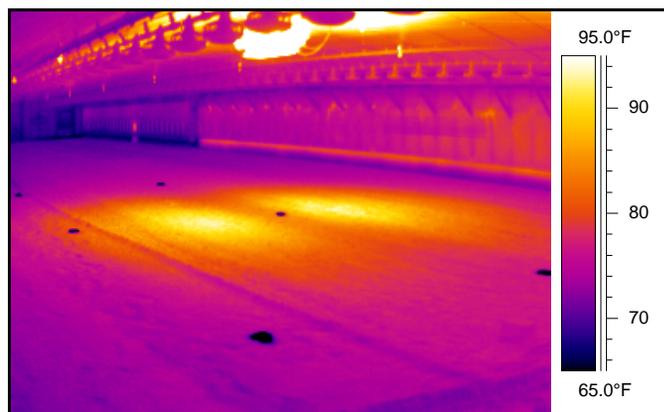


Figure 2. Floor heating pattern of CTB Quadatherm®.

Radiant heating systems are by far the most common method of providing supplement heat to birds in poultry houses today. What sets radiant heating systems apart from traditional hot air heating systems is the fact that roughly 50% of the heat energy produced by a radiant heater is delivered directly to the floor in the form of radiant heat. Radiant heat from a heater produces a floor temperature gradient where floor temperatures directly underneath the heater may be 20 to 40°F above ambient air temperature which gradually decrease to near ambient air temperature at a distance of between 5' to 20' from the radiant heater depending on the type installed. Having a floor temperature gradient is of significant benefit when it comes to providing optimal growing conditions for young chicks because they can select the floor temperature where they feel most comfortable which can vary from bird to bird. As birds get older, and the radiant heating system operates less frequently, the floor temperature gradient tends to become less intense resulting in a more uniform heating of the birds throughout a house. Birds also benefit indirectly from the floor heating properties of a radiant heating system due to the fact that the same radiant heat that helps to keep them warm also helps to keep the litter dry. Since one of the primary reasons for installing a radiant heating system is to heat the floor of a house, knowing the floor heating pattern of a particular type of radiant heater is important from both an installation and bird/litter management standpoint.

One of the oldest forms of a radiant heating system is the 30,000 Btu's/hr, traditional "pancake brooder". Though proven to be an effective heater, one of the weaknesses of a pancake brooder is the relatively low amount of radiant heat each brooder produces. Since the pancake brooder produces very little radiant heat, it must be kept close to the floor (within two to three feet) to produce a significant level of floor heating. The low installation height results in a floor heating pattern that only extends a foot or two past the edge of the brooder which means that in order to cover a significant percentage of the floor space in a poultry house a very large number are required.

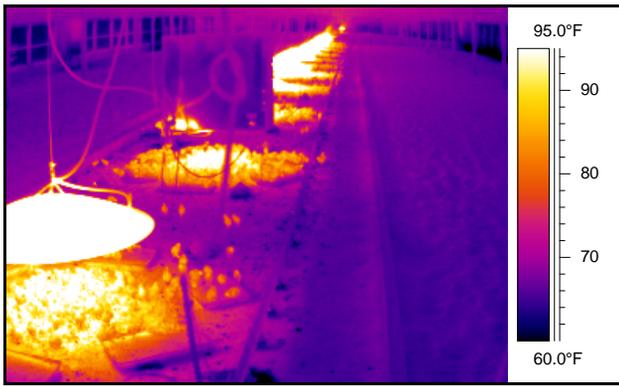


Figure 3. Conventional pancake brooders.

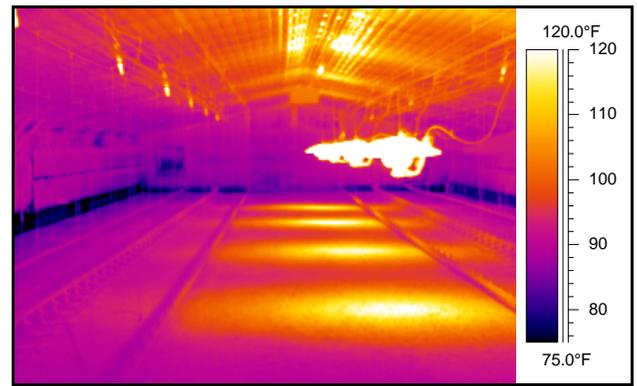


Figure 4. Radiant brooders in 40' wide house.

