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Poultry Housing Tips

Keeping birds warm with propane and feed

Volume 13 Number 2 **February, 2001**

There are basically two methods of heating a poultry house during cold weather. The first is to burn propane; the second is to use bird heat. Producers need to use both methods if they want a profitable operation. But, many times a grower will run into problems because they rely too much on one method of heating to the exclusion of the other. For instance, relying too much on propane for heating a house can obviously lead to high fuel costs, but relying too much on bird heat can lead to bird performance problems and a reduced paycheck.

Burning Propane:

Burning a gallon of propane produces approximately 90,000 Btu's of heat. This is true whether traditional brooders, radiant brooders, or furnaces are used to heat a house. A conventional brooder burns approximately 1/3 of a gallon of propane per hour and as a result will produce 30,000 Btu's of heat per hour. A radiant brooder burns a little less than ½ of a gallon per hour and produces 40,000 Btu's of heat per hour. And finally, a forced air furnace will typically consume a little over 2 gallons per hour and will produce over 200,000 Btu's of heat per hour. What is a Btu? Btu stands for British Thermal Unit and is defined as the heat required to raise the temperature of one pound of water one

degree. An easier way to think of it is that a Btu is the amount of heat produced by a match.

In the process of burning a gallon of propane, oxygen is removed from the house and heat, as well as carbon dioxide and water are added to the house. Specifically, burning one gallon of propane requires 850 cubic feet of air and produces 108 cubic feet of carbon dioxide and 0.8 gallons of water. Many people worry about using up all the oxygen in a house during cold weather. The fact of the matter is that it is basically impossible to decrease oxygen concentrations to a harmful level in a poultry house. Though 108 cubic feet may seem like a lot of air, in terms of poultry house ventilation it really isn't. For instance, let's say that a house had 20 conventional brooders operating constantly. The 20 brooders would burn approximately 7 gallons of propane per hour and 750 cubic feet of air would be consumed. That is 750 cubic feet of air per hour or 12.5 cubic feet of air per minute. To put this in perspective when a single 36" fan is operated for a minute, 10,000 cubic feet of fresh air is brought into the house. So, the oxygen burned by the brooders is quickly replaced by even the lowest of timer fan settings as well as leakage.

THIS DOES NOT MEAN THAT YOU CAN SHUT OFF YOUR TIMER FANS! The interesting thing is that while many producers are worrying about something that is not a problem they are ignoring the thing that has a potential for being a problem, the build up of carbon dioxide. The combination of carbon dioxide produced by the brooders as well as that produced by the chicks can in extreme cases (producers shutting off fans, during very cold weather in very tight houses) lead to problems. High carbon dioxide concentrations can make chicks lethargic and has been shown to adversely affect broiler weights. Though much more research needs to be done in this area, it is generally recommended that carbon dioxide concentrations should be kept below 5,000 ppm (fresh air has about 500 ppm of carbon dioxide) which can normally be accomplished through typical timer fan settings (i.e a couple of 36" fans running 30 seconds out of five). In addition to the build-up of carbon dioxide producers also should be concerned with the build up of moisture, ammonia and possibly carbon monoxide and therefore should always have fans operating off a timer.

Using bird heat:

Broilers produce approximately 5 Btu's of heat for every pound of weight. As a result to produce the same amount of heat as burning one gallon of propane 18,000, pounds of birds are required. If we had a house of 30,000 broilers at five days of age, the 7,500 pounds of birds would produce approximately 37,500 Btu's of heat or about the same as one conventional brooder. Since a day old chick does not produce much heat, producers have to rely heavily on burning propane to maintain proper house temperatures. As birds get older and weights increase, it becomes possible to use bird heat for a significant portion of the heat required to maintain proper house temperatures. For instance, by the time the birds are four weeks old 30,000 birds would produce about 375,000 Btu's of heat or the same as nearly 13 conventional brooders. This makes it possible to maintain both adequate air temperatures as well as air quality with appropriate ventilation during moderate weather. But, during cold weather furnaces may be required to supplement the heat produced by brooders/furnaces to optimal air temperatures as well as provide adequate air quality.

