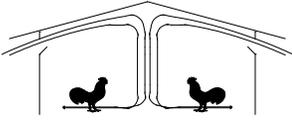




# The University of Georgia

College of Agricultural and Environmental Sciences  
Cooperative Extension



## Poultry Housing Tips

*Cold, Humid Air is Lighter than Cold, Dry Air*

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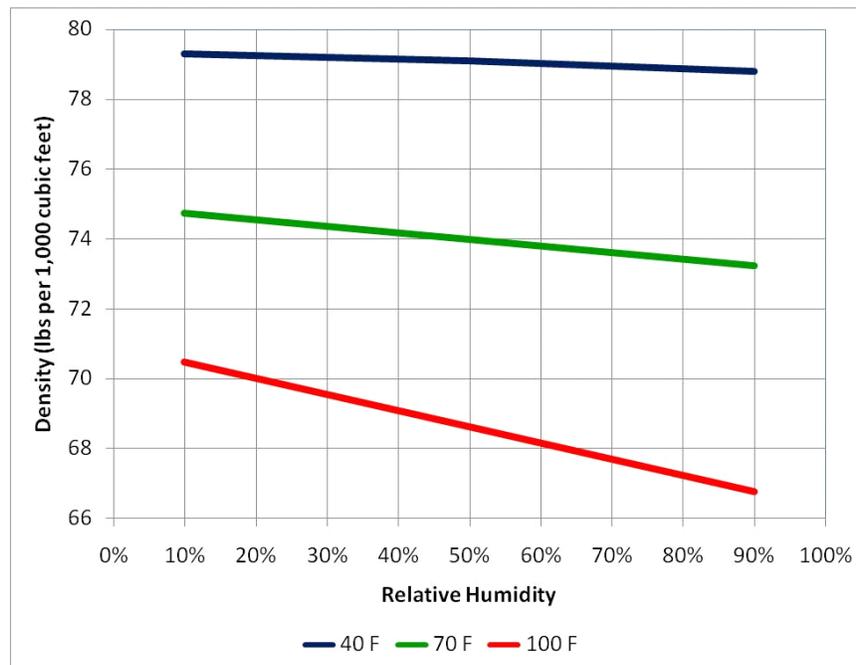


Figure 1. Density of air Vs. Relative Humidity.

Probably the vast majority of people on the street if you asked them would say that humid air is heavier than dry air. After all, humid air has more moisture in it and therefore should weigh more than air that contains less moisture. But, in actuality dry air weighs more than humid air (Figure 1). This is because moist air contains more water molecules which tend to displace oxygen and nitrogen molecules (actual oxygen levels in air are not significantly affected by humidity). Since a water molecule ( $H_2O$ ) weighs approximately 36% and 44% less than those of Nitrogen ( $N_2$ ) or Oxygen ( $O_2$ ) respectively, the air becomes lighter as the percentage of water molecules contained in the air increases. Though the density of air does decrease as humidity increases, the effect is actually quite small. For instance, the density of 40°F air decreases less than one percent as the relative humidity increases from 20% to 100%. Though it is true that the density of warmer air changes more with humidity (due to the fact warm air can hold more moisture than drier air), the differences are still very minimal (less than 1%) at temperatures typically seen in poultry houses.

Though relative humidity doesn't significantly affect the density of air, temperature in contrast does. As we have all learned in grade school, warmer air is lighter than cooler air. As a general rule, increasing the temperature of air by 50°F decreases its density by approximately 10%. As a result, the hotter the air the lighter it becomes, the faster it will move toward the ceiling in a poultry house. Air emanating from a brooder or from a furnace is much hotter than that produced by the birds and

as a result rises to the ceiling much faster than the heat produced by the birds. So, as you might expect temperature stratification can be a much greater problem during brooding than it is during the last few weeks of a flock (Figure 2).

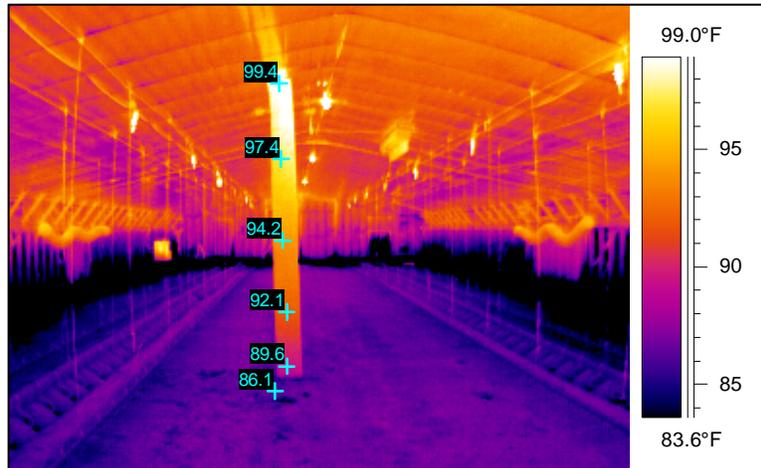


Figure 2. Stratification in house using forced air furnaces.

Cold air entering through an inlet tends to fall to the floor due to the simple fact that it is heavier than the air in the house. The colder the air, the heavier it is, the more likely it will fall to the floor causing problems with chilled birds and wet litter (Figure 3). This is why during cold weather producers should try to operate their inlet systems at a slightly greater negative pressure when it is very cold outside than they typically do during mild times of the year. A greater negative pressure will increase the speed at which the cold air enters the house. The faster the air enters the house, the further it tends to be thrown in towards the center of the house increasing the likelihood that it is thoroughly mixed with the hot air collecting at the ceiling before it moves down to bird/floor level.

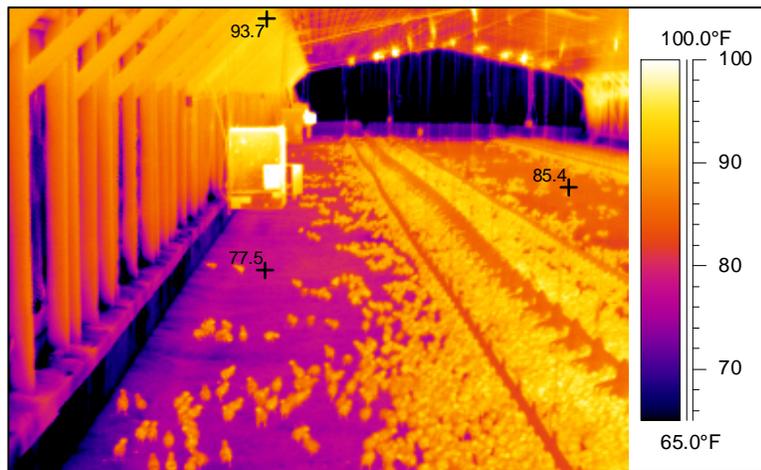
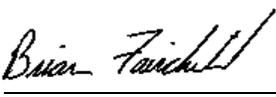


Figure 3. Cold air falling to the floor through a loose curtain.

So, though it is true that the air on a cold, rainy day will tend to fall to the floor more quickly than on a warm dry day making it more of a challenge to properly ventilate a house, the reason it is falling to the floor has nothing to do with the high relative humidity of the air and everything to do with its temperature. Hot air rises and cold air, regardless of its humidity, falls.

  
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