Radiant brooders (40,000 Btu's/hr) produce a significantly greater amount of radiant heat than pancake brooders and as a result are typically installed five feet or more above the floor to help distribute the increased amount of radiant heat over a larger area. When properly installed/managed, the floor temperatures directly underneath a radiant brooder will run approximately 20 to 30°F above ambient air temperature decreasing to a couple of degrees roughly eight feet from the brooder. This creates a roughly 16' in diameter radiant heat zone (over twice that of a conventional pancake brooder) where the birds are receiving a majority of the heat they require directly from the brooder in the form of radiant heat. Outside this zone the birds are primarily being heated by the hot air produced by the radiant brooders in the house and as a result will run one to three degrees below air temperature. To obtain the maximum benefit from radiant brooders it is generally recommended that they be installed in the vicinity of the feed and water lines where radiant heat is most needed from a chick comfort and litter drying standpoint.

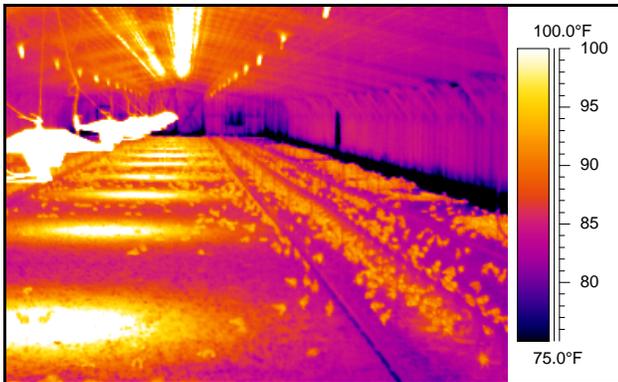


Figure 5. Radiant brooders in center of house.

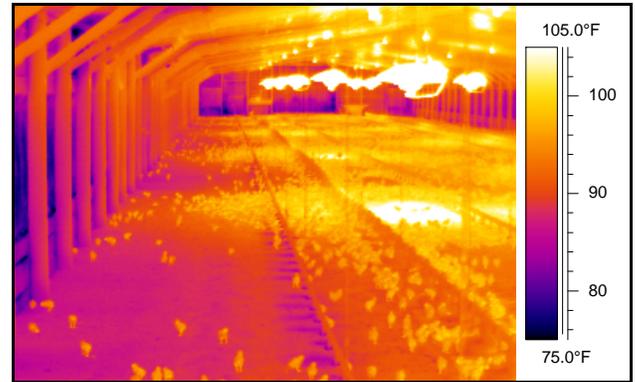


Figure 6. Radiant brooders over feed and water.

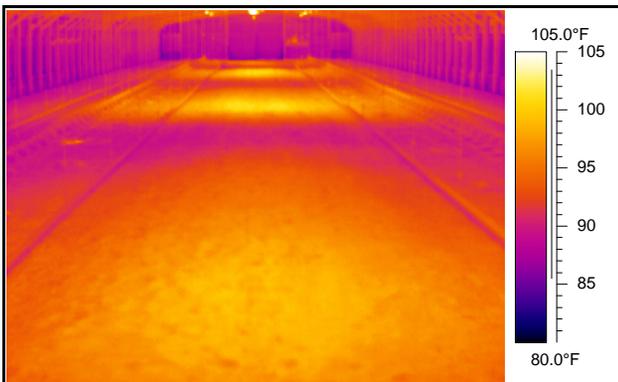


Figure 7. Radiant tube heating pattern (40' wide house)

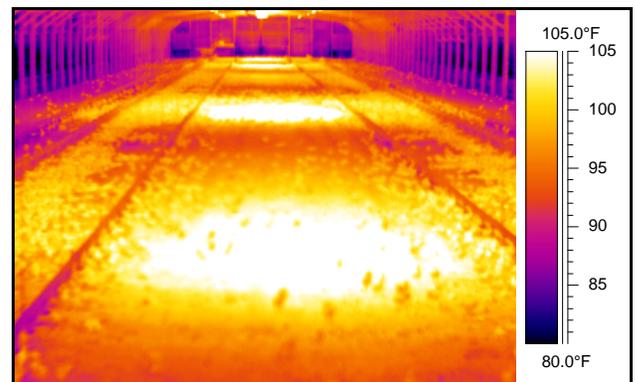


Figure 8. Radiant tube with day old chicks (40' wide house)

