

# Poultry Housing Tips

## Leakage and Litter Caking

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Figure 1. Leaking fan shutter

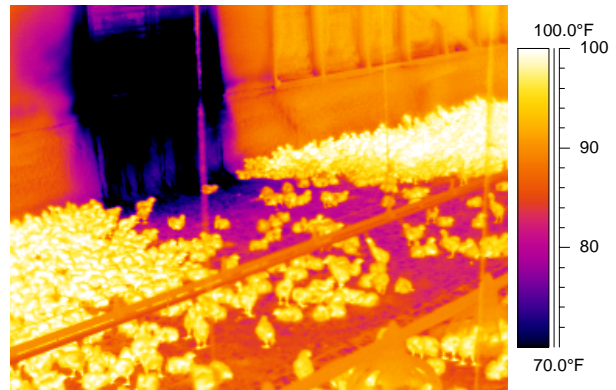


Figure 2. Cold spot near leaking fan shutter

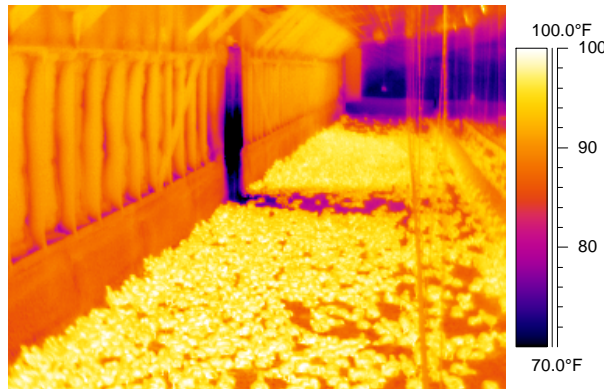


Figure 3. Side wall fan shutter leakage

Though during cold weather litter caking is typically caused by under ventilation, in some cases litter caking can be caused by localized over ventilation, more commonly known as leakage. Cold air entering through a crack in the side wall, loose fitting curtain/tunnel curtain, or fan shutter, quickly falls to the floor leading a cold spot in the house. The cold spot can lead to litter caking in a couple of different ways. First, since cold air has very little moisture-holding ability, very little moisture is removed from the litter in the vicinity of the leakage. For instance, 1,000 cubic feet of

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90°F air at 50% Rh can hold 17 ounces of water. If the cold air coming in is 40°F and 50% Rh it can only hold 3 ounces of water. Since the air can hold very little moisture, it can remove very little of the moisture the birds are constantly adding to the litter in the house.

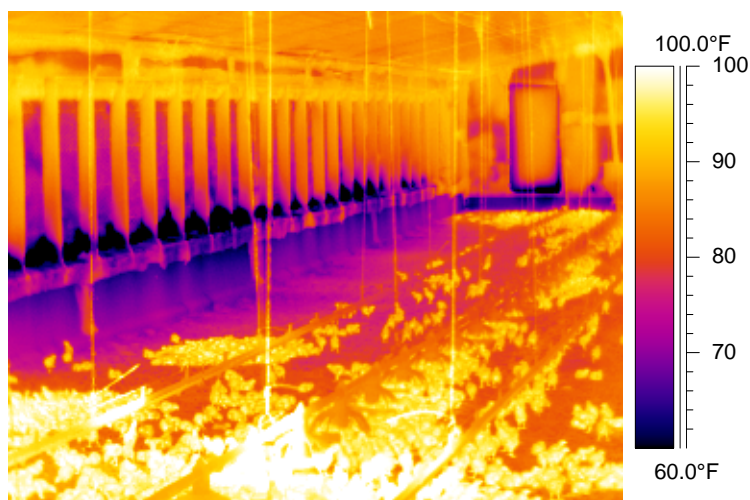


Figure 4. Leakage from loose tunnel curtain

Another reason for litter caking in the vicinity of an air leak is due to condensing of moisture from air on to the litter. For every 20°F decrease in air temperature the moisture-holding ability of air is cut in half. For instance, let's say the air temperature is 90°F and the Rh is 50%. If the air temperature is decreased to 70°F the relative humidity will increase to 100%. If the air temperature were to decrease an additional 20°F to 50°F the moisture holding ability of the air would be cut in half once again, increasing the relative humidity of the air 200%. This of course is impossible, so what does happen is that half of the moisture that is in the air has to drop out of suspension. Since the moisture-holding ability of 1,000 cubic feet of 90°F/ 50% Rh air is 17 ounces, this means that approximately 8 ½ ounces of water will condense out of the air for every 1,000 cubic feet of air cooled to 50°F.

