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Critical Information for Improved Bird Performance Through Better House and Ventilation System Design, Operation and Management

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Attic Inlets: Issues & Concerns

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Attic air inlets are being installed in many poultry houses across the Poultry Belt. These inlets allow growers to capture warmer attic air for minimum ventilation, thus reducing heating fuel costs, reducing relative humidity, and improving litter quality. We published a newsletter and white paper on Attic Inlet Technology in July 2008 detailing the pros and cons of different types of inlet systems (see www.poultryhouse.com to download this information). This newsletter will point out areas of concern with installation practices that are occurring in the field right now. Some of what we are seeing may cause problems down the road. To avoid possible problems and fully realize their benefits, attic inlet systems must be well thought out, properly installed, and properly operated and maintained. Following are the most common issues we have seen recently in the field.

Issue #1. Installing attic inlets in houses that are not tight. There seems to be a misconception by many who purchase attic inlets that attic inlets are a silver bullet that alone will solve the problem of high heating bills. This is not true. In fact, we have observed attic inlets installed in marginally suitable houses, resulting in failure to get full value from the attic air and perhaps making day to day management more difficult.

Attic inlets should not be installed in loose poultry houses. In a 40 x 500 poultry house with one 48-inch fan operating and all inlets, doors and openings closed up, if you cannot achieve a static pressure of 0.15 inches your results with attic inlets won't be as good as you expect. Here's why: With attic inlets installed and operating when the minimum ventilation fans are running, a large portion of the incoming air will still be coming through the cracks, not the attic inlets. Any value associated with pre-heating of attic air will be reduced by the amount of cold air coming in through the cracks. Bottom line on this is that attic inlets work best in tight, solid wall poultry houses. They will work reasonably well in tight curtain houses. Instead of spending money on attic inlets for a loose house, these funds should be spent on tightening and insulation for a much better return on investment.

Issue #2. Failing to figure the number of attic inlets correctly. What is the purpose of the attic inlet system? There are basically three inlet systems in a broiler house that has attic inlets: 1) The attic inlets for cold weather and low air flow (minimum time clock ventilation); 2) the perimeter inlets (side wall or ceiling) for power ventila-

Issue: Condensation in attic

One of the worst effects of mismanaging attic air inlets is to allow in-house air to get into the attic through open and unused attic inlets. If for any reason warm moist air from the broiler house comes in contact with cold roof surfaces and insulation, condensation will occur. Over time, this will cause serious damage to the insulation and the house structure. Attic inlets (no matter the brand or type) should always be shut and sealed when no air is being pulled into the house by the fans.

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tion; and 3) the tunnel inlet for hot weather, maximum bird cooling. The idea behind attic air inlets is to utilize warmer pre-heated attic air during the first mode of ventilation, shifting to side wall or perimeter inlets during the second mode of ventilation, and then to tunnel inlets during the third mode of ventilation.

In all of these ventilation modes, it is important to get the right airflow cfm, which requires matching air inlet cfm rating to the fan cfm capacity being used. One of the problems we are seeing is that some people are installing attic inlets using rules of thumb for determining the number of inlets that supposedly will work for any poultry house, no matter what the minimum ventilation fan setup might be. The total cfm capacity rating of installed attic inlets at the static pressure you will be operating at (we suggest 0.10 pressure) must be matched with the cfm ratings of the timer fans that will actually be utilized for minimum ventilation. While we have always recommended that all broiler houses have at least two 36-inch fans (at least one 36-inch fan in each non brood chamber and at least one 36-inch fan in the brood chamber), some U.S. poultry houses don't have any 36-inch fans, and therefore will be running as many as two 48-inch fans through attic inlets. About 1.0 to 1.5 cfm per sq foot at 0.10 SP is generally a good rule of thumb for calculating minimum ventilation using attic inlets, but there will be quite a bit of difference in the number of attic inlets needed when using two 36-inch fans in comparison to running two 48-inch fans for minimum ventilation. So if you are using a rule of thumb to decide how many attic inlets to install you could make a mistake.

In some poultry houses, we will be satisfied with using only two 36-inch fans for minimum ventilation through attic inlets. Other houses might utilize a 48-inch and a 36-inch fan or even two 48's. Regardless, the important point here is you need to know the cfm rating of your minimum ventilation fans that will be pulling air through the attic and install sufficient attic air inlet capacity to match these fans at a 0.10 pressure. If you wish to run at lower pressure with those fans running, you will need more inlets and should get engineering help. We are offering these guidelines as a starting point to prevent problems. In some cases it has been necessary for a grower to add a 36-inch fan in a location so he could run two 36-inch fans instead of one 36 and one 48, thus reducing his air flow to match the attic inlets which had been installed.

