Odour Control and Reduction in a Pig Feeder Barn Using an Enclosed Dunging Area and Biofiltration

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BIOFILTRATION OF ODOURS

BACKGROUND

Biofiltration is one of the techniques used to reduce odours produced in livestock facilities. It uses a filter capable of sustaining microbial life to treat odorous air. Microorganisms in the biofilter break down the odours in air flowing through the system.

Several factors influence the performance of biofilters. These include:

- Filter media
- Airflow
- Moisture
- Temperature
- Nutrient availability

Filter Media

The type of filter media used in a biofilter is crucial for optimum performance. The filter media should provide a suitable environment for microorganisms to thrive.

Some desirable properties of filter media include:

- Capacity to retain moisture necessary for the survival of microorganisms
- Sufficient porosity to enable easy flow of air through the biofilter. This influences the size and ultimately the cost of the fan used to deliver the air flow.

Peatmoss, wood chips, compost and perlite are some common filter media used in biofilters.

Airflow

When designing biofilters it is necessary to take into consideration the rate at which odorous air will flow through the system. For example, in a pig barn, airflow rate through the biofilters is determined by the capacity of the exhaust fans. If the airflow rate through the biofilter is too high, the odorous air travels through the filter media rapidly. This means that a smaller volume of odorous gases would be available for breakdown by the microorganisms.

Moisture

Moisture is essential for the survival of microorganisms. Thus, a biofilter should always retain sufficient moisture in the filter media to support microbial life. It is also important to ensure that moisture distribution through the media is uniform in order to keep the biofilter performance high.

Temperature

Temperature of the filter media also influences performance of biofilters. As a general rule, at temperatures above refrigeration microbial activity is enhanced. It is important to note though that different microbial populations thrive best over specific temperature ranges.

Nutrient Availability

Another requirement essential for the survival of microorganisms is the availability of nutrients, including minerals. Nutrient availability may be affected by the type of filter media in use. For example, compost from animal manure is typically richer in its nutrient value compared with peatmoss. Thus, depending on the type of filter media, supplemental nutrients may be required.

RESEARCH

The University of Alberta, in collaboration with Alberta Research Council (ARC) and Alberta Agriculture Food and Rural Development (AAF RD), is conducting research to determine optimum operational conditions for biofilters.

Currently, two biofilters located at the Swine Centre, Edmonton Research Station, University of Alberta, are in use to evaluate the effects of temperature and supplemental mineral nutrition on odour reduction from a pig manure treatment plant.

Test Conditions

- Temperature: 15 °C, 22.5 °C, 30 °C
- Nutrients: Chloride and phosphate salts

Operational Conditions

- Filter media: 1000 L of a homogeneous mixture of 75% polystyrene and 25% peatmoss
- Airflow rate: 100 L/s (200 cfm) through each biofilter
- Moisture: The volume of water applied to each biofilter is dependent on the target temperature and relative humidity of the odorous air from the treatment plant.
- Duration: 28 days

Enclosed Dunging Areas (EDAs)

BACKGROUND

The use of an EDA as a strategy for odour control is currently undergoing investigation by the University of Alberta in collaboration with the Prairie Swine Centre, ARC and AAFRD.

Typically, an enclosure (EDA) is constructed over the slats in a partially slatted floor pig barn. This strategy attempts to take advantage of the fact that pigs reared on partially slatted floors will defecate and urinate in the slatted area of the pen floor. It is also in this area that the most odours are generated.

A pen with an EDA in the background. On either side of the front panel are doorways with mudflap curtains. A 200 L biofilter is mounted on top of the EDA. In the foreground is a crowding-panel which is used to control the floor space available to the pigs.

Thus, an EDA helps to contain the odorous gases within a confined area thereby isolating the odours from other parts of the pen and room.

The odorous air contained within the EDA may either be exhausted outside the building or, preferably, filtered with a biofilter.

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