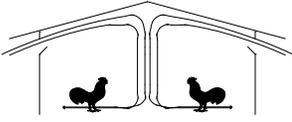




The University of Georgia

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Cooperative Extension



Poultry Housing Tips

Two Way Attic Inlets

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There are primarily two basic types of attic inlets used in broiler houses today, four way and two way. With a four way attic inlet fresh air exits through the four sides of the typically square inlet while with two way, the air exits on just two sides of a square or rectangular shaped inlet. The air is then directed along the ceiling to mix with the hot air produced by the birds and/or heating system before moving down to floor level. Though both types of inlets have proven to both improve air quality and reduce heating costs during cold weather, there are subtle differences in how they function so they often need to be installed and managed a little differently.

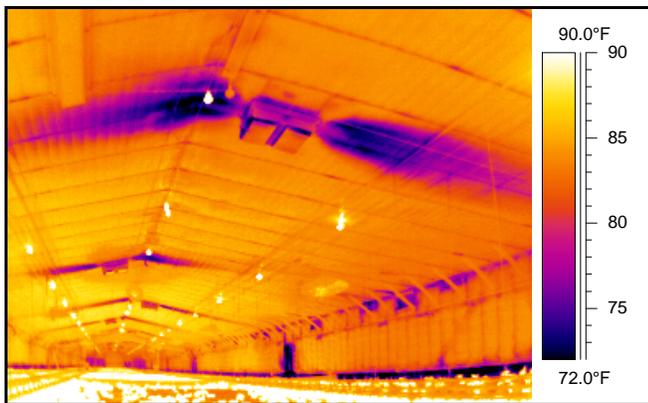


Figure 1. Two way attic inlet.

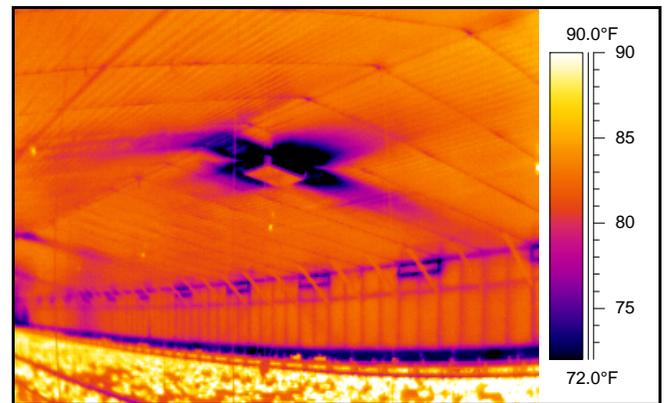


Figure 2. Four way attic inlet.

One obvious, yet key difference between four and two way attic inlets is that a four way inlet breaks the cool incoming air into four air streams while with two way only two air streams are created. The advantage is that breaking up air entering through each inlet into four smaller air streams, fresh air tends to be distributed more evenly throughout the house without causing harmful drafts. For example, let's say that there are two houses with 14 attic inlets each; one is equipped with two way inlets, the other equipped with four way inlets. When two 36" fans (20,000 cfm) are operating, approximately 1,400 cfm will enter through each of the 14 attic inlets. In the house with the two way attic inlets the 1,400 cfm per inlet is split into two equal air streams of 700 cfm directed toward the side walls (Figure 1). In the house with the four way attic inlets the 1,400 cfm is broken into four air streams of 350 cfm, two of which would direct the fresh air toward the side walls while the other two would direct air along the centerline of the house (Figure 2). By splitting up the fresh air into twice the number of smaller air streams (56 vs. 28) the cool incoming air will not only warm up quicker but will tend to decrease house temperature less because the air is being distributed not just toward the side walls but the center of the house as well.

It is important to note that for the most part, any type of attic inlet system will tend to do a significantly better job of distributing fresh air for minimum ventilation throughout a house than using 50+ traditional side wall inlets. When 50+ side wall inlets are used with just a couple of minimum ventilation fans they tend to open less than an inch. With such a small opening, the incoming air is typically directed vertically toward the ceiling. The cold air goes up, hits the ceiling, and falls to the floor without mixing with warm air collecting near the ceiling (Figure 3). As a result, producers often end up with cool

drafty side walls and caked litter. Even if half the side wall inlets are closed it can still be a challenge getting the cool incoming air to move along the ceiling to the center of the house where most of the hot air tends to collect. With either two way or four way attic inlets, the air is introduced into the house where the hottest air tends to collect and is broken into a relatively large number of small air streams that are directed horizontally along the ceiling for maximum throw and mixing (Figure 4). Furthermore, during the day, the air entering through the attic will be typically 5 to 30°F warmer than that coming through a side wall inlet. So, though the air entering through an attic inlet may still be cool, it is still warmer and being distributed more evenly throughout the house than that entering a house through a traditional side wall inlet.

