DaNet NewsLetter

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Content

Odour emission from animal houses is highly related to air as transportation medium. The project ROSES (Reduction of Odour Source in and Emission from Swine buildings) will focus on ventilation effects on odour emissions with special emphasis on airflow patterns and odour mass transfer in the boundary layer above floor and in the slurry pit and mass diffusion mechanisms within the slurry. In this DaNet Newsletter the overall objectives, background of the project and the ventilation effects on emission will be described.

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Reduction of odour source in and emissions from swine buildings - ROSES

Objective

Improved knowledge of the exchange mechanisms between air and the manure surface in the slurry pit and between air, soiled surfaces and animals in the room may lead to novel and efficient ways of reducing the odour emission. The emissions may be reduced by ensuring proper airflow and thermal conditions at the emitting surfaces.

The objective of the project is to provide technical and biological knowledge that makes it possible to reduce odour emissions from existing and from new swine buildings. The project will concentrate on growing/finishing swine production, which accounts for a major part of the odour emission from agriculture.

Transport mechanisms

In livestock housing, the sources of gas and odour emissions are the soiled area of the solid part of the floor, the slats, the side walls in the slurry pit and the surface of the slurry. The most important issue is to determine the resistance parameters for mass emission and mass transport. The basic factors that affect the resistances are ventilation rate, outlet opening area, airflow patterns in the room, air exchange between room and slurry pit and the airflow patterns in the pit.

The airflow patterns vary according to the ventilation systems, partition of pens, location and number of animals in the room. Temperature gradients between an emission

source and the air space above may also affect the airflow patterns due to the buoyancy effect. A high turbulence level results in reduced resistance to mass flow from the emitting surfaces due to reduced boundary layer thickness.

The interaction between air movements in the room and in the slurry pit will affect the odorant concentration in the pit and in the room air. Better knowledge is needed on the gas and odour exchange mechanisms between the air and the surfaces in the slurry pit and between the air and soiled surfaces and animals in the room. The airflow patterns and the air exchange rate in the headspace of the slurry pit will be investigated.

Methods

Experiments at laboratory level and mathematical simulations are used to identify promising solutions. These will subsequently be validated under near-practical conditions prior to validation in commercial swine buildings.

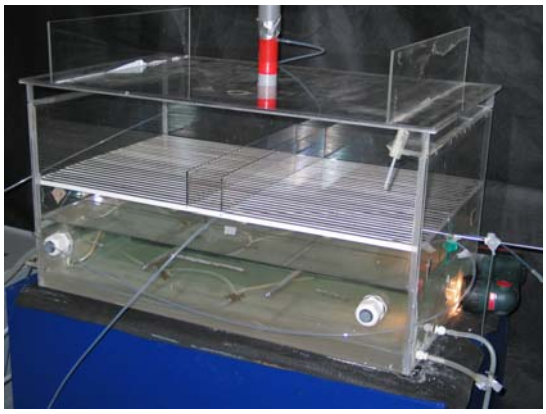

Figure 1. Scale model experiment with fully slatted floor and double sided ventilation inlet.

Investigations will be performed in both scale models and full scale rooms with fully slatted floor, partly slatted & solid floor, and partly slatted & drained floor. The effect of different control strategies using fixed inlet opening, fixed inlet velocities or constant inlet momentum will be determined at a number of ventilation airflow rates.

Results

Strategies for ventilation system design and control for reduced odour emission will be part of the outcome of the project.

Funding

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Participating institutes

- Danish Institute of Agricultural Sciences, Department of Agricultural Engineering
- Aalborg University, Department of Building Technology and Structural Engineering
- University of Southern Denmark, Department of Biochemistry and Molecular Biology
- The Royal Veterinary and Agricultural University, Department of Large Animal Sciences
- Danish Pig Production, Department of Pig Housing and Production Systems.