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Reduction of ammonia emissions from livestock manure in intensive bovine holdings using bio preparations

Reda Mažeikienė

Aleksandras Stulginskis University, Lithuania

Considerable intensification of livestock production leads to the increased concentration of emissions at the sites of livestock farming. High amounts of emissions containing air pollutants such as ammonia (NH_3), hydrogen sulphide, mercaptans, etc., not only are known to cause animal diseases but also lead to health disorders of operators and other persons residing in the surrounding areas as well as present a threat to the surrounding environment. Environmental issues at the sites of intensive livestock farming are becoming increasingly important. Recently, farms have been significantly increasing in size, and automated, open and naturally ventilated dairy barns have gained popularity despite the fact that they are characterized by many factors that lead to increased NH_3 emissions. Among other these might include high temperatures in barns, high amounts of liquid manure are accumulated, animals are kept inside the barn all year round, etc. Most of the European countries (where the numbers of animals are not decreasing) are not fulfilling their international obligations to reduce NH_3 emissions. Ammonia emissions are becoming a significant issue at the international level, meanwhile cattle production accounts for more than 90% of total NH_3 emission. After laboratory testing, the laboratory determined the effect of the biopreparation on the ammonia evaporation process from manure. When the biopreparator is added to the manure, the emission of ammonia from it slows down. Depending on the composition of the manure, the temperature environment, the duration of exposure to the biopreparat, the emission is reduced to 22%. The greatest effect is observed at 6 to 14 days, after 30 days of use, the effect is significantly reduced. The effect of the biopreparat on the ammonia evaporation is higher with more intense ammonia emissions, i.e., when the manure is fresh, there is no crust on the surface, the airflow over the manure is intense and the large gradient of the ammonia concentration on the manure surface. It is recommended that the biopreparat can be used to reduce ammonia emissions in cowsheds where liquid manure is accumulated. Its use is in line with the tendencies of modernization of cowsheds to install cranberries, liquid manure technologies. The effect of the biopreparatum will be greater during the warm period.

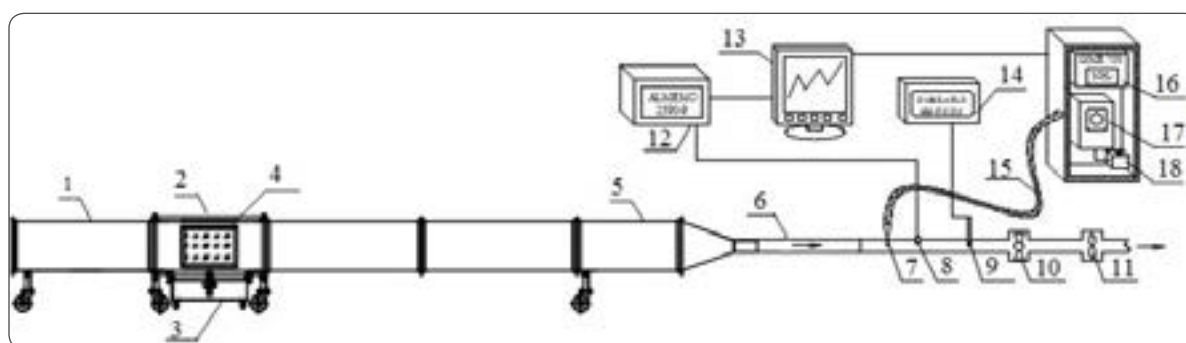


Figure: The schematic view of ammonia emission from manure inside the wind tunnel: 1-housing of a wind tunnel; 2- cover; 3-“a drawer” for manure storage; 4-a section for manure storage; 5-transition cone; 6-a duct; 7-air sampling probe; 8-sensors of temperature and moisture content; 9-sensor of thermal wind speed indicator; 10-a valve; 11-a ventilator with a frequency inverter; 12-a measuring and data storage instrument ‘Almemo 2590-9’; 13-PC; 14-a wind speed indicator ‘OMEGAFL0 HH-F615M’; 15-a heated air intake hose; 16-laser gas analyser ‘GME700’; 17-electrically heated three-way valves; 18-a membranous air pump

Recent Publications

1. Aguerre M J, Wattiaux M A and Powell J M (2012) Emissions of ammonia, nitrous oxide, methane, and carbon dioxide during storage of dairy cow manure as affected by dietary forage-to-concentrate ratio and crust formation. J. Dairy Sci. 95(12):7409-7416.

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2. Bjerg B, Cascone G, Lee I B, Bartzanas T, Norton T, Hong S W, Seo I H, Banhazi T, Liberati P, Marucci A and Zhang G (2013) Modelling of ammonia emissions from naturally ventilated livestock buildings. *Biosystems Engineering* 116(3):259-275.
3. Bagdonienė I and Bleizgys R (2014) Ammonia emissions from dairy cattle manure under variable ventilation rates. *Annals of animal science* 14(1):141-151.
4. Bleizgys R and Bagdoniene I (2016) Control of ammonia air pollution through the management of thermal processes in cowsheds. *Science of the total environment* 568:990-997.
5. Bleizgys R and Baležentienė L (2014) Assessments of biogenic gas emission processes in cowsheds. *Polish Journal of Environmental Studies* 23(4):1107-1114.

Biography

Reda Mažeikienė is a Livestock Technologist and Biomedical Stirs Specialist. She has completed her Master's degree in Livestock Technology at Lithuanian Veterinary Academy in 2004. In 2016, she started her doctoral studies at Aleksandras Stulginskis University (Lithuania) in the field of Technological Sciences, Environmental Engineering and her Doctoral thesis is entitled as "Biotechnological measures for air pollution control in animal husbandry". She has completed an internship at Hohenheim University, Germany in 2003 and an internship at Palermo University, Italy in 2018. Currently, she is working as a Project Administrator at Aleksandras Stulginskis University.

redos.laiskai@gmail.com

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