

Full paper is published in the proceedings of:

**MITIGATING AIR EMISSIONS FROM
ANIMAL FEEDING OPERATIONS
CONFERENCE**

Iowa State University Extension
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**Conference Proceedings
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Effects of Waste Management Techniques to Reduce Dairy Emissions from Freestall Housing

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Species: Dairy
Use Area: Animal Housing
Technology Category: Management
Air Mitigated Pollutants: Volatile Organic
Compounds: Ethanol, Methanol

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System Summary:

Recent dairy emission research has identified alcohols (methanol and ethanol) as the major volatile organic compound (VOC) group originating from fresh waste (Shaw et al., 2007; Sun et al., 2008). Effective control of these alcohols from dairies will help the dairy industry meet regulatory standards, satisfy public concerns, and improve local and regional air quality. Enhancing industry typical freestall waste management practices, which currently are predominant practices like flushing and scraping of fresh waste, may provide a large impact on mitigation of oxygenated VOC emissions in a cost effective manner.

Our research has shown that flushing is more effective than scraping in reducing methanol (MeOH) and ethanol (EtOH) emissions from barns. Flushing three times daily versus scraping three times daily yields an emission reduction efficiency of 50% for both MeOH and EtOH. Furthermore, flushing frequency by itself significantly reduces emissions. A comparison of 3 times versus 6 times flushing daily showed decreased emissions by 79% for MeOH and 63% for EtOH.

Applicability and Mitigating Mechanism:

- Oxygenated VOC (e.g., alcohols MeOH and EtOH) are produced by fermenting microbes present in fresh waste
- Frequent waste removal effectively mitigates MeOH and EtOH emissions from fresh waste
- VOC alcohols are water-soluble and become effectively trapped in water when flushed
- Flushing is more effective than scraping, and increasing flushing frequency further decreases VOC emissions

Limitations:

- Scraping methods leave a thin film of manure on concrete ground that continues to produce emissions

Cost:

There is no cost associated with increasing the flushing frequency of a liquid manure handling system. Essentially, flushing frequency is increased, while the amount of water per flushing event is decreased. Since the water used to flush barns is recycled water from the lagoons, there is no cost to re-circulate lagoon water through the barn alleys.