

March 2007

Content

Anaerobic processes in manure are considered to be the main cause of odour emissions from pig production units. The project Strategies for odour reduction from pig production units and slurry application ('STOP') is carried out in five interconnected work packages with subprojects, which address odour emissions from the whole pig production chain from feeding of the pigs to spreading of the slurry. In this DaNet NewsLetter an initial subproject on characterization of pig slurry odour profiles and links to slurry composition is described.



Author: Martin Nørregaard Hansen. University of Aarhus, Faculty of Agricultural Sciences, Department of Agricultural Engineering, Research Centre Bygholm, Horsens, Denmark

Characterization of pig slurry odour profiles

Background

Anaerobic processes in manure are considered to be the main cause of odour emissions from pig production units. Specific sources include slurry channels, stores and soiled surfaces. Numerous factors affect odour emissions, such as diet, manure management system and manure age. However, choice of sampling procedure, equipment and analytical technique are known to affect the determination (Hansen et al., 2006; Kai & Schäfer, 2001; Gralapp et al., 2001).

Olfactometric properties of air samples are not easily related to the concentrations of individual odour compounds in the air. Since the present project will adopt different analytical techniques for the various experimental activities, this is a great challenge that must be addressed. The relationships between manure composition and odours emitted are also complex, and identification of links between microbial metabolism in the manure and odour emissions may require a large database with comparable information on manure composition and odour emissions.

Objective

The objective of the subproject is to compare analytical techniques for odour detection, and examine the relationship between odour emissions and type, age and composition of pig manure.

Description of work

A campaign will be organized to describe the relationship between pig manure compo-

sition and odour release to the air under standardized conditions. Different types of manure will be collected on 8 different pig production farms. The manure will be incubated under well-defined conditions in closed experimental emission units with a constant headspace ventilation rate, and with or without pre-storage. At steady state, gas samples will be taken for the different analyses, and manure will be sampled at the slurry-air interface for chemical and microbiological analysis of manure composition.

Methods

The investigation is carried out as a comparative determination of odour emission from swine slurry in different production systems collected from the farms. From each farm the following three samples are collected:

- a. Fresh slurry from farrowing or weaner house
- b. Fresh slurry from growing/finishing house
- c. Slurry from storage tank.

The odour emission from each of the samples will be determined immediately after collection and again after two months of storage.

In all cases 43 litres of homogenized slurry will be kept in 63 litre containers that in connection with the odour measurements are placed in a dynamic emission chamber system (Hansen et al., 2006; Bang et al., 2005). The air exchange rate is controlled by a critical orifice to replace the air in the head space above the slurry 5 times an hour.



Experimental set-up with dynamic emission chambers including air supply to and exhaust from head space above the slurry.

The emission of odorants is determined by dynamic dilution olfactometry measurements and by determination of the emission of key odorants using Membrane-Inlet Mass-Spectrometry (MIMS) and Adsorbent Thermal Desorption (ATD) tube collection connected to a GC-MS analyzer. In connection with the measurements the constituents in the different slurries are analyzed.

Results

Recommendations about analytical techniques to be used for odour detection and relationships between odour emissions and constituents in manure from finishing pig production will be the outcome of the project.

Funding

The project is funded the Ministry of Food, Agriculture and Fisheries, Directorate for Food, Fisheries and Agri Business.

Participating institutes

- University of Aarhus, Department of Agricultural Engineering
- University of Aarhus, Department of Agroecology and Environment
- University of Aarhus, Department of Animal Health, Welfare and Nutrition
- University of Aarhus, The Faculty of Science, Department of Biological Sciences
- Danish Agricultural Advisory Service, National Centre
- The Pig Association Research Institute
- LugtTek A/S
- Technological Institute

Reference List

- Bang M., Hansen A.G., Hansen M.N. & Feilberg A. 2006. Experimental test of ozone and slurry additives (Laboratorie test af ozon og gylleadditiver). Dansk Landbrugsrådgivning Landscentret. pp 35 (In Danish).
- Galapp A.K., Powers W.J. & Bundy D.S. 2001. Comparison of olfactometry, gas chromatography, and electronic nose technology for measurement of indoor air from swine facilities. Transactions of the Asae. 44(5):1283-1290.
- Hansen M.N., Kai P. & Moller H.B. 2006. Effects of anaerobic digestion and separation of pig slurry on odor emission. Applied Engineering in Agriculture. 22(1): 135-139.
- Hansen M.N.; Bang M.; Hansen A.G. & Feilberg A. 2006. Effects of slurry additives and ozone treatment on odour emissions from pig slurry. Proceedings of the 12th Ramiran International Conference. DIAS report no. 122 (1). P 111-114.
- Kai, P. & Schäfer A. 2001. Identification of Key Odour Components in Pig House Air using Hyphenated Gas Chromatography Olfactometry. Agr. Eng. International: CIGR Journal of Sci. Res. and Development.