Radiant tube heaters have very large radiant heat emitters (the tube) which produce a high level of radiant heat and as a result need to be installed as high above the floor as possible. Installing a radiant tube heater high above the floor not only increases the radiant coverage area but helps to prevent excessive floor temperatures directly underneath the heater as well. Radiant tube heaters tend to have a heating pattern approximately 20' to 30' in width. The length of the radiant heating pattern is

typically 10' to 20' longer than the tube length which typically is between 30' and 40'. The surface temperature of the tube decreases as the exhaust gasses travel from the burner end to the exhaust end of the tube which results in a significant difference in the amount of radiant energy emitted along the length of the tube. The net result is that floor heating patterns end up looking more like an egg with the widest coverage pattern near the burner and the narrowest coverage area end at the exhaust end of the tube.

The most recent addition to the poultry house radiant heater market are the “high intensity radiant brooders” manufactured by CTB[®] and GSI[®] (80,000 Btu’s/hr). From a floor heating standpoint these heaters are a cross between conventional radiant brooders and tube heaters. The width of the heating patterns are very similar to a tube but the length of the heating pattern is less than a tube but greater than a radiant brooder (roughly 30' X 30'). The Quadratherm[®] (CTB) has more of an oval pattern with a “cool” spot in the center while the GSI AV heater[®] is more circular with the highest temperatures in the center. In general these types of radiant heaters have roughly twice the coverage area of a conventional radiant brooder (Figure 10).

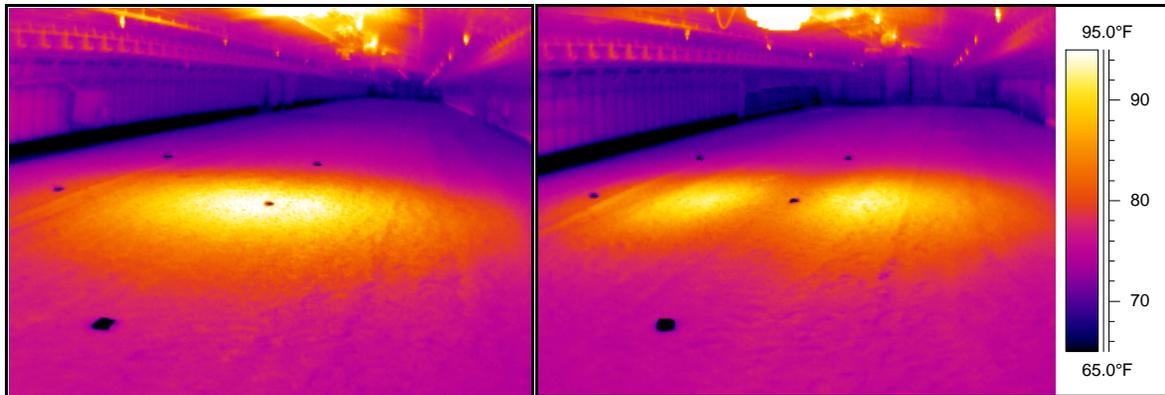


Figure 9. Floor heating pattern of GSI AV heater[®] (left) and CTB Quadratherm[®] heater (right) in 40' wide house.

