The ***Alabama Poultry Engineering and Economics***

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Feature article

The Pay-off of Monitoring in-House Conditions

In the last issue we said that we would be looking at how temperature loggers and devices that make a graphic record of temperature changes in a poultry house over time can help growers evaluate and fine tune their ventilation management. We also mentioned we would take a look at simple test instruments that help a producer get the best out of his ventilation systems and spot problems that might otherwise not be detected. To expand on that topic a bit, we should look at the economic value of having the right environment for the birds. Having the right environment for the birds should not be taken lightly. Clearly there are several indoor air quality and environmental factors that effect performance and therefore bottom line, and we need to manage these factors for best possible performance. Remember our goal is to maximize the utilization of feed calories and minimize the amount of body energy spent on body maintenance, and therefore achieve optimum production.

To see if we are on the right track with this task it is imperative that we keep score or check the conditions in our houses against our desired target levels. Keeping score of our progress or how we are managing, with respect to goals, gives us the feedback to know how to make improvements and corrections in the management process.

Monitoring in-house conditions provides feedback needed to make adjustments in order to reach goals

The big question that many live production personnel and growers ask is, What variables should we track? It is possible to monitor oxygen, carbon dioxide, carbon monoxide, relative humidity, ammonia, air temperature, air temperature variation, air flow and distribution, litter temperature, wind speed, static pressure, litter moisture and dust levels in a poultry house. But in looking at this long list of variables that could be monitored we must realize that we will not have time to closely monitor and track all of these factors. This means we should concentrate on the top three or four that will impact our bottom line the most, and only spot check the ones that are less critical. An argument can be made that all of these items might be important to overall production, but as a grower or live production person we know if we can get a handle on the top three or four items and do a good job with them we are much less likely to have a problem with the others.

Efficient monitoring calls for watching key factors very closely, spot-checking less important factors

The old saying, "Take care of your pennies and the dollars will take care of themselves," holds true in some respect to managing conditions in the poultry house. Keep an eye on and manage the big three or four indoor air quality variables, and the rest will take care of themselves.

Monitoring Temperature: In approaching this task, let's take a look at some things we know about temperature and performance:

1) There is direct relationship between air temperature and performance and there is a direct relationship between litter temperature and performance. This is not theory, it is fact.

2) Temperature swings away from desired temperatures cause stress in birds. This is fact.

3) An old rule of thumb that has been used in the poultry industry for many years is that each 2^0F away from the thermal neutral zone of a broiler costs four points in feed conversion. This is true but more difficult to document.

Good temperature management has a big payoff in improved feed conversion and bird performance

4) Analysis under today's economic conditions shows that, from a company standpoint, for a 500 house complex placing a million chicks per week in the five pound area, saving one point of feed conversion would be worth about $200,000 annually to the company; and if a grower could gain three points of feed conversion in his operation it could easily be worth $500 per house per year in additional pay, not even counting the value of the gas that would be saved during cold weather or brooding.

So of all the items mentioned above, it's pretty clear that monitoring temperature should be pretty high on the list.

There are all types of devices available to measure temperature, from hand held units, maximum-minimum thermometers, temperature/relative humidity meters, temperature+wind speed meters, infrared temperature guns, and data loggers. Spot checking of temperatures is certainly a good idea and we highly recommend it. Just remember that it's the temperature at bird level that matters most. The dial thermometer from the feed store is not accurate enough to use as a monitoring instrument.

An accurate thermometer is worth the price – remember, temperature at bird level is what matters most

For a good picture of what has happened in the chicken house during a growout it is hard to beat a temperature logging device that measures temperature at bird level every ten or fifteen minutes for either the first three weeks or for the entire growout. Data loggers cost about $150. Logger graphs such as the one shown at right for a controller operated house during the first three weeks give outstanding feedback as to how good a job we are doing in managing temperature.

Monitoring Ammonia: Another variable that cannot be overlooked in monitoring air quality in the poultry house is ammonia. Ammonia is one of the most serious problems in production. There is a direct relationship between ammonia exposure and performance of the broiler chicken. It's a matter of the level of ammonia and the time the bird was exposed. The early part of the growout is the critical period. You will find in the literature many different levels of ammonia reported, but the generally agreed practical goal should be to keep ammonia at 20 parts per million or less. A recent study, cited at the University of Georgia, said that ammonia at less than 25 parts per million had little effect on seven week weight of birds. However, ammonia at 50 parts per million had as much as a 10% effect on seven week weight and ammonia levels of as high as 200 parts per million could affect weights by as much as 25%.

How important is ammonia monitoring? High levels early in a growout can cut seven-week bird weights by as much as 25%

In a good ammonia control program the first step should be prevention. There are good litter treatments now available that really work to keep ammonia levels from going too high. Ventilation is the other tool for controlling ammonia, and this is one of the main reasons we must maintain at least some ventilation rate during brooding. In general, if ammonia can be controlled for the first 14 to 21 days we will not experience much of a problem with it later in the growout because the amount of bird heat generated in the houses necessitates that we utilize the ventilation equipment to exhaust heat. Therefore by controlling temperature in the latter parts of the growout the control of ammonia is taken care of. In the brooding phase, however, litter treatments plus ventilation are needed. On used litter, studies have shown that keeping the level of ammonia to acceptable levels by ventilation alone could cost two to four times what we would consider normal operating cost, depending on outside air temperature.