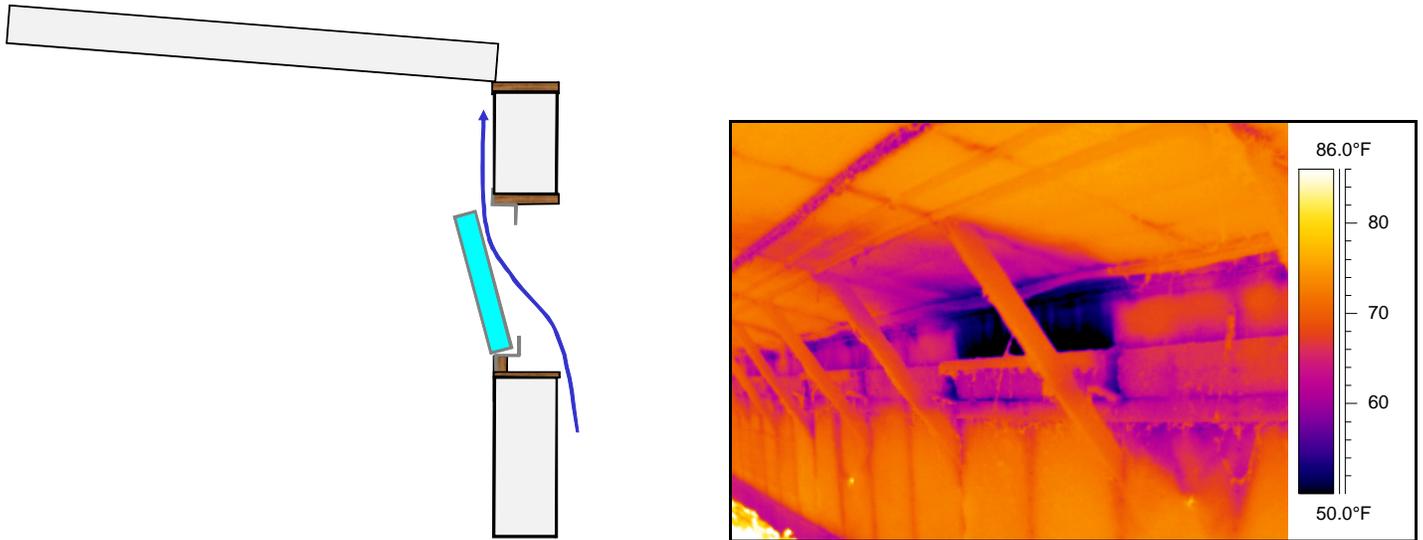


Figure 3. Air flow from side wall inlets with small opening.



Figure 4. Two way and four way attic inlets introducing fresh air in the center of the house.

Though often the differences in the conditions produced by two way and four way inlets are subtle, they can become very apparent as the amount of cold air drawn through an attic inlet system increases. When a two way inlet opens more than an inch or so, a relatively strong, cool air jet can quickly move from the center of a house to the side wall creating a cool, drafty spot along the side wall (Figure 5). The more the inlet opens, the more significant of a problem this becomes (Figures 7 and 9). Though four way inlets can also create a cool spot along the side wall they tend not to be as pronounced for a couple of reasons (Figures 6 and 8). First, at the same static pressure a four way inlet needs to open half as much per side compared to a two way attic inlet to supply roughly the same amount of air per inlet, thus creating smaller, less powerful air jets. Secondly, it is important to realize that the typical four way attic inlet can not open more than a couple of inches, whereas many two way attic inlets can open four or more inches which can lead to the creation of very large and powerful air jets. Last but not least, most four way inlets either direct the air up toward the ceiling or horizontally along the ceiling. Some two way inlets can actually direct the air down towards the floor if they are allowed to open too much.

There are a number of steps that producers can take to minimize the likelihood of a two way attic inlet system causing cool, drafty spots along the side walls. First and most importantly, producers should limit the inlet opening to a couple of inches or less to limit the size of the air jets emanating from the inlets. The smaller, less powerful jets will tend to heat up faster and slow down before they hit the side wall and roll down on to the birds. Secondly, the static pressure at which the inlets operate can be increased slightly by either making adjustments to individual inlets (i.e., spring or counterweight) or to the machine controlling the amount of inlet opening. Thirdly, install two way inlets as close to the centerline of the house as possible to maximize the distances between the inlet and the side wall. Last but not least, it is important that when considering a two way inlet system that a sufficient number are installed so that they don't open excessively when the minimum ventilation fans are operating. In the past, some two way attic inlet systems were sized based on the air moving capacity of the inlets when open 4" to 6". Since for optimal performance their opening may need to be limited to a couple of inches, the number of inlets required will have to be increased. As a result, a house may require a greater number of two way inlets than four way inlets to maximize the effectiveness of a two way attic inlet system.