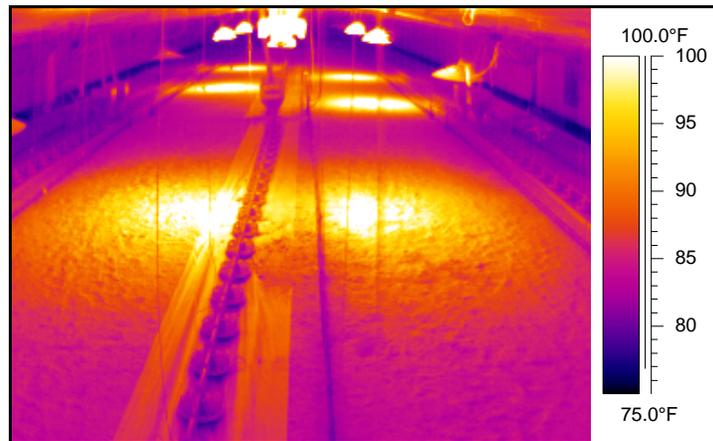


Figure 10. Single CTB Quadratherm[®] vs two rows of L.B. White Infraconic[®] radiant brooders in a 50' wide broiler house.

The thermal images shown in Figure 10 were taken in a 40' wide house equipped with both types of high intensity radiant brooders 45 minutes after the heaters were turned on. The blue dots are ice packs placed on the floor to act as reference points. The first row is directly underneath the high intensity radiant heaters in the center of the house; the second row is ten feet from the side wall. The distance between the ice packs in the two rows is approximately 16'. Figures 11 and 12 show the floor temperatures from a side wall perspective. From the thermal images it is clear to see the similarity of the heating patterns as well as the overall width of the heating pattern of approximately 30'.

It is important to realize the limitations in the floor heating pattern of any radiant heater. For instance, though a high intensity radiant brooder or tube works very well in a 40' wide house, very little radiant heat will be delivered to feed and water near the side wall of a 50'+ wide house, much as the case where radiant brooders are installed down the center line of a 40' wide house. Yes, you can heat a house in both cases but it is important to realize that for large portions of the house the radiant heating system is acting more like a hot air system rather than a radiant system (Figures 13, 14). This can make determining the proper temperature settings and/or temperature sensor location particularly challenging. Ideally, the radiant heat zones

of the heaters would overlap to some extent so that a chick would not have to move more than five to ten feet to find some level of radiant heat. Another benefit of installing sufficient radiant heaters so that most of the floor is covered with some level of radiant heat is you're less likely to create intense hot spots near the heaters trying to obtain acceptable floor temperatures in areas of the house far from the radiant heater. On a related point it is important to keep in mind that the fewer radiant heaters you install, the longer they will need to operate to maintain a proper house temperature during cold weather, the more likely you are to create intense hot spots that are little benefit to the birds in a house.



Figure 11. Floor heating pattern of GSI AV heater®.

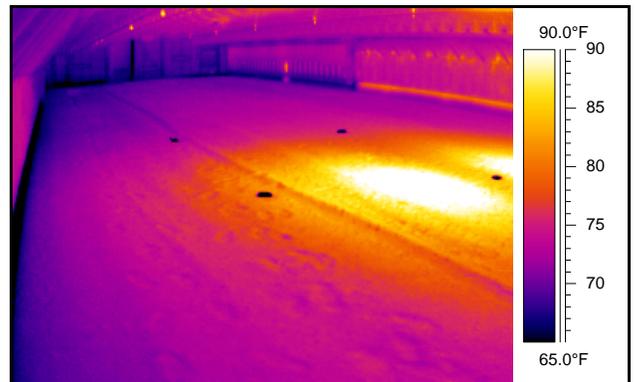


Figure 12. Floor heating pattern of CTB Quadratherm® heater.



Figure 13. Quadratherms® installed down the center of a 50' wide house.

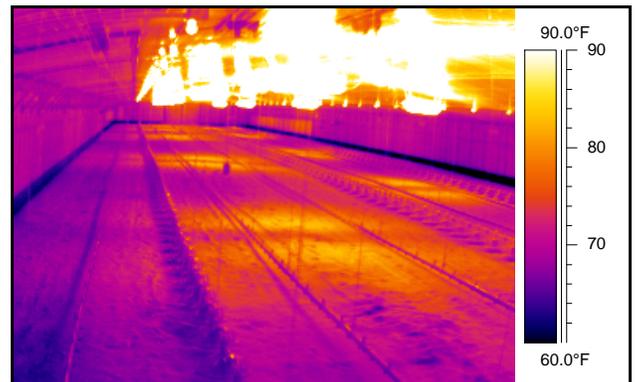


Figure 14. Two rows of CTB Quadratherms® installed in a 54' wide house.

