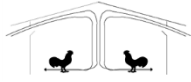




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## *Poultry Housing Tips*

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Condensation . . . What causes it and how to get rid of it

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One of the keys to understanding poultry house ventilation during cold weather is remembering one simple rule: In order for air to hold moisture, energy or heat is required. The warmer the air, the more moisture it can hold. For example, the air contained in a 400' broiler house can hold up to 66 lbs of water at 40°. But, if the same amount of air were heated to 70°, the amount of moisture the air can hold increases to 184 lbs.

This phenomenon is a very important consideration when trying to keep litter dry. During the winter, heat given off by the birds and furnaces/brooders collects near the ceiling. If cold outside air is drawn in through inlets by exhaust fans and is directed along the ceiling, it will mix with the warm air near the ceiling and heat up. As the temperature of the fresh air increases, its moisture holding ability increases. The warmer and dryer air then moves down toward the floor and across the litter, removing moisture and thereby preventing caking. The now moisture-laden air is removed from the house by exhaust fans.

This moisture removal process is an essential tool for the poultry grower; however, it can also work against him if he is not careful. This is because if warm, moisture-laden air comes in contact with a cold surface, the heat in the air will be transferred to the cold object. This of course decreases the temperature of the air and, in turn, the moisture-holding ability of the air. The now cooler air cannot hold the same amount of moisture so the moisture drops out of suspension onto the object which cooled the air. This process is commonly referred to as condensation.

Depending on where it occurs, condensation can cause a number of problems. If condensation forms in the attic space, the moisture can ruin insulation and decrease the structural integrity of the building. In open-ceiling houses, if moisture from condensation gets between the metal roof and board insulation, the life of the roof can be decreased and the moisture can drip onto the litter and equipment. Condensation forming on side walls and curtains returns the evaporated moisture back to the litter, causing caking.

Three things determine whether condensation will form in a poultry house: air temperature, relative humidity, and the temperature of surfaces within the house. Specifically, if warm, moist air comes in contact with a cold surface, condensation will form. The warmer and moister the air, the more condensation that will form when this air comes into contact with a cold surface. For instance, if the air temperature in a house is 80° with 90% relative humidity and this air comes in contact with a surface that is 77°, condensation will form. But, if it is 70° with 50% relative humidity, condensation will not form until the air comes in contact with a 51° surface.

Each combination of temperature and relative humidity has a specific temperature at which moisture will begin to fall out of suspension. This temperature is referred to as its dew point. Table 1 shows the dew point temperature for various combinations of air temperature and relative humidity.

From Table 1, it becomes apparent that the more humid the house, the more likely condensation will form. At 90% humidity the surfaces in the house need only be approximately three degrees cooler than the air and condensation will begin to form, whereas at 40% humidity, house surfaces must be about 25° cooler for condensation to form.

<b>Dew Point Temperatures</b>		<b>Air Temperature</b>				
		<b>60°</b>	<b>65°</b>	<b>70°</b>	<b>75°</b>	<b>80°</b>
<b>Relative Humidity</b>	<b>40%</b>	36	40	45	49	56
	<b>50%</b>	41	46	51	55	64
	<b>60%</b>	46	51	55	60	70
	<b>70%</b>	50	55	60	65	74
	<b>80%</b>	54	59	64	68	78
	<b>90%</b>	57	62	67	72	82

**Table 1. Dew Point Temperatures (°)**

Most condensation problems can be remedied by simply bringing in an adequate amount of fresh air to keep the moisture from building up in the house. It is important to keep in mind that there is a tremendous amount of moisture being added to the litter and air in a poultry house. During its lifetime, a five-pound broiler will consume about 2.2 gallons of water. Only 20% of this water is retained by the bird. The rest is added to the litter in the form of wet manure and to the air in the form of water vapor from breathing. If this moisture were not removed, at the end of a seven-week growout there would be over 40,000 gallons of water sloshing around inside the house and the birds would be wading around in about four inches of water.

The key to keeping this moisture from building up is to continuously remove excess moisture with timer fans. Ideally, a producer would bring in enough fresh air so that house relative humidity would be approximately 60%. At this level of humidity, condensation is much less likely to form. Ventilation charts like the one on the following page (Table 2) are designed to help keep house moisture down without causing the producer to use excessive amounts of fuel.

Even in a well-ventilated house, condensation can form if the air comes in contact with a cold surface. This is why it is important that a poultry house be well insulated. This is especially true of any exposed metal surface where condensation is most likely to form. In houses with open ceilings it is crucial that no air is allowed to seep between the sheets of insulation. Using tongue and groove insulation board can dramatically decrease the amount of condensation that forms. On dropped-ceiling houses, it is crucial that any hole in the ceiling surface be patched. Any warm air that travels through these holes will cause condensation to form on the metal roof which will then drip down onto the ceiling insulation, reducing insulating value as well as life. Metal end walls should always be insulated. The insulation value of most 2" wooden walls is usually high enough to minimize the amount of condensation forming as long as house humidity is not too high.

Timer Fan Settings		
Bird Age (weeks)	Two 36" timer fans (minutes on out of 10)	Three 36" timer fans (minutes on out of 10)
1	1	1
2	1.5	1.25
3	2.5	1.75
4	4	2.75
5	5.5	3.75
6	6	4
7	7	4.75
8	8	5.25

**Table 2. Minimum Ventilation Chart for Moisture Control**

Another likely surface for condensation to form on is the side wall curtains. Short of installing insulated curtains there is little growers can do from an insulation point of view. This is one of the reasons why it is important not to let humidity get too high in a curtain-sided house.

Providing air movement within a house can go a long way in minimizing the build up of condensation. Air circulating within the buildings helps to move the warmer, dryer air in the house across the damp surfaces, helping to remove condensed moisture. It is very difficult, if not impossible, to totally eliminate the formation of condensation in a poultry house during cold weather. But, by ventilating properly, insulating metal surfaces, and providing good air movement either with air inlets or circulation fans, most producers will find that they can keep it to a manageable level.

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