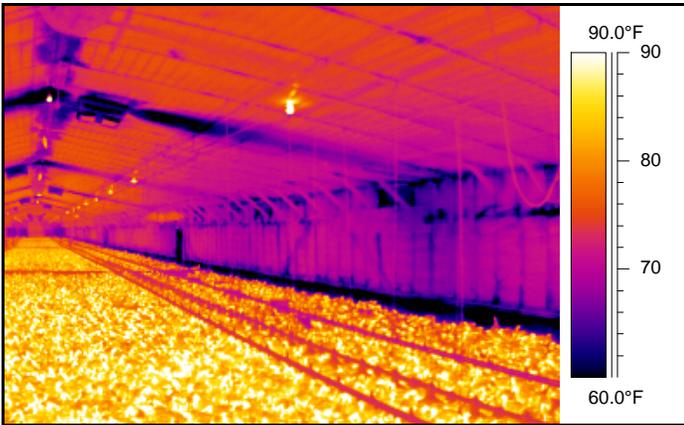


Figure 5. Cool spot on side wall caused by a two way inlet.

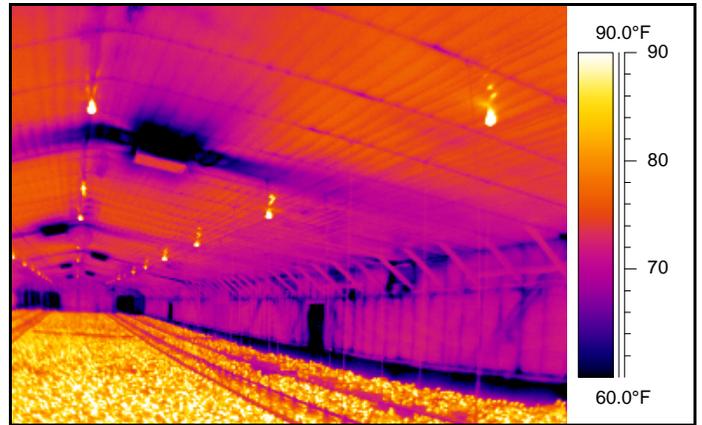


Figure 6. Four way attic inlet system on same farm.

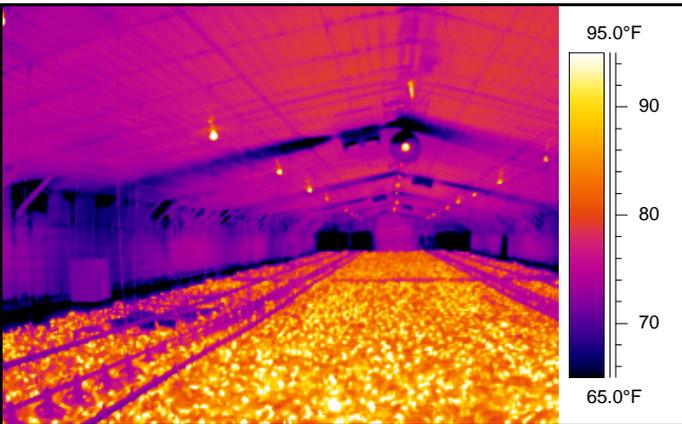


Figure 7. Large cool spot on side wall.

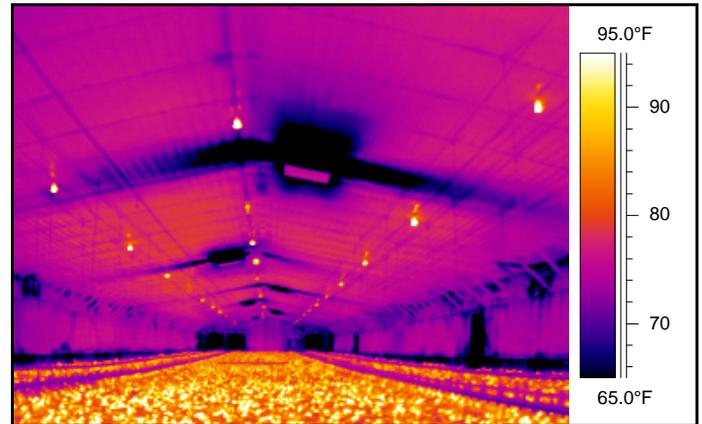


Figure 8. Four way attic inlet system on same farm.

