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Development of a new dynamic chamber system for measuring harmful gas emissions from composting livestock waste

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ABSTRACT

A dynamic chamber system consisting of a chamber covering a composting mixture (3 m in diameter, 2.2 m in height, 13 m³), a ventilator for suction of air into the chamber, and equipment to measure the gas composition and indicate temperature, was developed for evaluation of harmful gas emissions from such livestock waste composting. Fresh air was introduced through the space between the floor and the lower edge of the chamber, and exhaust gas was removed through an outlet placed on top of the chamber. NH₃, CH₄ and N₂O concentrations in exhaust air from the chamber were measured by Infrared Photoacoustic Detector (IPD, multi gas monitor type 1312, INNOVA, Copenhagen, Denmark) at 5 minutes intervals. The system was evaluated with standard gas of NH₃, CH₄ and N₂O. High recoveries of 98.5% (NH₃, SD 6.25), 96.6% (CH₄, SD 4.03) and 99.5% (N₂O, SD 2.68) were obtained for each gas emission in the chamber over 17-20 min. The measured values of those gases obtained by the IPD method and conventional method at the time of a composting examination of swine waste were measured, and the differences were only a few percent of the total emissions.

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