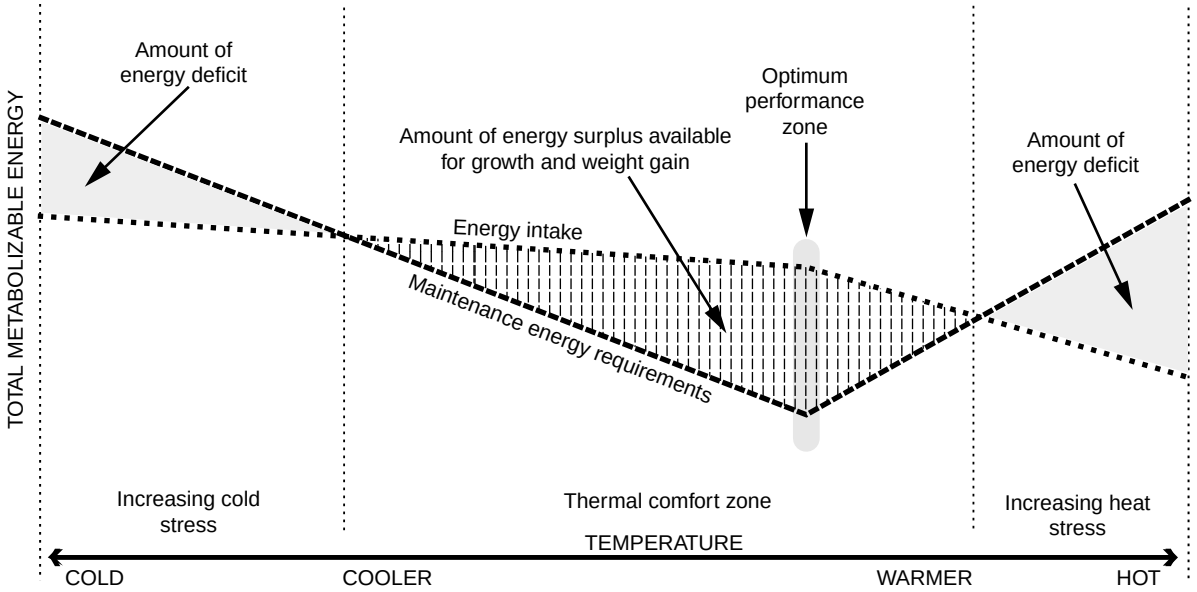
If ammonia can be controlled for the first 14 to 21 days, we will not likely have a problem with it later

Monitoring ammonia is more difficult than monitoring temperature. Ammonia is measured with gas dragger tubes where a known volume of air is passed through a reagent type tube. The device and the tubes to measure ammonia are fairly expensive. We should note that ammonia is heavier than air and measuring ammonia at the birds' beak level is very important. This means for a baby chick it should be two inches off the litter.

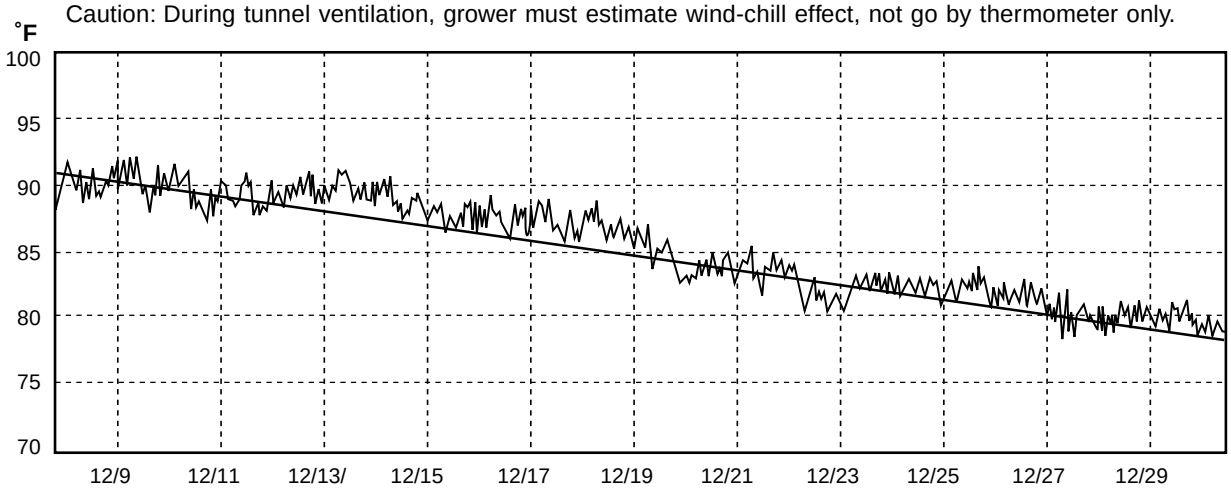
It is probably not economically justifiable for growers to have ammonia detection equipment, but certainly live production offices will have dragger type tubes and can be called on to spot check houses. This technology costs between $400 and $500.

