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ENVIRONMENTAL UPDATE

SUMMER 2002

Biofilters: Are they an Option for Odour Control?

Odour complaints are one of the most commonly expressed concerns regarding the development of new and expanding hog operations. If odour mitigation techniques could be developed to address these concerns, potential growth restrictions and conflict with neighbors would be greatly reduced. Some suggest biofilters offer part of the solution.

What are they?

A biofilter is a bed of organic material that filters exhaust air This technology has been used experimentally for swine facilities. This filter is a mixture of wood chips, shavings, peat moss, compost, or other porous organic material, and typically 12 - 24 inches deep.

How do they work?

Air from swine facilities is exhausted through the bottom portion of the biofilter. Air then passes through the biofilter, where microbes on the organic materials use the gas and nutrients filtered from the air to convert the odourous air to carbon dioxide and water.

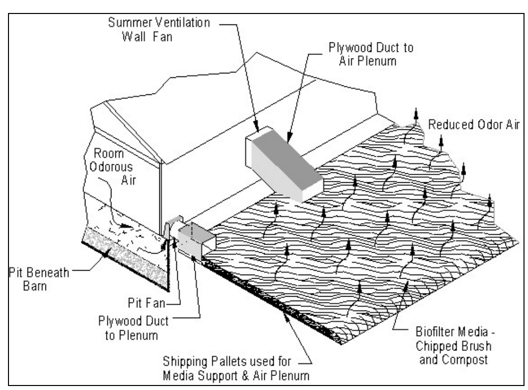
Important Considerations

Two parameters are very important to efficient and cost effective biofilter operation: (1) *Aiirflow rate*, which is established by the maximum building ventilation rate. (2) *Residence time* , the amount of time the odourous air spends within the media. It is dependant on media depth, cross-sectional area and airflow rate.

Odour Control

Studies at the University of Minnesota have examined the relative effectiveness of biofilters in controlling odour, ammonia, and hydrogen sulphide emissions from swine facilities.

Odour: Researchers were able to achieve an odour reduction of 91% (12 inch deep biofilter, 8 second residence time) and 87% (6 inch deep biofilter, 4 second residence time) over an 8 month period (Sept –June). Odour reduction efficiency continued to improve throughout the first 6 months of the experiment. Efficiency of the biofilter increased as microbes, multiply and



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Iowa Introduces New Livestock Legislation

The Iowa state legislature passed an important bill this spring (2002), further regulating livestock production in the state. The bill addresses two key issues: (1) air quality and (2) manure nutrient planning.

Facility Size: Regulation is based on facility size. The old piece of legislation had two important size thresholds: (1) facilities with more than 200,000 pounds of live bodyweight are required to submit manure management plans. (2) Construction permits are required for facilities with more than 625,000 pounds of bodyweight. The new regulation changes from, regulation based on pounds to regulation base on animal units. A method currently employed by the U.S. Environmental Protection Agency and similar to animal unit measurements used for permitting in Canadian provinces.

Air Quality: New regulations dictate the Iowa Department of Natural Resources (IDNR) establish a system to monitor odour, ammonia, and hydrogen sulphide levels at setback distances from swine facilities. If a violation occurs, testing can then occur within the setback distance in order to determine the source of the odour. However, no new restrictions will be enforced until December 1, 2004.

Manure Management Plans: To date, manure management plans only had to be submitted when the facility was constructed. The new legislation requires confinement facilities with at least 500 animal units to submit manure management plans annually. Manure management plans must be submitted to all counties where manure will be applied, as well as where the operation resides. The second component requires manure management plans switch to phosphorus planning, based on the IDNR phosphorus index.

Separation Distances: The new legislation increases the setback distances for confinement facilities with more than 500 animal units. A setback distance of 200 feet was established for rivers and lakes, unless manure was injected or incorporated within 24 hours of surface application.

Province	Sow/Boar	Weanling	Finisher
Saskatchewan	3.0	20.0	6.0
Alberta	1.5	18.2	5.0
Manitoba	3.2	30.0	7.0
Ontario	5.0	20.0	4.0
Ohio	2.80	20.0	5.50

New regulations in Iowa will implement maximum odour, H_2S, and ammonia levels at setback distances from swine facilities

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Soil Sampling: Why is it Important?

