Wintertime Ventilation Needs of Sheep

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Sheep that are housed inside during the winter require proper ventilation to obtain their maximum performance potential. Ventilation systems are best designed by a ventilation expert because of the complexity of the various factors involved. Producers though must understand how their system works and how to manage it to obtain optimal animal performance.

The five main environmental factors that are controlled by ventilation are:

- Fresh air to breathe
- Freedom from drafts
- A comfortable room or barn temperature
- A reasonable humidity level in the air space
- Acceptable levels of contaminants

In winter only a small volume of fresh air is required to provide oxygen, reduce humidity, and control odours. Summer ventilation requires large volumes so as to control the temperature. The challenge of any ventilation system is to provide uniform, high quality air throughout the facility. Fan ventilated barns require proper sizing, staging, location, and control of both the inlets and the fans. Natural ventilated barns use the natural forces of wind and thermal buoyancy combined with controllers (automatic or manual) to ventilate. Adjust the ventilation system to eliminate dead air

spaces. If needed, add stir fans to ensure even air distribution throughout the facility.

Mature sheep with a full fleece are not susceptible to winter drafts; young lambs are at the other end of the spectrum. Low birth weight lambs, triplet and quadruplets, are often already challenged with lack of body fat reserves. A wet, newborn lamb exposed to a draft is at risk of dying from hypothermia at 10^0C. A dry, healthy lamb, even a small one, kept away from drafts with a belly full of colostrum can handle temperatures down to -10^oC.

In older bank barns the major source of drafts are open hay/straw chutes and improperly closed doors. Fan vented facilities can have improperly adjusted air inlets that dump incoming cold air directly on to the lambs. These inlets should be adjusted to jet air along the ceiling so as to mix with the room air, then slowly descend into the animal space. Doors left open can short circuit the ventilation system and cause drafts and pockets of poor quality barn air. Naturally ventilated barns are at the mercy of wind speed and direction for ventilation. Place a 12" windbreak skirt to the eve in front of the inlet or use 30% to 40% porosity shade cloth on the top 12" of opening on the curtain. These techniques allow for minimum ventilation, but reduce the effect of wind gusts and blowing snow. On still, extremely cold days, often a chimney can become an inlet. Condensation and snow can also accumulate underneath the chimneys. Locate lambing pens and young lambs away from these areas. Young lambs prefer to have a solid surface to lie against. Provide solid paneling such as plywood or previously enjoyed plastic penning from the swine industry located away from exterior surfaces. By lying together away from drafts and in dry surroundings, the overall room temperature can be lower, yet still provide a comfortable environment for these young animals.

A quick and easy method to determine the presence of drafts is to wet the back of your hand. Most people can sense wind chill on the wetted portion of their hand if the air speed is greater than 50 to 60 feet per minute (0.25 to 0.30 m/s). Place your wetted hand in the area where newborn lambs are and approximately 4 to 6 inches (10 to 15 cm) above the surface; if you can feel a draft on the back of your hand it is too drafty.

Mature sheep have a large comfort temperature range. Research from Norway concludes that full fleeced, well fed, healthy mature ewes housed in a dry draft free environment can withstand temperatures as low as -40^oC.

Sheep can withstand cold temperatures as long as they are dry. Even a healthy, dried off and fed newborn can withstand temperatures to -10°C provided the environment is dry and draft free, though it is preferable to have a temperature greater then 16°C. The smaller the lamb or the higher the lambing percentage the warmer the barn should be during lambing. Instead of warming the entire barn space, provide a radiant type heating during lambing. A Radiant tube, Radiant brooders or Quartz Electric Radiant types of heaters should be used as they warm the surface of the manure pack, where the lamb is, as opposed to the air space above the lamb. The surface of the pack forms a warm, dry microclimate, which quickly dries and warms the newborn lamb.

The main goal with winter ventilation is to control humidity and gasses such as Ammonia and Carbon Dioxide in the barn. The RH (relative humidity) should be ideally maintained between 50% and 75%. If the barn becomes too dry, the lung tissue of the animals can dry out increasing susceptibility to diseases. More often the case though is that barns become too humid, condensation forms on exterior surfaces allowing for the proliferation of molds and funguses that not only impinge on the health of the animals but can also cause equipment and structural deterioration of the barns themselves. The presence of fog throughout the barn indicates a RH of greater than 90%.

Humidity is removed from a barn space by the introduction of outside cold air, warming the air by animal heat within the barn with or without supplemental heat to lower the RH of the incoming air. The presence of condensation on exterior surfaces should also be avoided. Moisture is then absorbed by this air raising its RH and exhausted back outside along with gases and dust from the barn space. The major sources of moisture include the animals and the manure pack. A mature ewe with lamb produces 2.2 litres/day and a finishing lamb 0.9 litres/day of humidity through respiration. The manure pack can also be a source of humidity within the barn. Once the manure accumulates to the point where it begins to heat from decomposition, significant moisture as well as Ammonia and Carbon Dioxide can be released. Birthing fluids add a significant amount of moisture to the manure pack, consider a clean out as soon as lambing is completed. Check the watering system to ensure leaks and spillage are kept to a minimum. With a solid manure system every litre of water that enters the barn must exit the barn in the animals produced, the manure or out of the ventilation exhaust. If the surface of the pack is well bedded to reduce the

moisture content of the pack and removed on a frequent basis before heating takes place, the overall air quality can be improved. Consider purchasing a Temperature/Humidity pen that allows the producer to quickly monitor the temperature and RH throughout the barn and identify problem areas. These devices can be obtained for less then $150 from ventilation supply companies.

The recommended minimum ventilation rate to control humidity is 10 cfm (cubic feet per minute) per ewe and 3 cfm per feeder lamb. This may have to be increased to 3 and preferably 4 air changes per hour (a complete change of air in the barn every 15 to 20 minutes) to ensure good air quality if the manure pack is heating.

Having the ewes shorn is one method to reduce the RH. The sensible heat (the heat that we feel) production can increase by a factor of four by a shorn ewe over a full fleeced ewe. The heat that is produced by the animals raises the temperature of the barn and consequently lowers the RH, thereby providing a greater absorption of the water vapour within the barn space. In an uninsulated structure, more heat is lost to the outside through the exterior surfaces. This lowers the temperature within the barn, thereby lowering the moisture absorption ability of barn air. These uninsulated surfaces are often below the dewpoint (point of condensation) of the room air and condensation on the exterior surfaces results. The recommended minimum insulation level for condensation control is R5 (RSI 0.9). Let's consider the example of an uninsulated versus and insulated barn (R 5). If the outside temperature is 0°C, the inside temperature is 8°C and the RH is 75% in the barn. From the Psychrometric Chart (ASHRAE 1963) the dew point or the temperature, at which the RH equals 100% (condensation), is 3.3^{o}C. The uninsulated surface will have a temperature of 2°C and will therefore have condensation. The insulated surface temperature will be 7°C and therefore will have no condensation on the surfaces.

In conclusion dry sheep are happy sheep. If possible, shear incoming ewes to increase their heat output. If the barn cannot be kept warm through the addition of insulation or supplemental heat, then it is far preferable to increase the ventilation rate so that the RH remains below 75%. Keep the manure pack well bedded and remove it regularly to lower this additional source of moisture and gases.

Particular care must be taken to avoid drafts onto newborn and compromised lambs. Use solid panels to shelter these animals from drafts, and provide supplemental radiant type heat if required. A dry and cold environment out of the drafts is far preferable to wet and warm environment in a cold draft.