The *Poultry Engineering, Economics & Management*
NEWSLETTER

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

Auburn University, in cooperation with the U.S. Poultry & Egg Association Issue No 34, March 2005

Problems With Blown-In Insulation In Dropped-Ceiling Houses

Having quality ceiling insulation is of significant benefit to poultry producers year round. During cold weather, hot air produced by the brooders, furnaces and the birds quickly rises towards the ceiling. If the ceiling is not properly insulated, this valuable heat will pass through it, resulting in lower house temperatures and higher heating costs. Conversely, during summertime, ceiling insulation keeps the amount of heat entering the house through the ceiling to a minimum. On a hot summer day, attic temperatures in dropped-ceiling houses can easily exceed 130ºF. If a ceiling is not properly insulated, heat from the attic space will enter the house, leading to higher house temperatures and lower bird performance.

The most common form of insulation used in dropped ceilings today is blown-in cellulose. Cellulose is a good insulating material, is relatively easy to install and, most of all, inexpensive. Though most dropped ceilings are properly insulated when blown-in insulation is installed, over time problems can occur related to maintaining uniform distribution of the cellulose. One of the most common problems, as shown in the photo below, is that the cellulose slides down from the centerline peak, so there will be little or no insulation all along the middle of the house ceiling.

Insulation distribution problems can go unnoticed for years for the simple reason that, at first glance from inside the house, all dropped ceilings look pretty much the same regardless of the condition of the insulation on top of the vapor barrier. Furthermore, very few growers go up in their poultry house attic

Blown-in cellulose insulation is an excellent, low-cost insulating material that is very commonly used in poultry houses. However, it has a tendency to shift over time away from the centerline peak of the ceiling, allowing significant heat losses in winter or during brooding, and heat gains in hot weather. See inside for steps you can take to spot this problem and to prevent it from cutting into your bottom line.

space to check out the condition of their cellulose insulation. Our experience recently in inspecting various poultry houses with a thermal camera and an infrared thermometer gun indicate that this type of problem is very common.

Thermal cameras register heat instead of visible light, so that in thermal photographs warmer areas are brighter and cooler areas are darker. These pictures therefore display surface temperatures very dramatically, as you can see in the photos on page 3. An infrared thermometer gun does not indicate air temperature, like ordinary thermometers, but gives a direct readout of the temperature on the surface of whatever it is pointed at. The temperature bars alongside the photos on page 3 indicate the temperatures an infrared temp gun would register, so you can tell at least approximately what the actual temperatures of different surfaces in the photos are.

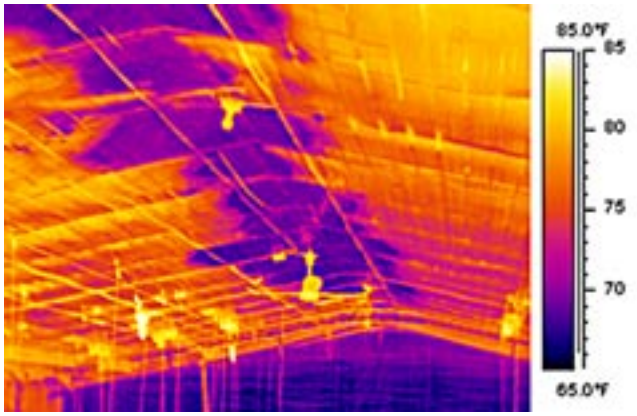
The top two photos were taken in two different broiler houses during brooding. Both show that there is little or no ceiling insulation present behind the vapor barrier along the peak, so that significantly more heat is leaving the house through the peak area of the ceilings than through other areas. The dark areas near the peak indicate much lower temperatures, in the 65-70ºF or lower range, while the lighter areas indicate ceiling temperatures at 80-85ºF and higher. The second set of thermal images was taken in houses during hot weather. The higher ceiling temperatures in the vicinity of the peak in the left hand photo and near the side wall in the photo on the right again indicate insulation distribution problems, but this time extra heat is flowing from the attic space into the house from these areas of the ceiling.

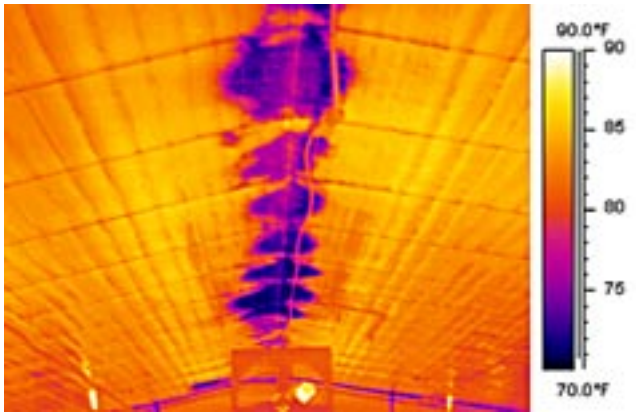
There are a number of possible causes of the lack of insulation near the peak and side walls of a dropped ceiling house. First, exhaust fans turning on and off tend to pulse the ceiling a little, which over time can tend to shake the insulation down toward the side wall. Secondly, strong winds can also shift cellulose insulation, especially if the eaves are not closed sufficiently. Last but not least, insufficient amounts of insulating material may have been blown in originally, or the insulation simply was not blown in uniformly.

