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Suffocation ?

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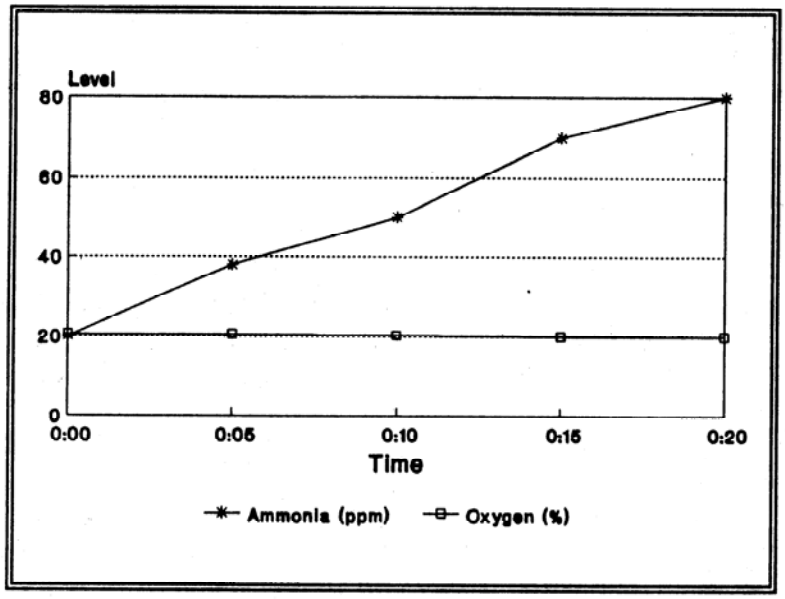
It's a cool day, about 50°F, you have six-week-old birds, your fans are running, and suddenly the power goes off. For one reason or another your curtains fail to drop and you're not around to hear the alarm. You arrive at the house 30 minutes later to find a number, if not all, your birds dead. Why caused your birds to die?

When posed with this question most producers and servicemen will almost inevitably answer, "The birds died due to a lack of oxygen" or more simply put "They suffocated". But did they?

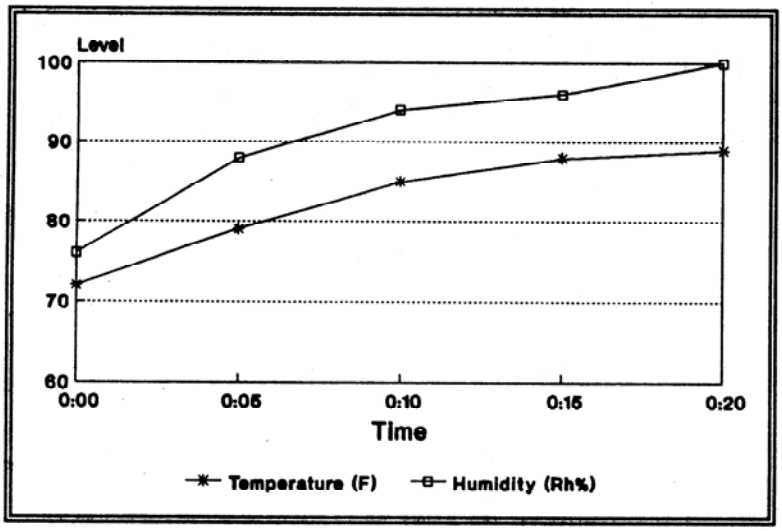


Last fall we examined this very situation. Fans were shut off in a 20,000 bird commercial broiler house and over the course of 20 minutes air temperature, humidity, ammonia, and oxygen levels were recorded. At the end of 20 minutes the experiment was halted because of concern for the well being of the birds. The concern was not over a large drop in the level of oxygen in the house (In fact, percent oxygen in the house had only dropped from a normal level of 20.5% to 20.0%), but rather, the concern was due to the birds exhibiting signs of extreme heat stress.

It is of interest to note that house temperature was only in the eighties when the test was halted. Hardly, what most would consider a heat stress situation. But, the fact of the matter is, the birds were about to start dying (Czarick and Lacy, 1990).

In order to understand why the birds were so severely heat stressed, you have to know a little about bird physiology. Think of a bird's metabolic system as its engine. We put fuel into the bird in the form of feed. The bird uses the energy in the feed to breathe, move around, to keep itself warm, and most importantly to put on weight. But, as with any engine, there is a substantial amount of excess heat produced when operating.

PUTTING KNOWLEDGE TO WORK



The amount of waste heat produced by a bird is substantial. A four-pound bird produces more than 60 Btu's of waste heat each hour. For a house with 20,000 birds this amounts to more than a million Btu's. It would take more than six forced-air furnaces running constantly to produce this amount of heat.