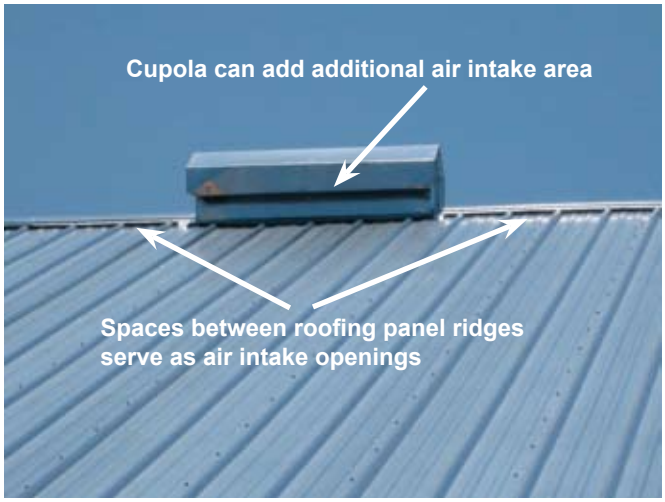
Issue #3. Failing to understand the limitations of the attic as an incoming air source. In extreme cases, we have had calls from growers that desired to do away with side wall inlets completely and ventilate solely through attic inlets. This has never been the purpose of attic inlets and there are serious problems that could result if this is attempted. The problem is that there is a limit to how much air can be pulled into or through the attic.

Here's why: In a 40 x 500 x 9 foot poultry house the total amount of air in the house is roughly 180,000 cubic feet (40x500x9 = 180,000 cubic feet). If you calculate the volume of air in the attic of this house, with a 5 in 12 top chord truss pitch, you get roughly 50,000 cubic feet. We have seen little or no problem with running up to 40,000 to 50,000 cfm's of air in standard broiler houses using the ridge vents, eaves, bird board openings, and corrugation openings as sources for incoming attic air. However, if we choose to pull too high a rate of air flow through the attic, we don't have enough openings into the attic to replenish the air that is drawn from the attic. The attic air system is meant to temper/heat a small amount of incoming air to provide warmer ventilation air and reduce relative humidity in the house. Trying to draw all ventilation air through the attic during power ventilation will place excessive static pressure on the ceiling and may cause damage to the ceiling system.

Note: In some poultry houses, depending on construction, there may not be sufficient natural openings into the attic to safely do even minimum ventilation through attic vents. In these houses, adding a provision for additional air intake capacity, such as a cupola along the roof ridge, or adding gable vents, may be needed to be able to use attic air inlets. A good rule of thumb is to estimate the available square footage of all openings into the attic and multiply that number by 500 fpm, which is a good rule of thumb for the maximum air speed that can be drawn into the attic through the ridge vent, bird board cracks and eaves without causing excessive static pressure loss. Your calculated number will then be in cfm and should be at least equal to your timer fan capacity. Example: 80 square feet of open area into the attic times 500 fpm equals 40,000 cfm you can run for minimum ventilation drawing air into the attic.

We don't think any manufacturer of attic inlet systems would be supportive of total power ventilation through the attic. There are just too many issues that would make this difficult and also have potential to cause damage to the poultry house. Our recommendation is that attic inlets should be utilized only during the first stage of minimum ventilation, if and when heat is needed. When we shift away from timer fans we should shift to sidewall or perimeter inlets.

Issue #4. Believing there is no inlet management required with attic inlets. Growers with lots of poultry houses who have installed manual attic inlets have called us and are concerned about the time and effort it takes to open and close inlets as they go through a grow out. Manual inlets are very popular in retrofit broiler houses. Manual inlets also require the most amount of grower intervention. The inlets may be used during pre-heat and may be used during brooding, but at some point in the grow out these inlets need to be closed. But if the weather