The need for accurate manure application is important for many reasons: maximize crop yield response, and ensure long-term environmental sustainability of the pork industry. One piece of the manure application puzzle is proper soil sampling prior to manure application.

The key component of an sustainable manure management plan, is properly sample and test every field every year. Without knowing this producers risk the possible over, or under application of a valuable source of crop nutrients.

Prior to soil sampling, producers need to keep the end in mind. What are they trying to achieve with manure application? Improved crop response, identify and correct micronutrient deficiencies or problem areas, or monitoring soil nutrient levels are just a couple of ideas to keep in mind when choosing how to soil sample.

Different methods of soil sampling exist. When choosing the type of soil sampling, the following points are critical, regardless of the type of sampling procedure chosen. (1) Select a sampling procedure that will provide information to adjust or support manure application rates, and practices. (2) Every field should be sampled every year. (3) All fields should be sampled for a 0-15 cm, 15-60 cm, or 0-6 inch, 6-24 inch depth, with separate composite samples for each analysis.

Representative Random Composite Sampling

The most common method of soil sampling involves taking random core samples throughout the field. Once

individual samples are collected they are thoroughly mixed, and then a single sample is submitted to the lab for analysis.

Cautions with Sampling:

1. Avoid sampling in areas of variability (saline areas, old manure piles, fencerows, etc.)
2. On hilly land, use the mid-slope to get average results, avoid hills or knolls and depressions.
3. Composite samples should be taken from at least 15 to 20 sites per field (one sample for every 8 - 10 acres).

The major advantage of this method is the ease of analysis. However, this does not provide any information on field variability, nor does it support the potential for variable-rate fertilizer application.

Site-Specific Sampling

This method focuses on managing the variability that occurs within any given field. Once the variability is understood the field is then divided into relatively uniform plots that are managed individually.

Benchmark Sampling

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It is important to select a sampling method that will provide information to adjust or support manure application rates

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Continued from page 3, *Soil Sampling*

Continued sampling at the same location is the main principle of benchmark sampling. An area of one-quarter of an acre (or 100 square feet) is chosen to represent the average soil conditions of the entire field. Within the area 15 to 20 samples are randomly collected and thoroughly mixed prior to submitting to the lab for analysis.

More than one benchmark area per field may be chosen if variable landscapes occur within fields. Sampling errors should be minimized by using the same sampling area each year, provided the area chosen is representative of the entire field. This technique assumes the benchmark area is less variable than the entire field due to its smaller size. However, this method also assumes the rest of the field will respond in a similar fashion to the benchmark area. Additionally, this technique does not properly address field variability.

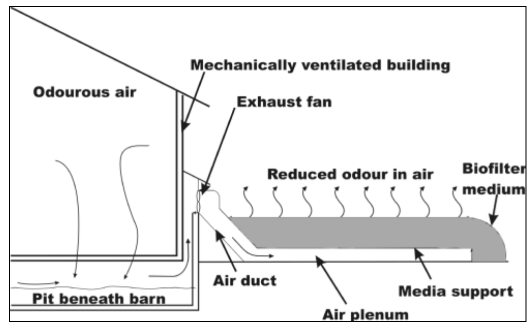
Grid Sampling

This sampling method breaks the field into smaller grids. It uses a systematic approach to reveal fertility patterns,

Continued from page 1, *Biofilters*

adapt to their new environment.

Hydrogen Sulphide: Both media (biofilter) depths studied were very effective in reducing H_2S emissions from swine facilities. The 12 inch deep biofilter reduced H_2S emissions by



97%, while the 6 inch deep biofilter measured 96%.

Ammonia: Biofilters can effectively reduce ammonia emission rates, however they did not achieve the same effect as seen on odour or H_2S levels. Ammonia reduction levels were 82% for the 12 inch, and 74% for the 6 inch biofilter.

What is the optimal biofilter depth?

Too little, will result in decreased odour control. Too much will result in increased operating costs. Typically a biofilter requires 50 - 85 square feet per 1,000 cubic feet per minute (cfm) of airflow. for efficient operation.

Ongoing research at the University of Minnesota has found a significant reduction in biofilter performance when residence time falls below 4 seconds. When the residence time is shortened by decreasing depth (less than 6 inches) odour and H_2S reduction was reduced to 65% and 57% respectively.

Moisture content: Biofilters do not operate efficiently when moisture content

As the intensity of soil sampling increases, fertility patterns become more apparent throughout the field being examined

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