There are two potential problems associated with keeping the house warm using bird heat -- poor feed conversions and excessive house moisture. When producers allow house temperatures to fall below the optimal because they do not want to burn propane, the birds must then "burn" extra feed to keep themselves as well as the house warm. This extra feed of course lowers feed conversions which results in a smaller paycheck. It is a balancing act; a grower can use feed or fuel to keep their birds warm during cold weather. More fuel...less feed. More feed...less fuel. Where the exact feed versus fuel point is can be a challenge to find, especially when temperatures are low and fuel costs are high.

The second potential of relying too much on bird heat to keep a house warm during cold weather is excessive moisture buildup. The heat produced by the birds is accompanied by moisture. This means that for every pound of weight a bird will produce not only 5 Btu's of heat, but 0.010 lbs. of moisture as well. This may not seem like much at first, until you look at how this amount of moisture compares to the moisture produced by burning a gallon of propane. For every 90,000 Btu's of heat produced by the birds nearly 21 gallons of moisture is added to the house, compared to the 0.8 gallons of water produced by the burning of one gallon of propane (which produces the same 90,000 Btu's of heat).

The more a producer relies on the heat produced by the birds to keep a house warm, the more he has to watch out for the build up of moisture. In a sense, the heat produced by the birds is a "wet" heat compared to the "dry" heat produced by the brooders/furnaces. The greater the amount of "wet" heat used, the greater the potential for the build-up of moisture. Moisture problems often occur when a producer cannot maintain the desired air temperature with bird heat alone. Instead of supplementing the bird heat with a little heat from furnaces/brooders, which would not only keep the house temperature up but dry out the house as well, growers will often cut back their timer fan settings. Reducing timer fan settings does maintain more of the bird heat and keep the house temperatures up; however, it also retains more of the moisture generated by the birds. The more timer fan settings are reduced, the greater the potential for moisture buildup. Over time this build up of moisture can be seen in the form of sweating curtains, wet side walls and caked litter.

A good example of relying too much on the birds to heat the house is when growers pull heat to the off brooding end of a house during very cold weather. If you think about it, when we pull heat to the off brooding end we are in a sense trying to heat the rear of the house with bird heat alone. During moderate weather this does not present a problem because the rear of the house is relatively warm (50°F or better) and condensation is much less likely to form. Think of it, when it is 50°F outside do you see big condensation clouds being generated by timer fans when they turn on? But, during very cold weather when the rear of the house may be below 50°F, pulling warm moist air to the rear of the house can cause a condensation cloud to form in the rear of the house. The colder the rear of the house and the moister the air is in the brooding end, the more likely you will get condensation forming in the rear of the house. How do we solve this problem? First, obviously, you could stop pulling warm air to the rear of the house during very cold weather. A second option is to add a little dry heat to the rear of the house by setting the furnaces/brooders at 50 or 60°F. This may not cost as much as you might think. Condensation is not typically a problem during the first few days of brooding. This is because the birds are not producing much moisture and as a result the air in the brooding end is relatively dry. But as the birds get older and produce more moisture condensation the potential for condensation problems on the off brooding end of the house increase. As a result condensation problems are typically worse when the birds are about a week old. Since this is about the time growers should be starting to preheat the off brooding end of the house, adding a little heat to the rear of the house may not be as expensive or as wasteful as one might believe.

Balancing Bird Heat and Brooder/furnace Heat:

If you are having a serious sweating problem, chances are that you are relying too much on bird heat to keep the house warm. To solve the problem, you generally need to turn on brooders/furnaces and/or increase your timer fan settings. A good sign that you are relying too much on bird heat to keep a house warm is a high relative humidity. Optimal relative humidity is somewhere between 50 and 70%. If you have good air temperatures and your relative humidity is near 80%, you are relying too much on bird heat and ventilation rates need to be increased. The problem of course, is that this will reduce your house air temperature. You can either increase the house air temperature and decrease the humidity by burning a little propane or possibly let the air temperature drop a little if the birds are older and keep an eye on them to make sure they don't appear to be getting too cold.

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