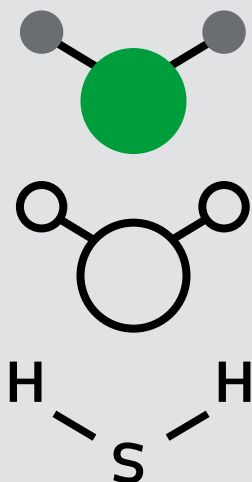


Hydrogen sulphide: More serious than just a bad smell

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- Hydrogen sulphide smells of rotten eggs
- It is unsafe, though, to assume that no smell = no hydrogen sulphide
- It is toxic, flammable and corrosive

Legal Workplace Exposure Limits

- Time weighted average (8 hour shift – longer term) = maximum of 5ppm or 7 mg/m³
- Short term limit (15 minute shift) = maximum of 10ppm or 14 mg/m³

What is hydrogen sulphide?

Hydrogen sulphide, chemical formula H₂S, is a colourless gas smelling of rotten eggs. It is very poisonous, corrosive, and flammable. It is created naturally by decaying organic matter and is released from sewage sludge, liquid manure, and sulphur hot springs. In industry, it is formed when sulphur is removed from products in the petroleum refining process and is a by-product of paper pulping.

Hydrogen sulphide is heavier than air and may travel along the ground. It collects in low-lying and enclosed, poorly-ventilated areas such as basements, tunnels, manholes, sewer lines, underground telephone vaults and manure pits.

The primary route of exposure is inhalation; the gas is rapidly absorbed by the lungs. Absorption through the skin is minimal. The "rotten egg" odour of hydrogen sulphide is obvious, even at low concentrations in air. However, with continuous low-level exposure, or at high concentrations, a person loses his/her ability to smell the gas even though it is still present due to 'olfactory fatigue'. This can happen very rapidly and, at high concentrations, the ability to smell the gas can be lost instantaneously. Therefore, one's sense of smell cannot be relied upon to indicate the presence of hydrogen sulphide.

Apart from being poisonous, hydrogen sulphide is a highly flammable gas and gas/air mixtures can be explosive. It may travel to sources of ignition and flash back. If ignited, the gas burns to produce other toxic vapours and gases, such as sulphur dioxide.



The dangers of hydrogen sulphide at different concentrations

Hydrogen sulphide has been identified as the cause of unconsciousness and death in a number of occupational exposure incidents. In the UK, around 125,000 workers at any one time are potentially exposed to hydrogen sulphide in work related to the treatment of sewage, effluent waste and farm slurry. In the offshore oil and gas industries, about 3000 workers are potentially exposed. The Health and Safety Executive has investigated several workplace accidents involving hydrogen sulphide exposure from slurry pits, animal rendering plants and biodigester facilities in recent years.



“ In the UK, around 125,000 workers at any one time are potentially exposed to hydrogen sulphide ”

In addition to its proven effects on health, hydrogen sulphide has been linked to:

- Alzheimer’s disease
- Ischemic stroke
- Neurodegeneration

Exposure limits (ppm)	Health Effects
0.008-0.2	Olfactory threshold –“rotten eggs” smell detectable
20	Sense of smell to gas lost. Concentrations tolerated for some hours without harm
20-50	Eye irritation
50	Prolonged exposure may cause pharyngitis and bronchitis
60	Prolonged exposure may cause conjunctivitis and eye pain
150+	Irritation of upper respiratory tract Sense of smell lost
250	Pulmonary oedema with risk of death
500	Very dangerous, evacuation should occur well below this level
1000	Loss of consciousness occurs
1000-2000	Acute intoxication: symptoms include rapid breathing, distress, nausea and vomiting. May be rapidly followed by loss of consciousness, coma and cessation of breathing.
2000+	Immediate loss of consciousness and high probability of death



Handling the threat of hydrogen sulphide

Before entering areas where hydrogen sulphide may be present, the air must be tested for its presence and concentration by a qualified person using air monitoring equipment, such as hydrogen sulphide detector tubes or a multi-gas meter that detects the gas. Testing should also determine if fire/ explosion precautions are necessary.

Hand-held detection equipment for hydrogen sulphide generally has a minimum-detection threshold of 1 ppm. OSHA and NIOSH standards are above this detection limit, so such equipment is good for monitoring acute exposures. However, it will not detect hydrogen sulphide at levels below 1 ppm, which can affect health if exposure is continuous. At these levels, though, the presence of the gas is detectable through its smell.

Where hydrogen sulphide is present, the space affected must be ventilated continually to remove the gas.

If the gas cannot be removed, the person entering the space/ area must use appropriate respiratory protection and any other necessary personal protective equipment, rescue and communication equipment.

Further information

UK Government

[Hydrogen sulphide: health effects, incident management and toxicology](#)

HSE – Offshore

COSHH essentials

[No 6 – Hydrogen sulphide](#)

The International Volcanic Health Hazard Network

<http://www.ivhnh.org/>

Science Direct

[Case studies of hydrogen sulphide occupational exposure incidents in the UK](#)

How to control hydrogen sulphide?

The best way to control hydrogen sulphide is simply to keep it in the ground! This can be achieved by creating a positive pressure. By forcing fresh air into the affected area, gases like hydrogen sulphide are prevented from leaking into the work area. In situations like tunnels, where there is an opening each end, by forcing air from one end to the other the hydrogen sulphide can be diluted to a level which isn't harmful.



NEVER USE NEGATIVE PRESSURE WHEN THERE IS A RISK OF HYDROGEN SULPHIDE!