

BIOFILTERS FOR POINT-SOURCE GASEOUS EMISSIONS FROM DAIRIES Part 2: Applicability of biofilters to dairy point-source emissions

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Applicability of Biofilters to Point-Source Gaseous Emissions from Dairies

Point-source gaseous emissions from dairies contain complex mixtures of contaminants in ranging concentrations emitted at various flow rates. While most air pollution control technologies have optimal application limits, biotechnologies like biofilters, which use diverse microbial communities to mitigate contaminants, are adaptable to a broad range of effluents (Figure 1.)^[1]. Biofilters are also relatively low-cost, simple in design and control, can be constructed by farm personnel from affordable, readily-available materials, and have small energy requirements, furthering their suitability for dairies^[2].

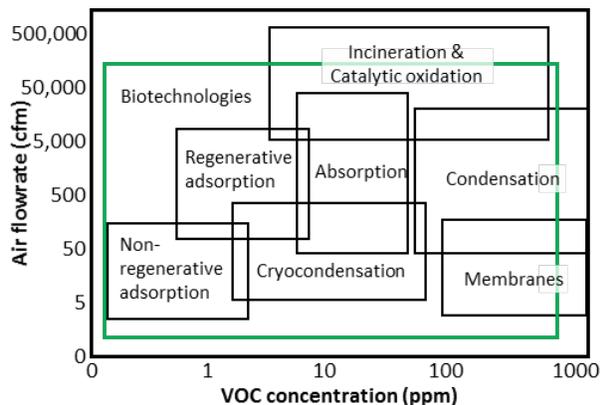


Figure 1. Generalized application limits of various air pollution control technologies^[1].

For point-source gaseous emissions from dairies to be treatable with a biofilter: 1) the contaminants must be biodegradable, 2) the contaminant must be generated in a contained space, 3) this space must have mechanical or naturally assisted ventilation, and 4) an air handling system must be installed to move the contaminated air through the biofilter. The following are examples of point-sources of gaseous emissions on dairies that have been successfully treated with a biofilter.

Examples of biofilters on dairy farms

1. Emissions from manure pits

Barn manure collection pits are often agitated to facilitate manure pumping, which can generate nuisance emissions and barn corrosion. A cover can be installed over these pits and a blower used to feed a small biofilter (Figure 2.).



Figure 2. Biofilter treating emissions from a barn manure collection pit at a MN dairy^[3].

2. Anaerobic digester influent storage

Anaerobic digesters on dairies can be used to breakdown manure and other organic materials to generate renewable biogas. Reception pits used to store feedstocks prior to anaerobic digestion can be sources of nuisance emissions. Blowers can be used to collect and feed these emissions to a biofilter (Figure 3.).



Figure 3. Biofilter at a NY dairy treats odors from manure and food waste reception pits.

3. Air from an anaerobic digester effluent outlet and a solid-liquid separation building

Anaerobic digester effluent pits and buildings where solid-liquid separation (SLS) occurs can be sources of contaminated air. Blowers and ducting can be used to collect this air and feed a biofilter (Figures 4. & 5.).



Figure 4. A large 6 ft. deep biofilter at a dairy in MN was designed to treat contaminated air from both an anaerobic digester effluent and the SLS building^[3].



Figure 5. Biofilter treating air from a manure pit inside a SLS building with removable wooden wall for easy media replacement^[3].

4. Barn ventilation air

Livestock barns may use mechanical or natural assist ventilation (e.g. swine nurseries, calf barns). Ducting can direct exhaust fan air to a shallow, open-bed biofilter designed for minimal pressure drop (Figure 6.).



Figure 6. A low-cost, open-bed biofilter treating wall fan exhaust from a swine nursery barn.

5. Air from composting facilities

Buildings used for composting can also be mechanically ventilated with exhaust air pushed through biofilters to mitigate contaminated emissions (Figure 7.).



Figure 7. Open-bed biofilters treating exhaust air from a large composting facility^[4].

FACT SHEET SERIES

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