



Technical Bulletin

Hydrogen Sulfide (H₂S)

Hydrogen Sulfide is a naturally occurring element found in some crude oils. It can sometimes be found in refined products such as bunker fuel. It is a colorless gas that is heavier than air and has a distinctive odor of rotten eggs. H₂S can be harmful to human health and at certain concentrations lethal.

H ₂ S Concentration (ppm in air)	Effect(s)
0.001 - 0.3	Odor threshold (highly variable)
1	ACGIH TLV-TWA (Threshold Limit Value -Time Weighted Average) ¹
1 - 5	Moderately offensive odor
5	ACGIH STEL (Short Term Exposure Limit) ¹
20 - 50	Eye and lung irritation
100	Concentration that can be endured for 1 hour without serious consequences which may include: olfactory fatigue, respiratory irritation, conjunctivitis, etc ²
150 - 200	Sense of smell paralyzed; severe eye and lung irritation
250 - 500	Pulmonary oedema may occur, especially if exposure is prolonged
500	Serious damage to eyes within 30 minutes; severe lung irritation; unconsciousness and death within 4-8 hours
1000	Breathing may stop within one or two breaths; immediate collapse; "knockdown"

It is important to distinguish between concentrations of H₂S in the atmosphere and concentrations in liquid. It is not possible to accurately predict the likely vapor concentration for a given liquid concentration. Vapor levels of H₂S in the head space of onboard vessel bunker tanks are dependent upon varying factors such as temperature changes, head space configuration and tank circulation compared to corresponding levels of H₂S in the liquid portion of the product. The levels of H₂S in liquid can be reduced using H₂S scavengers. The concentration in the vapor space of a bunker tank can be successfully lowered by forced air ventilation. In both of these cases H₂S levels may increase at some point in the future if the bunker fuel is heated, transferred or agitated.



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The 2 ppm (in liquid) specification for H₂S in ISO 8217:2010 for bunker fuels will assist vessel operators to lower the risk of hazardous vapor concentrations, however will not eliminate those risks.

H₂S exposure risks from bunker fuels must be managed as a potential safety hazard by monitoring onboard levels on individual vessels and following industry guidelines such as the International Safety Guide for Oil Tankers and Terminals (ISGOTT). These levels should be monitored adjacent to bunker tanks and tank vents utilizing vapor monitoring devices. It is important for vessel personnel to be aware of the potential of H₂S to be present in the fuel and take appropriate safety precautions at all times.

Threshold Limit Value: – According to IS-GOTT's³ current guide, the Time Weighted Average (TLV-TWA) for H₂S exposure is 5 ppm over a period of eight hours. Since the release of this edition in 2006 industry activity has shown this level to be reduced even further. The American Conference of Governmental Industrial Hygienists (ACGIH) has reduced the H₂S TLV-TWA to 1 ppm in their 2010¹ edition.

Operators should endeavour to ensure that the lowest possible gas concentrations of H₂S are achieved for personnel exposure regardless of what exposure standards the vessel is held to.

References

- 1 American Conference of Governmental Industrial Hygienists (ACGIH) 2010 Exposure Limits for Chemical Substances and Physical Agents & Biological Exposure Indices, ACGIH, Cincinnati, OH
- 2 National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life or Health (IDLH) Values
- 3 International Safety Guide for Oil Tankers and Terminals Fifth Edition 2006 2.3.6.3 Exposure Limits

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DS-F&L-MARINEGBU-FUELS-GSC&TO@exxonmobil.com

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