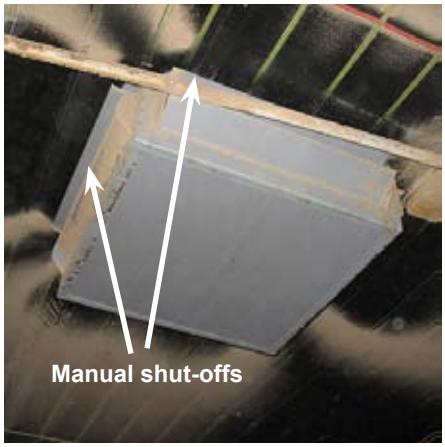


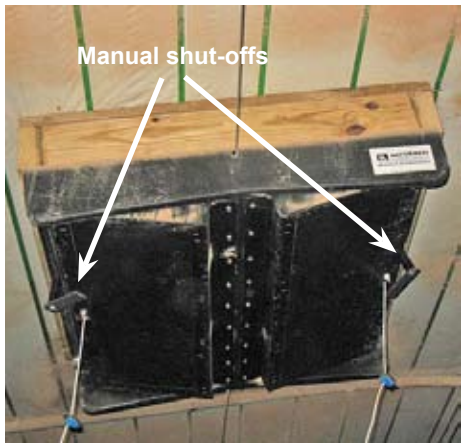
Issue: Proper attic inlet area opening

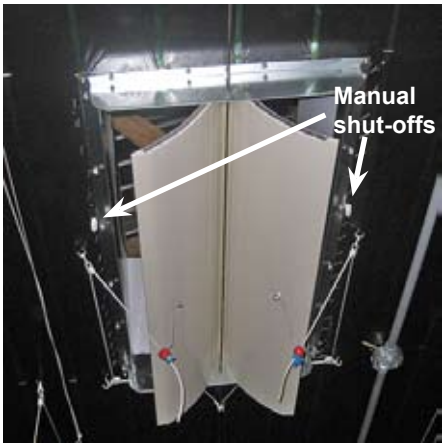
Before installing attic inlets, be sure there are enough openings into the attic to handle the fans used during attic minimum ventilation. As shown in photos at right, most houses have enough open space in the corrugations, bird board openings, and ridge vents to accommodate about two 48-inch fans. If these openings are not adequate you will need to add additional air intake capacity, such as the cupola type vents as shown in above photo.

Issue: House tightness

In a loose house, fans will pull air in through the attic inlets and through all loose boards, cracks and other openings at the same time. For successful use of attic air inlets, your house should pull a static pressure of at least 0.15 in a pressure test or you won't get the desired benefit from the attic inlets. As the smoke test shows, the house shown in photo at left needs serious tightening.







Issue: Shut-off latches

It is recommended that all inlets, no matter the type or brand, be equipped with manual shut-off latches, as shown in photos above. Growers need to specify that they want manual shut-offs on attic inlets when ordering the inlets. Also, all attic inlets should be kept clean so they will seal tightly when they are not in use.

changes they might need to be opened again, so some decisions must be made with respect to managing the manual inlets. Growers with lots of poultry houses have realized that they would like their attic inlet systems to be actuated in such a way that the controller will make the decision when to use the attic inlet system and when to use the perimeter inlet system. Most controller manufacturers now have the software in their products to do this.

Another fact must be remembered regarding attic inlets, whether manual or actuated. There may be times, either before or during the grow out, that you will not want to use all of your attic inlets. Perhaps you might start a grow out with two 36-inch fans, so you would want to match your attic air inlet capacity with the 36-inch fans. If your attic air inlet capacity would handle four 36-inch fans you might want to open more inlets as you turn on more fans.

We feel that no matter what type or brand of attic inlet system you install, every attic inlet installed either in the brood chamber or in the non brood chambers should be equipped with a manual shut-off device. This will provide flexibility for the future when it may become desirable to shut off specific individual attic inlets. To install an attic inlet (or for that matter a side wall perimeter inlet) with no shut off latch is not a good decision for the long run.

A final word of caution regarding any type of attic inlet system: Attic inlets must remain closed at all times when air is not being pulled from the attic into the poultry house by the fans. If for any time during a grow out or in between flocks, attic inlets are left open and fans are not being run, the air in the poultry house will move to the attic by the chimney effect. Air, moisture and dust present in the broiler house will contact the roof tin, and attic insulation. The result will be condensation of moisture. This will change the moisture conditions in the attic and attic lumber, which may accelerate the corrosion of roof metal and fasteners, and we believe be detrimental to the poultry house in the long term. If you install and use attic inlets, keep them clean so they seal tightly and be sure they are closed tightly when not in use.

The Bottom Line

The use of attic inlets as a management tool for poultry growers is gaining acceptance. However, there is still much to learn about the management and the long term effect of these inlet systems on our houses. As growers, equipment representatives and broiler production personnel begin to learn more about these systems and how they are best used, we will monitor developments and provide updated reports of our findings as needed.

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