		Air Temperature (F)							
		60	65	70	75	80	85	90	95
Rh (%)	10	6	10	13	17	20	24	27	30
	20	20	24	28	31	35	40	44	48
	30	29	33	37	41	46	50	54	59
	40	36	40	45	49	54	58	62	67
	50	41	46	51	55	60	64	69	73
	60	46	51	55	60	65	70	74	79
	70	50	55	60	65	69	74	79	84
	80	54	59	64	68	73	78	83	88
	90	57	62	67	72	77	82	87	92

Table 1. Condensation Chart

As can be seen in Figures 2 -5, where a leakage occurs the floor temperature is decreased. When warm moist air comes in contact with the cooled litter or building surface the temperature of the air decreases and some of the moisture in the air may drop out of suspension onto the litter or building surface. Whether condensation forms depends on the temperature and relative humidity of the air in the house as well as the temperature of the litter. The warmer and more humid the air is in the house and the cooler the building surface or litter is the more likely condensation will occur. A condensation chart like the one in Figure 6 can be used to determine if condensation is likely to occur.

For example, the air temperature in the house in Figure 1-3 was 90°F and the relative humidity was approximately 50%. Given these conditions from the Table 1 we can determine that condensation will form on any surface cooler than 69°F. The thermal image indicates the wall temperature was below 69°F and thus condensation is likely to occur, which it was. The floor temperature near the fan was very close to 69°F, and had the humidity been any higher there would likely have been condensation forming on the litter. In fact, had the humidity been 60% as opposed to 50% condensation would have formed on any surface 74°F or cooler, which the litter was. Another point to keep in mind is that even though at the time the litter temperature was above the critical condensation forming temperature, over time the cool air still would have limited moisture removal from the litter leading to litter caking.