Some “high intensity radiant brooders” and tubes are capable of two stage heating. Though this can prove beneficial in some cases it is important to keep in mind that when a radiant heater is in “low” burn mode the amount of floor heating produced by the heating system is significantly reduced. So whereas when on “high heat” mode a high intensity radiant brooder may have a radiant floor heating pattern 30' in width, in “low heat” mode this can be reduced 25' to 20' (Figure 15, 16). If there are an adequate number of radiant heaters this wouldn't necessarily be a problem. But, for instance in the case of wider houses with a single row of radiant heaters, essentially only the center 20' of the house would receive an appreciable amount of radiant heat essentially turning the radiant heating system in to more of an air heating than a floor heating system.

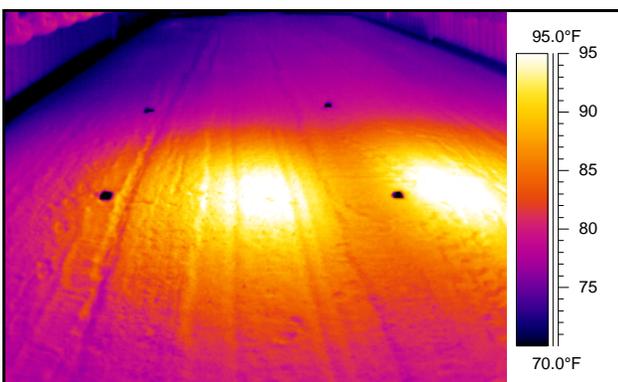


Figure 15. CTB Quadratherm® (high heat)

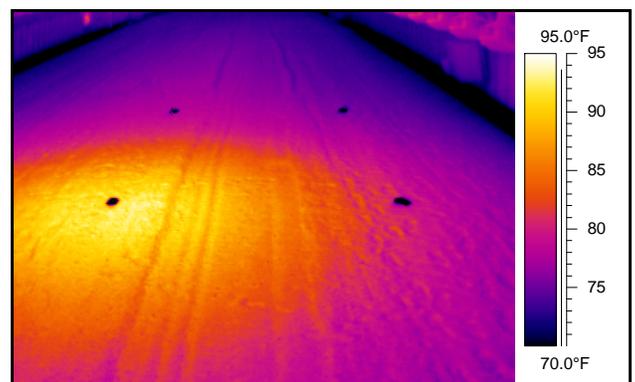


Figure 16. GSI AV heater® “low heat” mode

Installing the correct number of radiant heaters as well as their placement in a house can have significant impacts on floor temperature, heating system run time and ultimately chick performance. You do not have to look far for examples where insufficient numbers of radiant heaters were installed (Figure 17). Though you may end up being able to maintain the proper air temperature, the birds will not fully benefit from all the advantages of a radiant “floor” heating system.

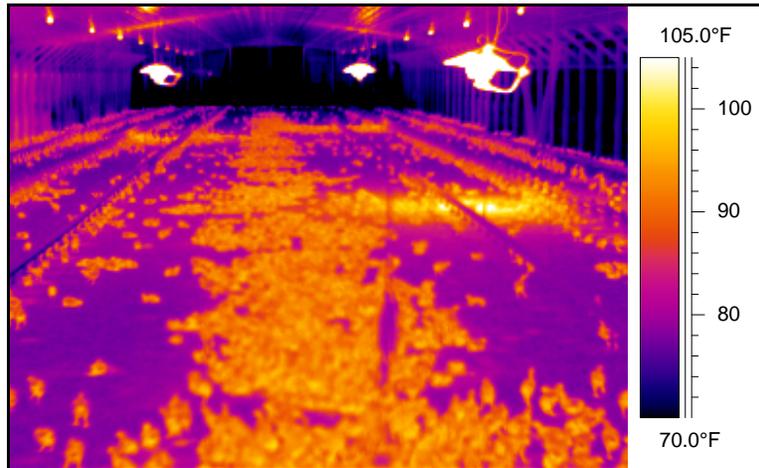
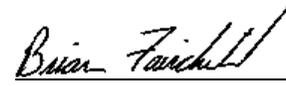


Figure 17. Insufficient number of radiant brooders.


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