

Manure Handling Systems Reduce Air Contaminants in Swine Barns

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Summary

Two manure-handling systems, a washing gutter and an inclined washed conveyor belt, were tested to determine which system best eliminates all manure contamination from the experimental chambers in an air quality laboratory. Both systems proved efficient at reducing the air contamination from the excreta. However, neither system totally eliminated the release of contaminants to the airspace.

Introduction

To better understand the sources of air contamination in an intensive swine operation, this study will look at various factors separately (i.e., feed, manure, and the animals themselves), and attempt to eliminate the effect of each factor on air quality. It is anticipated that once the effect of each factor is reduced to zero, these factors can then be varied individually to find out their effect on overall air quality. The first focus of the study was the manure handling system. Two methods of removing the manure were tested, one was a washing gutter using nozzles and pressurized water to clean the dunging area (Fig. 1), and the other was a washed, inclined conveyor belt (Fig. 2). The objective was to attain zero air contamination from the manure in the room using these manure handling systems.

Experimental Procedure

An air quality laboratory was built at the Floral facility of the Prairie Swine Centre Inc. The laboratory consisted of two rooms, each lined with stainless steel to reduce absorption of contaminants by the room surface. The washing gutter was installed in one room, and the inclined conveyor belt system in the other room. Testing of the manure handling systems focused on the frequency of cleaning the dunging areas. Three different frequencies were tested - every half hour, every hour and every two hours. Groups of 10 female pigs weighing about 30 kg each were used in each room, and data was collected over one week in each trial. Three trials were run at each frequency for a total of nine trials in each room. Ammonia levels were used to measure the effectiveness of the systems (as ammonia comes only from the manure), and were measured at the inlet and outlet of each room over a period of a week.

Results

The average ammonia emissions from the washing gutter and the conveyor belt rooms were $48.7 \text{ mg day}^{-1} \text{ kg}_{\text{pig}}^{-1}$ and $57.0 \text{ mg day}^{-1} \text{ kg}_{\text{pig}}^{-1}$, respectively. Even



Figure 1. Water nozzles used to wash the manure from the gutter portion of the pen.

Figure 2. Conveyor belt system used to remove manure from the pen.

though these emissions were 38% and 47% lower than previous observations from grower-finisher rooms with a conventional pit-plug design in the same swine building, both systems failed to achieve near zero ammonia emissions. There were no differences at a statistically significant level ($P > 0.05$) between the ammonia emissions from the two manure handling systems nor among the three frequencies tested (Fig. 3).

Implications

Another manure handling system will have to be found to achieve zero contamination levels for testing of the origin of contaminants. The washing gutter system is recommended for health and productivity testing with a range of contamination levels, as it was simpler and easier to operate than the conveyor belt system.

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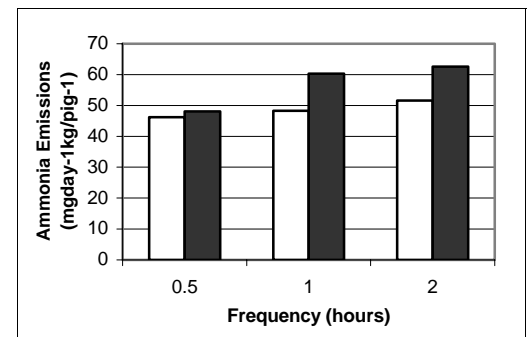


Figure 3. Average ammonia emissions from the experimental chambers over all the trials. Averages followed by the same letter are not significantly different ($P > 0.05$).

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