Animal Housing—Barriers Overview

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Application: used for odors from buildings

**Pros**
- Relatively easy to implement.
- Reduces dust emission.
- Some designs may reduce odor transmission.

**Cons**
- More difficult to implement on non-tunnel ventilated barns.
- Gas emission reductions are limited to those adhering to dust.
- May require extra maintenance, especially in windy areas.

**Description**

Barriers, often called “windbreak walls”, are used downwind of fans to reduce the forward momentum of airflow, settle out dust particles, and push the exiting plume higher into the atmosphere in order to encourage mixing. Figure 1 shows an example of a barrier system at a field demonstration in North Carolina. It is apparent that the exhaust from the tunnel ventilation fans with no barrier (on the right) flows along the ground while the barrier (on the left) directs exhausting air upward and is better mixed in the wind, thereby diluting emittants.

Barriers are generally used on tunnel ventilation buildings because all the fans are located on one end. Other types of buildings would be more costly to outfit with barriers because fans are located at multiple places around the building. Documented testing has not been done on individual fan barriers but the result may very well be similar.

Barriers are constructed using a framework capable of resisting the wind. Treated wooden posts with girts or a steel frame of some sort are typically used. The most typical barrier surface is an ultraviolet-resistant tarp material but can be constructed of exterior grade plywood. Some barriers have been created by using crop residue, such as corn stalks or straw, between layers of chicken wire to create a sort of hanging biomass mat. A typical layout is shown in Figure 2. One of the critical dimensions is the distance between the fan and the wall. If this wall is too close then back-pressure is created on the fan which will reduce the ventilation capacity. If the wall is too far away dust removal will be less efficient. Fan testing has shown that a separation distance of four times the diameter of the fan is a sufficient distance to not negatively impact fan capacity. The windbreak wall is typically 12 to 14 feet tall in order to provide an adequate surface for impaction and to push the plume upward.

**Figure 1. Smoke test with windbreak wall (left) and without (right). (Courtesy of Larry Jacobson, University of MN.)**

**Figure 2. General layout of a barrier or windbreak wall on a tunnel ventilated building.**
Information on effectiveness is limited because of the lack of a defined flow path of the plume. Nicolai et al (2008) tested a commercially available version of a barrier which uses a porous material as the wall surface, Figure 3. This study mostly focused on hydrogen sulfide to address local regulations. They determined that within 400 feet of the barrier H2S was effectively reduced but beyond that distance concentrations were similar to barns without barriers in front of fans. This represents a dilution and not necessarily a removal of H2S. They made no comments on dust reduction but dust removal was likely effective. Hoff et al (1997) used a barrier filled with crop residue and found average dust reduction of 62% and an odor reduction which ranged from 43% to 93%.

Cost Considerations

Construction costs are relatively low and were estimated at $1.50 per pig space by Schmidt (2004). Maintenance may be needed for periodically cleaning the barrier surface. Grass and weeds should be controlled within the barrier area to prevent rodent populations from flourishing and to allow easier access to the barrier surfaces. Wind damage may be a periodic problem on some sites.

More Information

cXtension

National Pork Board

References


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