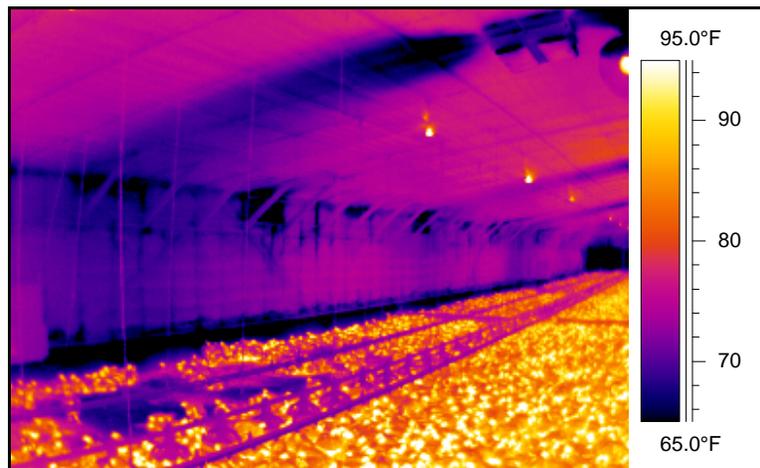


Figure 9. Closeup of cool spot shown in Figure 7.

One place where the performance characteristics of two way attic inlets is beneficial is in wide houses. Wide houses not only tend to have greater number of attic inlets spaced closer together than 40' wide houses, but most importantly the distance between the attic inlet and the side wall is greater. The greater distance between the attic inlet and the side wall allows the typically larger air jets generated by two way attic inlets more time to heat up and slow down before reaching the side wall and rolling down toward the floor. Furthermore, it takes a fairly strong air jet to make it all the way from the center of the house to the side wall. The typical four way attic inlet will typically only throw the air 10' to 15' which works well in a 40' wide house, but can prove problematic in wider houses when installed down the centerline of the house. One solution to this issue is that in wider houses two rows of four way inlets should be offset from the center line of the house 5' to 10', depending on house width.

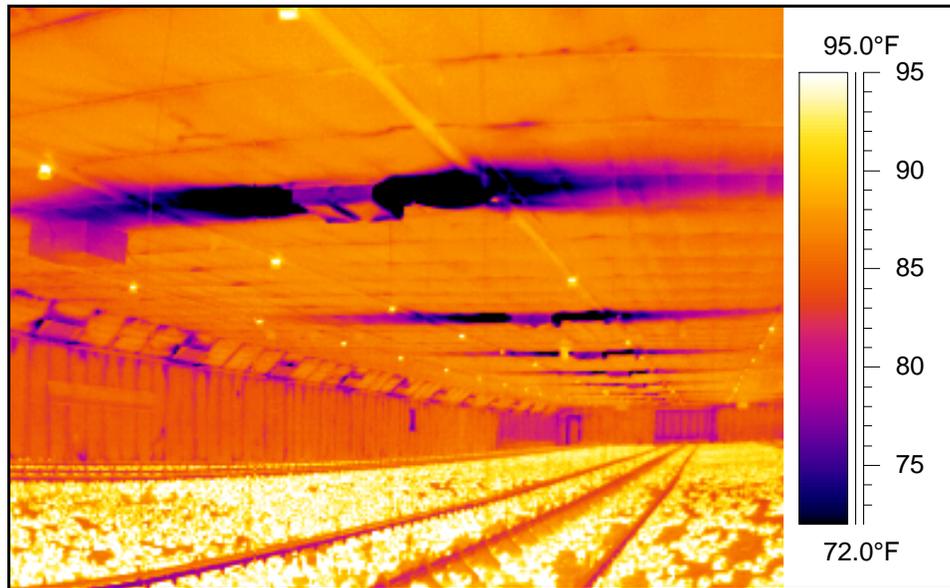
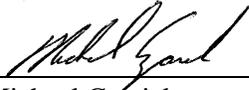


Figure 10. Two way attic inlets in a 60' wide house.

Though the ability to pull warmed air from a house's attic space is certainly advantageous, the importance of the fact that an attic inlet systems allow small amounts of fresh air to be brought in uniformly throughout a poultry house should not be underestimated. The introduction of fresh air during cold weather at the ceiling in numerous small jets evenly distributed throughout a house makes it much easier to maintain proper air quality without causing cold spots, drafty conditions or excessive fuel usage. Though a modern broiler house may have a large number of side inlets evenly distributed throughout the house, the problem is that they are largely, due to poor design, ineffective of distributing and conditioning cold incoming air when open less than an inch, the typical opening when used with two or three minimum ventilation fans.


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