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Treatment of Swine Slurry by an Ozone Treatment System to Reduce Odor

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ABSTRACT

Development of a technology that can reduce the odor of liquid swine manure during agitation and land application could prove beneficial to the swine industry. The purpose of this study was to evaluate a commercial ozone treatment system for swine slurry under production scale conditions. The facility used for this study was a curtain sided finishing building housing 500 grow–finish market hogs located over a manure pit measuring 12.2 m wide × 25.9 m long × 2.4 m deep with a total pit capacity of 770,142 l, containing 577,607 l. The system evaluated exposes air to ultra-violet light creating O₃. The O₃ is then injected into slurry at a rate of 851.6 l/min. treating 51,097 l/h. In this study the entire pit contents were treated every 11.3 h. At 0, 24, 48, and 96 h two slurry samples were collected with a 3.05 m probe and six air sample bags were collected via a vacuum pump. No significant differences were detected in slurry samples between time periods. Mean slurry values were 13.6 ± 4.6% solids dry wt., 850 ± 70 mg/l settleable solids, 54,200 ± 4384 mg/l total suspended solids, 61,050 ± 12,657 mg/l chemical oxygen demand, 0.86 ± 0.14%N, 0.49 ± 0.27%P, 0.45 ± 0.01%K and dissolved oxygen below detection limits. Ammonia concentrations decreased (P = 0.004) from 0 to 96 h. Odor panelists analyzed air samples for intensity at recognition (IR), offensiveness at recognition (OR), intensity at full strength (IFS) and offensiveness at full strength (OFS). Panelists found OR, IFS and OFS were reduced (P < 0.01) at 48 h and 96 h compared to 0 h and IR was reduced (P < 0.04) at 24 h and 48 h and not at 96 h but trended lower (P = 0.12) at 96 h. The system evaluated significantly improved air quality within the building suggesting that odor emanating from swine buildings and odor generated during land application of slurry should be reduced.

KEYWORDS

Swine Slurry, Odor, Treatment, Ozone

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References

- [1] W. F. Ritter, "Odour Control of Livestock Wastes: State-of-the-Art in North America," *Journal of Agriculture Engineering Research*, Vol. 42, 1989, pp. 51-62.
- [2] R. I. Mackie, P. G. Stroot, and V. H. Varel, "Biochemical Identification and Biological Origin of Key Odor Components in Livestock Waste," *Journal of Animal Science*, Vol. 76, 1998, pp. 1331-1342.
- [3] D. H. O' Neill and V. R. Phillips, "A Review of the Control of Odour Nuisance from Livestock Buildings: Part 3, Properties of the Odorous Substances Which Have been Identified in Livestock Wastes or in the Air around them," *Journal Agriculture Engineering Research*, Vol. 53, 1992, pp. 23-50. doi:10.1016/0021-8634(92)80072-Z
- [4] S. J. Masten and S. H. R. Davies. "The Use of Ozonation to Degrade Organic Contaminants in Wastewaters," *Environmental Science and Technology*, Vol. 28, No. 4, 1994, pp. 180-185.
- [5] M. Horváth, L. Bilitzky and J. Hüttner, "Ozone," Elsevier Science Publishing, New York, 1985.

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- [6] J. J. Wu, S. Park, S. M. Hengemuehle, M. T. Yokoyama, H. L. Person, J. B. Gerrish and S. J. Masten, " The Use of Ozone to Reduce the Concentration of Malodourous Metabolites in Swine Manure Slurry," *Journal of Agricultural Engineering Research*, Vol. 72, No. 4, 1999, pp. 317-327. doi:10.1006/jaer.1998.0378
- [7] S. S. Schiffman, " Livestock Odors: Implications for Human Health and Well-Being," *Journal of Animal Science*, Vol. 76, 1998, pp. 1343-1355.
- [8] T. S. Lorig, " Cognitive and Noncognitive Effects of Odor Exposure; Electrophysiological and Behavioral Evidence," In: S. Van Toller and G. H. Dodd (Eds.), *The Psychology and Biology of Perfume*, Elsevier Applied Science, London, UK, 1992, pp. 161-173.
- [9] F. Haywood, " Handling Liquids and Solids on Hog Farms," *Biocycle*, Vol. 38, 1997, pp. 55-57.
- [10] A. Eaton (Ed.), " Standard Methods for the Examination of Water and Wastewater," 20th Edition, American Public Health Association (APHA), American Water Works Association (AWWA), Water Environment Federation (WEF), 2000.
- [11] Association of Analytical Chemists (AOAC), " Official Methods of Analysis," 12th Edition AOAC, Washington DC, 1975.
- [12] P. J. Stoffella and B. A. Kahn, " Compost Utilization in Horticultural Cropping Systems," Lewis, New York, 2001.
- [13] Q. Li, L. Wang, Z. Liu, and R. M. Kamens, " Could Ozonation Technology Really Work for Mitigation Air Emissions from Animal Feeding Operations?" *Journal of Air and Waste Management Association*, Vol. 59, 2009, pp. 1239-1246. doi:10.3155/1047-3289.59.10.1239
- [14] A. G. Williams, " Indicators of Piggery Slurry Odour Offensiveness," *Agricultural Wastes*, Vol. 10, No. 1, 1984, pp. 15-36. doi:10.1016/0141-4607(84)90016-7
- [15] D. R. Kenney and J. L. Hatfield, " The Nitrogen Cycle, Historic Perspective, and Current and Potential