9.0 Slurry storage and gas poisoning with organic matter

Risk assessment
In Ireland, over 40 million tonnes of slurry are stored, handled and spread each year. This presents two particular safety and health problems. Gas poisoning and drowning in slurry and water caused 20 (10%) farm deaths between 2006 and 2015.

9.1 Drowning in slurry and water

- drowning is by far the most common stated cause of death involving slurry,
- in the period 2006-2015 there were two deaths where children/young persons drowned on farms, and
- where possible, fence off water hazards and take a cautious approach when working near water tanks, ponds, rivers or lakes.

Protect against drowning in slurry by taking the following precautions:

- Open slurry tanks should be protected by an unclimbable fence or wall at least 1.8 metres high, with locked gates. When this type of storage tank has to be emptied, consider putting in place an adequately constructed access platform with safety rails.
- Covered or slatted tanks require access manholes that children cannot open easily. A safety grid should be fitted below the manhole cover to give secondary protection.
- Department of Agriculture, Food and the Marine specification S.123 gives full details on the protection and layout of slurry tanks.
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9.2. Slurry gas poisoning

Decay of slurry, dairy washing or any liquid containing organic matter produces a mixture of dangerous gases, including hydrogen sulphide, methane, carbon dioxide and ammonia. Some gases, like methane, are highly flammable. One slurry gas in particular, hydrogen sulphide, is extremely toxic and poisonous. All these gases are heavier than air, so they displace oxygen and will accumulate at the bottom of tanks. This can lead to suffocation when a person enters a tank even when empty.

When slurry is disturbed by agitation, the gases within the slurry are released. Gas release happens mainly in the first 30 minutes after agitation begins.

Gases can build up in partially emptied tanks above the slurry, so never enter a tank for any reason.

Smell is no indicator of the absence of gas, as many gases are odourless. Hydrogen sulphide has a ‘rotten egg’ smell at low levels, but cannot be smelt at higher levels. High levels can be released when slurry is agitated. One breath or lung-full at high level can cause INSTANT death.

Gas release from slurry is greatest in the following circumstances:

- within 30 minutes of agitation beginning, especially after the surface crust is broken;
- when effluent has been added, leading to acidification of the slurry;
- when slurry has been stored for a long period;
- when jetting is used rather than sub-surface agitation;
- when slurry is agitated in deep tanks; and
- when slurry is mixed with cold water.

**Precautions**

- check weather forecasts,
- only agitate where there is good air movement,
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- evacuate all livestock and make sure no person or animal is in or near the building,
- open all doors and outlets to provide a draught,
- at least two people should be present and should stay up-wind,
- never stand over slats or near tank access points when agitation is in progress,
- avoid vigorous agitation in confined spaces,
- do not allow slurry to rise within 300mm of the slats or tank covers,
- keep all people away from the agitation point for 30 minutes after agitation,
- avoid naked flames, as the gas mixture can be highly flammable, and
- a slurry safety sign should be installed on the wall or shed near all agitation points.

Confined spaces

Never enter, or allow others to enter, any tank or confined space without breathing apparatus. Gas build-up due to decomposition of organic matter can lead to poisonous gases and lack of oxygen. Death can be instant. Rescue may be impossible as any rescuer must wear breathing apparatus. Rescue attempts have led to multiple deaths.

If you suspect someone has been overcome by slurry gas switch off the agitation, contact and inform the emergency services immediately and wait for assistance.

9.3 Slurry gas monitors

The use of slurry gas monitors and detectors as a means of protection against the risk of exposure to slurry gas is not recommended. The following advice in relation to such devices should be taken into account;

- Because of the potentially fatal consequences of exposure to slurry gases at relatively low concentrations, it cannot be guaranteed that the device will give adequate prior warning.
- The essential primary safety precautions set out in 9.2 above should be followed.
- Slurry gas monitors and detectors if used should only be regarded as a back up to the primary precautions and are generally of little or no benefit.
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9.4. Storage and handling of spent mushroom compost

Mushroom compost stored in bulk, especially when not turned for aeration, produces dangerous levels of hydrogen sulphide gas in the interior of the heap. Precautions when handling this material include:

- Never handle the spent mushroom compost in an enclosed space, such as sheds, tanks or trailers, where the toxic gas can build up. Make sure that there is good thorough ventilation when moving compost.
- Children should not have access to stored spent mushroom compost and particularly should be kept well away during any handling or removal.
- Compost should not be moved on a calm day. Only handle compost on a windy day when there is good air movement.
- Keep persons not directly involved in the work well away from the general work area.
- Persons using machinery to move spent mushroom compost should keep cab doors and windows closed and a hydrogen sulphide monitor should be used inside the cab.
- If it’s possible that hydrogen sulphide is present, as indicated by the smell of rotten eggs, certified fresh-air breathing apparatus should be used, in addition to the controls listed previously.
- Never work alone when dealing with spent mushroom compost.
- Stores must be constructed in accordance with Department of Agriculture, Food and the Marine specification S.108. (available at www.agriculture.gov.ie).