Monitoring Relative Humidity: The third major air quality factor that should be monitored in a modern poultry house is relative humidity. This should be looked at in wintertime or cold weather. We can do much less about high relative humidity in hot weather. An inexpensive relative humidity meter might come from a local electronics store and even a unit that costs $200 or less can do the job. The best time to measure relative humidity for the worst periods is early in the morning. As a general rule of thumb we are doing a pretty good job in the poultry house if we are keeping relative humidity between 45% and 75%. Excessively high relative humidity in cold weather means more minimum ventilation is needed for moisture control. This can result in some increase in heating cost, but it is absolutely necessary. Continued high humidity is a sign of worse things to come and must be

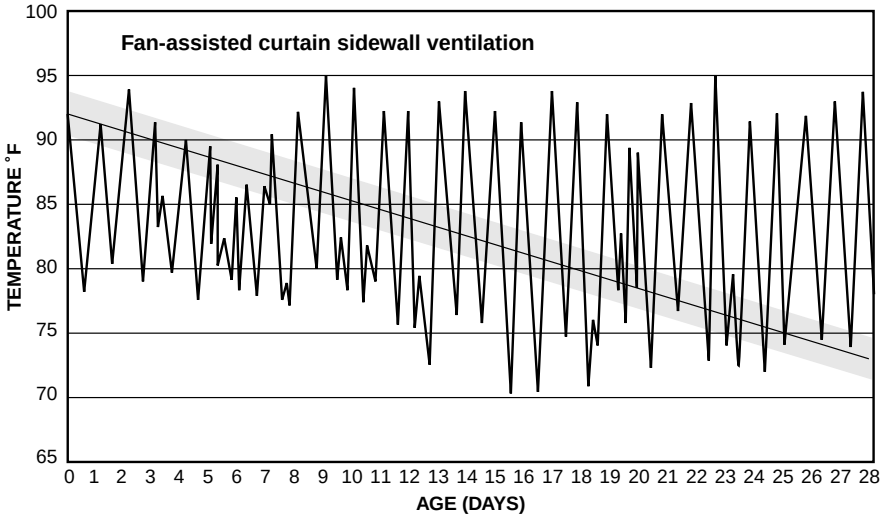
High humidity in cool weather is a sign of worse things to come, and must be corrected



▲ **Why it is important to maintain optimum temperature –** Diagram illustrates the principle that if broiler birds are either too cool or too warm, they will be able to use less of their feed energy to grow and gain weight. Further, there will be a fairly narrow temperature zone where top performance can take place. Maintenance energy requirements go up on both the cooler and warmer sides of the optimum zone. Caution: During tunnel ventilation, grower must estimate wind-chill effect, not go by thermometer only.



▲ **Datalogger shows temperature variations during first 21 days of broiler growout** – Grower can look at a chart of this type to check how closely in-house temperature is being held to target, and make equipment, management and/or controller adjustments needed. This record shows a good environmental control job, with few temperature swings of more than a few degrees above or below optimum target.



◀ **Datalogger shows conventional house can't match negative-pressure environmentally controlled house**

Curtain ventilation allows little control of in-house temperature. Wide temperature swings severely hurt performance.

corrected. We need to understand that relative humidity is related to litter moisture and to ammonia production. The lower the relative humidity, the less ammonia will be a problem. Also, being in the right RH range will help minimize bird health problems.

Other items listed above, such as oxygen, carbon dioxide, carbon monoxide, etc, are all very important, but if we are doing a good job monitoring and controlling temperature, ammonia and relative humidity, most of the other potential air quality problems in the broiler houses will disappear.

Monitoring Airflow: The second kind of environmental factor that needs to be monitored is air flow and distribution. If we don't have the needed airflow and mixing in the house, the indoor air quality is going to be seriously degraded and flock performance will be hurt. Remember, airflow is our major tool for controlling temperature and relative humidity, along with ammonia.

Without using a wind speed meter and smoke bombs, you just can't know for sure if your ventilation system is doing the job you need it to

With the investment that has been made in broiler production facilities, a $65 to $100 handheld wind speed meter is something all growers should consider owning. A wind speed meter lets you check to see if you have adequate air speed and also lets you check for serious dead spots. This meter is most valuable when you are in the tunnel mode. You can sample airflow across and throughout the house to see if airflow is well distributed and uniform, and make adjustments accordingly.

Smoke bombs are especially good for monitoring wintertime ventilation. You can see the air coming in the vents and tell if there is adequate mixing. You can also check curtain cracks, doors and shutters for leaks. If only one tool could be chosen for checking wintertime ventilation, it would be the smoke bomb. A $10 box of smoke generators or smoke bombs is a good investment from time to time, to take a look at overall air distribution in the house.

Using a wind speed meter and smoke bombs are things every grower needs to know how to do. Looking at air flow and distribution is very high on my list as far as monitoring what's going on inside the chicken house is concerned.

ALABAMA COOPERATIVE Extension SYSTEM

The Alabama Poultry Engineering and Economics 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, jdonald@acesag.auburn.edu. Published by:

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