It is also important to realize that blown-in cellulose can lose its insulating value if it becomes wet as a result of moisture leaking into the attic space through a poorly sealed ridge ventilator or nail holes. Moisture can not only reduce the insulation value of cellulose directly, but over time dampened insulation will compress, leading to reduced insulation value even after it has dried.

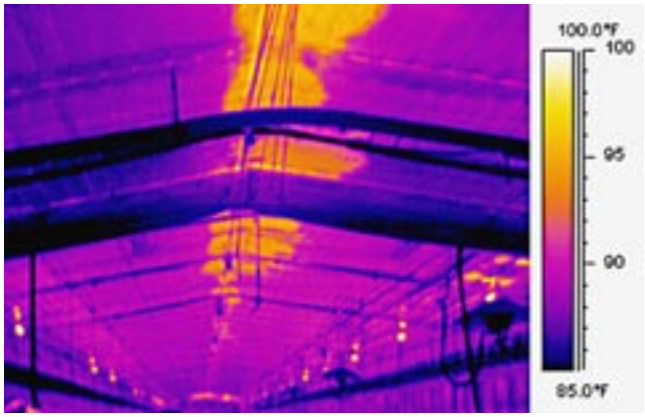
While a thermal camera displays problems with dropped-ceiling insulation very graphically, an infrared temperature gun (also called a noncontact thermometer) is the tool most easily used by growers to find out if they have insulation problems. These instruments are not overly expensive and can do a good job of showing cold spots during winter and hot spots during hot weather. (See “Tools of the Trade” at *www.poultryhouse.com*.) All you do is point the temp gun at the ceiling and read the temperature on the instrument’s display panel. If you don’t have a noncontact thermometer, simply look for condensation forming on the ceiling during cold weather. If there are small beads of water present on the ceiling material, chances are there is little or no insulation on the other side in the attic space. Once you have

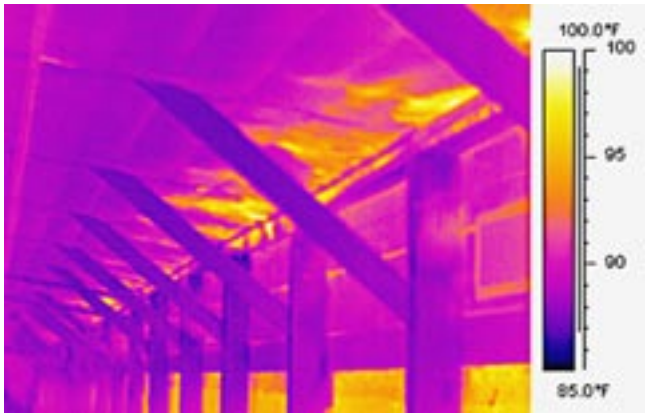
Photo shows how wind can push blown-in insulation away from the eave, leaving the ceiling along the sidewall without insulation. In cold weather, this is likely to show as beads of condensation on the tri-ply. Blocking should be installed along the sidewall to prevent this from happening, and also to prevent insulation from sliding into the eave venting area.





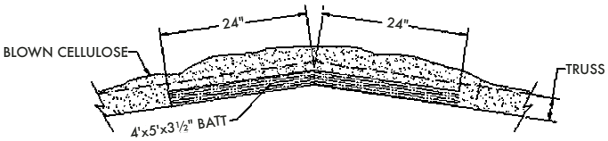
Thermal photos above, taken in two different broiler houses during brooding, show dramatic differences in temperature along the ceiling, with darker areas cooler and lighter areas warmer, caused by blown-in insulation having shifted away from the centerline peak area above the tri-ply. The houses will lose a significant amount of heat through these uninsulated areas, causing increased heating cost and possibly affecting flock performance.