A bird is working continuously to rid it's body of this excess heat. If house temperature is fairly low, below 80°F, little work is required. A bird can more or less just sit around and lose this excess heat due to its body temperature (104°F) being so much warmer than the surrounding air. But as air temperature increases, the bird begins to lose less and less heat to the air because there is less of a temperature difference between the air and the bird. This makes sense, after all it is more difficult to cool off a hot bowl of soup in a warm oven than in a refrigerator.

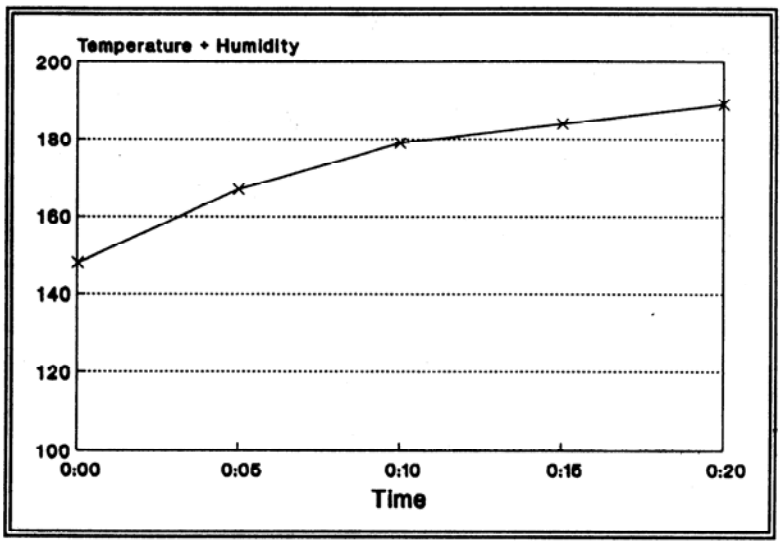
The warmer it gets, the more of a problem getting rid of excess heat becomes. To make up for its inability to passively lose heat to the surrounding air, a bird will begin to actively get rid of excess heat through the act of panting. As a bird pants, water is evaporated from the surfaces of its respiratory system. The evaporation of water removes heat from the bird. In fact, for every ounce of water evaporated from the bird's respiratory system, approximately 70 Btu's of heat are removed from the bird.

If for one reason or another the bird's ability to evaporate moisture through respiration is inhibited, heat will begin to build within the bird's body. As heat builds, the bird's body temperature will rise, just as your car engine temperature would rise if something happened to the radiator. If the bird doesn't find some relief from the heat, its body temperature will continue to rise, and it will eventually die.

What can inhibit a bird's ability to evaporate moisture? High relative humidity. Relative humidity is an indicator of air's ability to hold moisture. A relative humidity of 80% means that the air is holding 80% of the water that it is capable of holding. If the relative humidity of the air in a chicken house is 100%, additional water can not be evaporated into it. If water can't be evaporated from the bird's respiratory system, panting will do little good.

The end result of all of this is that in a power-loss situation the combination of high temperatures and high house humidity lead to the death of the birds. When the fans shut off, air temperature increases due to the heating of the air by the birds. As the air temperature increases, less heat is lost from the birds because the difference between their body temperature and the air is decreasing. The birds begin to pant to rid themselves of excess heat, and in the process moisture is added to the air, increasing house humidity. As the moisture level in the air reaches saturation (relative humidity = 100%), the effectiveness of panting decreases to the point where no cooling is produced and the build up of heat kills the birds.

A rough idea of when high humidity and high temperatures begins to be a problem can be obtained by the following rule of thumb. If you add temperature and relative humidity and it is greater than 160, the birds will probably be heat stressed. If it is over 180, there is a good chance for mortality.



Knowing the importance of the combined effects of temperature and humidity can be of use throughout the year. When setting high temperature alarms during the winter months, don't set them too high. If set above 90°F the birds may be dead long before the alarm ever has a chance to go off. A setting near 85°F would help you be aware of the situation before it is too late.

During the summer months, care should be taken when operating fogging systems. Make sure that your foggers do not come on before outside air temperature rises well above 80°F. If the foggers come on too early or stay on too late, you can have a situation where the combination of air temperature and humidity can place a stress on the birds.

The fact that birds die due to heat in a power-loss situation is very important. Because the birds are producing so much heat, it doesn't take long, regardless of outside conditions, for the combined effects of temperature and humidity to kill the birds. In most cases a grower has less than 30 minutes. That is why it is so important that curtain drops are always in good operating condition, and alarms are set and installed properly.

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