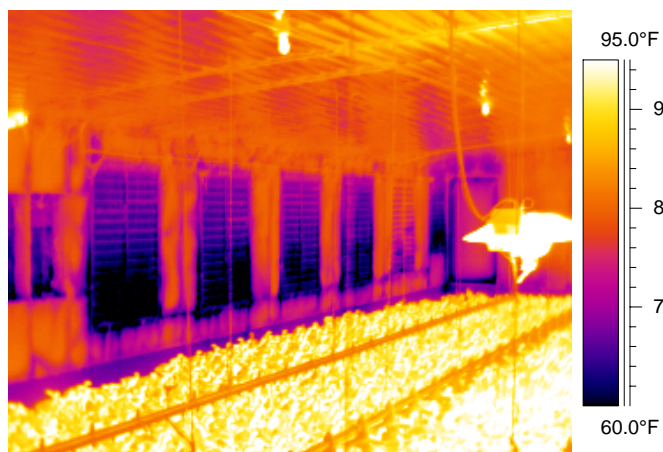


Figure 5. Tunnel fan shutter leakage

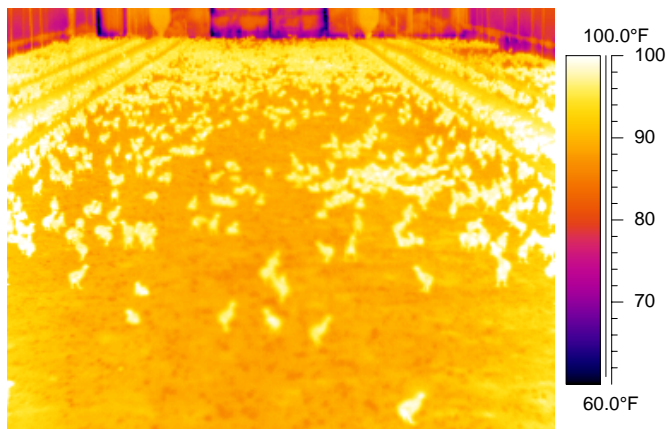


Figure 6. Center of brooding area

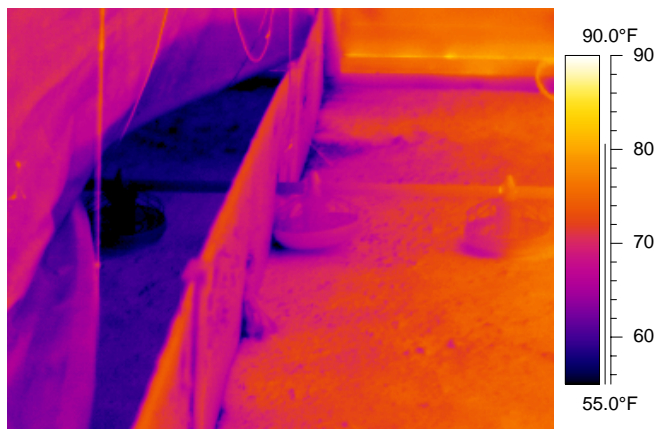


Figure 7. Loose brooding curtain

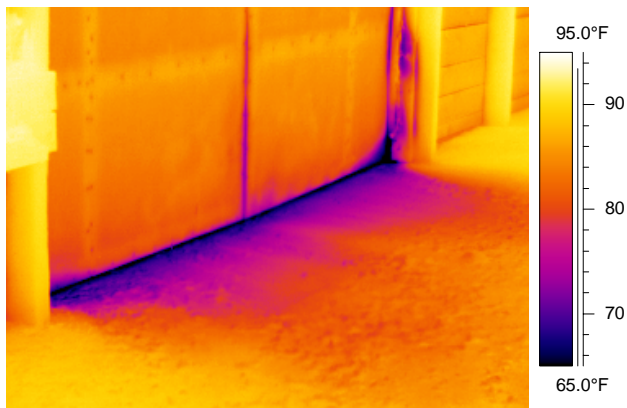


Figure 8. Leaking end wall door

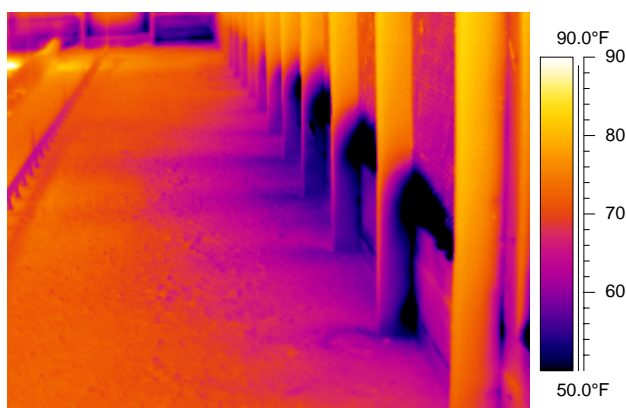


Figure 9. Air leakage due to ice forming at the bottom of an unstripped side wall curtain.

Wherever there is cold air leaking into a warm, humid house there is an increased likelihood for litter caking. Tunnel fan shutters, end wall doors, brooding curtains, and tunnel curtains are all areas where leakage typically occurs and therefore producers need to pay special attention to make sure that they are as tight as possible. Minimizing air leakage need not be an expensive proposition. Placing plastic over unused fans, making sure there are no holes in brooding curtains and that they seal tightly, installing tunnel curtain pockets, stripping the bottom of side wall curtains, using a few cans of foam to seal holes in side and end walls, are all things a producer can do that don't cost a lot of money. This not only reduces the likelihood of litter caking, but helps to ensure good air quality and provides warmer conditions for the birds to grow in as well as lead to lower heating costs.



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