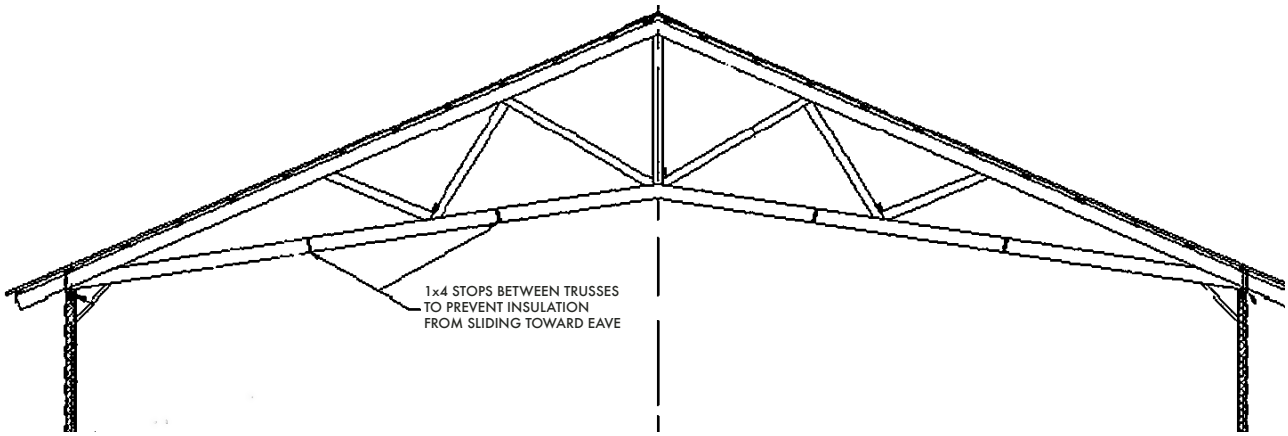
Above left thermal photo, taken during hot weather, shows temperatures in the 90s and above along the centerline where blown-in insulation has shifted, compared with temperatures in the 80s along the rest of the ceiling. Right photo shows hot spots in another house where insulation has been blown by wind away from the sidewall area. In both houses, additional ventilation will be required and it will be harder to maintain an optimum growing environment for the birds.

Steps to prevent blown-in insulation from shifting include installing 1 x 4 stops between the bottom truss chords (below), and laying 4-foot wide fiberglass batt insulation along the ceiling peak, with the cellulose insulation blown in on top of the batt (right).



CEILING PEAK INSULATION

BLOWN OVER BATT – CEILING PEAK INSULATION
LENGTH OF HOUSE ABOVE BIRD AREA



spotted a problem area, a quick peek into the attic space can be helpful to fully evaluate the situation. If you find that you do have a problem with badly distributed ceiling insulation, the good news is that blowing in a little insulation to fill voids is not necessarily an expensive proposition.

Also, there are steps you can take to minimize the shifting of insulation from the peak of the house. These steps are easier to do in new construction when first installing blown-in cellulose insulation, but are possible in existing houses as well. First, before blowing insulation in, lay a four-foot width of 3 1/2-inch fiberglass batt insulation along the peak of the ceiling (see illustration on page 3). The cellulose insulation is then blown on top of the fiberglass batts, which then tends to hold the blown cellulose in place. A further improvement would be the installation of 1 X 4 boards as insulation stops between the lower chords of the trusses every 4 to 6 feet (see illustration on page 3). The insulation stops act as dams keeping the insulation from sliding away from the peak toward the side walls.

The Bottom Line

How much can shifting ceiling insulation cost a producer? The answer is difficult to determine precisely because it depends on a variety of factors, such as the size of the insulation void, outside temperature, inside temperature, etc. But as a general rule, during brooding, a two-foot swath of missing ceiling insulation in a brooding area could increase propane usage by 30 to 50 gallons. During hot weather, the heat entering through a two-foot insulation void that ran the length of the house would be roughly equivalent to the heat produced by nearly 2,000 five-pound broilers, which would result in a slight but significant increase in house temperature, which in turn would incur extra cost in running the additional ventilation that would be required.

Over time, even small added operating costs add up. A point possibly even more important to keep in mind is that any defects in insulation are likely to cause a less-than-optimum growing environment, and that can cost you dearly in flock performance points.

Michael Czarick, Extension Engineer, University of Georgia (mczarick@engr.uga.edu, www.poultryventilation.com)

Jim Donald, Extension Engineer, Auburn University (jimdonald@aces.edu, www.poultryhouse.com)

U.S. Poultry & Egg ASSOCIATION

***The Poultry Engineering, Economics and Management Newsletter* is produced in cooperation with the U.S. Poultry & Egg Association, as part of their commitment to poultry industry education. We are proud of this association, and know it will help to improve our continuing efforts to bring you the critical engineering, economics and management information you need.**

ALABAMA COOPERATIVE Extension SYSTEM

The Poultry Engineering, Economics and Management Newsletter provides up-to-date information on topics of interest to poultry production personnel, focusing on most effective and efficient uses of modern technology and equipment, with a special emphasis on economic implications. The Newsletter is published six times a year, or as needed to address emerging or special issues. Contact: Jim Donald, Extension Biosystems Engineering, 228 Corley Bldg., Auburn University, AL 36849-5626, (334) 844-4181, fax (334) 844-3548, jimdonald@aces.edu. Published by:

Jim Donald, Extension Engineer, Auburn University

Mike Eckman, Extension Poultry Scientist, Auburn University

Gene Simpson, Extension Economist, Auburn University