

# Research Briefs: Partial Biofiltration of Hybrid Ventilated Swine Facilities

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## Research Purpose

A strategy for providing partial biofiltration of a critical minimum amount of ventilation air for hybrid ventilated swine finishing facilities was developed and tested. The biofiltered critical minimum ventilation air (CMVR) was set at 81 m<sup>3</sup>/h-pig (48 ft<sup>3</sup>/min-pig) with the intention of providing enough fan ventilation in a hybrid ventilated swine finishing facility to suppress curtain movement during stable atmospheres. Two side-by-side 300-head hybrid ventilated deep-pit swine finishing rooms were used for this research, one room as the control (CTL) with the other treatment (TRT). The TRT room was fitted with a wood-chip based biofilter for scrubbing the CMVR. In terms of total room emissions, the TRT room had an average odor emission 37% less and an average ammonia emission 58% less than the CTL room.

## Activities

This research defines a critical minimum ventilation rate (CMVR) that encompasses, for the majority of time, ventilation air that is delivered during the more stable evening hot-weather hours. It is the ventilation air that predominates during hot-weather evening hours that would be considered the critical minimum, leaving the remaining exhaust air to disperse and dilute naturally with the corresponding unstable day-time atmospheres. This research project is further being refined with automated control that bypasses the biofilter completely if atmospheric conditions predict no odor impact to surrounding receptors. This “impact-based” odor control activity is defining much of the current ISU-based research being conducted on swine barn ventilation air odor control.

## What We Have Learned

It is impractical and unnecessary to treat for odor control all of the ventilation air exhausted from animal production facilities. At times, generally as high as 90% of the time, no odor control is required at all if one views odor control from an “impact-based” perspective. Properly designed “impact-based” control methods for odor nuisance control can significantly reduce the operational costs for odor control.

## Why is This Important?

Many livestock production systems use hybrid ventilation to control the environment for efficient growth. The air exhausted naturally with curtains is very difficult to treat for odors. If ample exhaust air is allowed to be emitted by controlled fan sources, a significant amount of odors can be reduced and if done at a high enough level, can substantially reduce odor transport during the most stable atmospheres.

## For More Information

Contact us at [hoffer@iastate.edu](mailto:hoffer@iastate.edu) or (515) 294-6180. For more information, read the following articles:

Chen, L., S.J. Hoff, J.A. Koziel, L. Cai, B.C. Zelle, and G. Sun. 2008. Performance evaluation of a wood chip-based biofilter using solid-phase microextraction and gas chromatography-mass spectrometry-olfactometry. *Bioresource Technology* (in press).

Hoff, S.J., J.D. Harmon, L. Chen, K.A. Janni, D.R. Schmidt, R.E. Nicolai, and L.D. Jacobson. 2008. Partial biofiltration of a hybrid ventilated deep-pit swine finisher. *Applied Engineering in Agriculture* (in-review).

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