

Methane (CH₄) Safety

Methane (CH₄) is a major greenhouse gas. It is produced during anaerobic decomposition of manure and accumulates around manure storage areas.

Methane emissions from manure depend on the way manure is managed (liquid manure systems produce more methane than solid manure systems) and environmental factors such as temperature and moisture (warmer temperatures and moist conditions will produce greater amounts of methane).

Methane characteristics

Methane is an odourless gas and is lighter than air. Because methane is lighter than air, it tends to rise and accumulate near the higher, stagnant parts of enclosed buildings and tightly closed manure storage pits. It is most likely to accumulate during hot, humid weather.

Methane is extremely difficult to detect without gas detection instruments. Concentrations in confinement livestock housing are normally well below the levels that may be explosive; however, explosions attributed to methane have occurred around manure storage pits without proper vents.

Methane can displace oxygen in confined areas, resulting in an oxygen-deficient atmosphere. Methane can explode at concentrations of 50,000 ppm or more (a level of 5 per cent).

Health effects

The Occupational Safety and Health Administration (OSHA) has no permissible exposure limit for methane, but the National Institute for Occupational Safety and Health's (NIOSH) maximum recommended safe methane concentration for workers during an 8-hour period is 1,000 ppm (0.1 percent). Methane is considered an asphyxiant at extremely high concentrations and can displace oxygen in the blood (Table 1).

Table 1. Methane exposure levels and effects

Exposure level (ppm)	Effect or symptom
1000	NIOSH 8-hours TLV*
50,000 to 150,000	Potentially explosive
500,000	Asphyxiation

* TLV = Threshold Limit Value

Reducing methane emissions

Feed management

- Increase the digestibility of livestock feed by mechanical (i.e. chopping, grinding or pelleting feed), chemical or biological processing.
- Feed livestock less frequently as a way to lower methane production.
- Use feed additives such as ionophores that act to inhibit methane production by rumen bacteria.

Aerating manure

Aeration allows microorganisms to break down organic material through the addition of oxygen (O₂). Aerobic decomposition of manure lowers or eliminates methane emissions, but may increase nitrous oxide emissions.

Filtration of the ventilation air

Filtering exhaust air from animal houses to remove odour-causing gases, GHGs and dust particles may provide a way to reduce methane emissions. However, more research is needed in this area.

Temperature control

Cooling of indoor stored manure can lead to a reduction in emissions.

Protect yourself and others from exposure

1. Make sure all pits and manure storage areas are adequately and appropriately ventilated.
2. Smoking should not be allowed around manure pits.
3. Frequently test the levels of methane in the barn using an explosion meter.
4. Do not lower fans into the manure pit because this practice could cause methane explosion.
5. Prohibit all open sparks or flames in areas near pits or storage facilities.
6. Electric motors, fixtures and wiring near manure storage structures should be kept in good condition to prevent a spark from igniting the methane.
7. Entry into a confined space should not be performed without a proper breathing apparatus.
8. Post warning signs to keep people away from dangerous confined spaces.
9. Have someone outside the manure pit to call for help if needed.
10. Do not try to rescue a person who has been overcome by the gas. Call for help immediately.

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