

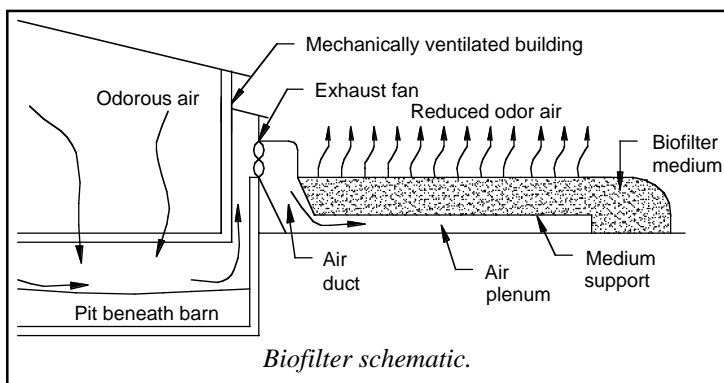
# Biofilters for Odor Control

*Biofilter on a 750-sow farrowing/gestation building.*

Odor, gas, and dust emissions from livestock and poultry facilities may result in complaints from neighbors or exceed state or federal ambient air quality standards. Biofiltration is a simple, low-cost technology, used by industry for many years, that has been adapted for use on livestock farms. Biofiltration can reduce odor and hydrogen sulfide emissions by as much as 95% and ammonia emissions by up to 80%.

## What is a biofilter?

A biofilter is simply a bed of organic material (medium), typically a mixture of compost and wood chips or shreds, about 10 to 18 inches deep. As air passes through the biofilter the microbes on the organic material convert odorous gases to carbon dioxide and water. The effectiveness of the biofilter is primarily a function of the amount of time the odorous air spends in the biofilter (contact time) and the



*Biofilter schematic.*

Facility Type	Summer ventilation requirements per animal space (cfm)
Nursery	35
Finishing	120
Gestation	150
Farrowing	500
Broiler	7
Dairy	335

From *Mechanical Ventilating Systems for Livestock Housing*, MWPS-32. Midwest Plan Service: Ames, Iowa.

moisture content of the filter material. Contact time is part of the biofilter design while moisture content is a function of good management. The size (footprint) of the biofilter depends primarily on the amount of air needing treatment. A typical biofilter will require 50 to 85 square feet per 1000 cubic feet per minute (cfm) of airflow.

## How much does it cost?

Biofilters are easy to design and build, and are relatively inexpensive. The costs are a function of specific design and the materials used. Construction costs range between \$100 and \$150 per 1000 cfm of air to be treated. Design air flow rates for some facilities are shown in the table above. Operation and management costs of a biofilter are approximately \$3.00/1000 cfm per year. Annual operating costs for the biofilter include the increased electrical cost used to blow the air through the biofilter, moisture additions to the biofilter medium with a water sprinkling system, and the replacement of the medium every three to five years.



*Biofilter on the pit fans of a 1000-head naturally ventilated swine finishing building.*

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**How can biofilters be used?**

***Mechanically ventilated buildings***

Biofilters effectively remove odors from any mechanically ventilated livestock or poultry facility. In these buildings each exhaust fan is attached to an air duct that brings the air into a plenum under the biofilter material. The air is treated as it is forced through the biofilter by the building exhaust fans. Excessive dust concentrations in some poultry barns may create the need for additional dust filtration prior to the biofilter to prevent biofilter plugging.

Biofilter installation on existing buildings usually requires replacing the existing exhaust fans. Typical exhaust fans do not have enough power (static pressure) to both ventilate the building and push the air through the biofilter.

***Naturally Ventilated Buildings***

In naturally ventilated buildings, air that is exhausted through the building pit fans can be passed through a biofilter. But air passing through the building sidewalls or ridge openings cannot be captured and treated with a biofilter. During cold weather, when most of the building air is ventilated through the pit fans, odor reduction is approximately 95%. However, during periods of hot weather, when the majority of air is moving out of the building through the sidewalls or ridge vents, the effect of the biofilter on odor emissions is limited. One way to improve the efficiency of biofilters on naturally ventilated buildings is to increase the capacity of the pit fans to include mild weather ventilation rates. This change results in a higher percentage of ventilation air passing through the biofilter and better odor control.

***Manure Storage***

Biofilters may also be used to treat the air exhausted from a covered manure storage. Any manure storage that is covered with an impermeable membrane such as concrete or plastic requires a vent to allow the odorous gases produced by the microbial degradation of the manure to escape. If not vented, these gases create significant pressures under the cover. A biofilter can be used to clean these vented gases.

***For more information...***

Visit <http://www.bae.umn.edu/extens/manure/> for more information on biofilters, or contact the University of Minnesota Department of Biosystems and Agricultural Engineering at 612-625-9733.



*Biofilter under construction: placing biofilter material on top of the ducting.*