The 1ppm Hydrogen Sulfide Threshold: Are You Prepared?

Abstract

Dräger recently worked together with ASSE to conduct a survey of its members to determine their awareness of the new hydrogen sulfide standard and the preparedness of their organizations to meet this threshold. This document summarizes the results of the survey.

Introduction

Among deaths from gas inhalation in the workplace, hydrogen sulfide ($\text{H}_2\text{S}$) remains the leading cause. Commonly known as sewer gas, sour gas and stink damp, hydrogen sulfide goes by a number of names, including dihydrogen sulfide, sulphur hydride, hydrosulphuric acid, sulfuretted hydrogen, and hepatic gas. Regardless of what you call it, it can be lethal: any inhalation of $\text{H}_2\text{S}$ in a sufficiently high concentration can cause death.

Recommended Detection Thresholds are Being Lowered

Industrial hygiene organizations are recommending lower thresholds for detection of hazardous gases. For example, the American Conference of Governmental Industrial Hygienists (ACGIH) recently put into place the following limits for $\text{H}_2\text{S}$:

• Threshold Limit Value (TLV): 1 ppm
• Time Weighted Average (TWA): 1.4 mg/m$^3$
• Short Term Exposure Level (STEL): 5 ppm, 7.0 mg/m$^3$

At this point these are guidelines, not legal requirements.

Lack of Industry Awareness

The study reveals that 53% of safety experts in the oil and gas industry are unaware of the new standards.

Short-Term Impact on Hygiene Practices

The majority (76%) of safety experts who know about the new standards reported no urgency to adopt them, despite the increased safety that can result. When asked why they chose not to take action in the short term, their responses were highly varied.

• 33% did not make a change because it was a recommendation rather than a regulatory standard.
• 26% felt that the data does not accurately support the need to lower the threshold limit.
• 11% said they use alternative Personal Protective Equipment to protect their workers.
• 10% said their current Standard Operating Procedures (SOP) do not allow for this change to occur.
• Other responses included “still evaluating,” “not relevant to the business,” “not feasible to incorporate,” “evaluating equipment that can reliably measure to 1ppm.”

Current Alarm Levels Vary Greatly
So, if companies are not using the new TLV standard of 1ppm, what H₂S alarm level are they currently using? The responses varied greatly:

- 39% use 10ppm and 15ppm.
- 35% use 5ppm and 10ppm.
- 15% use 10ppm and 20 ppm.

**Few Have Made Adjustments Recently, Few Plan to Do So**

Of those companies who have not adopted the new ACGIH guidance, only 24% have adjusted their H₂S limits within the last three years. Moreover, only 34% anticipate adjusting their current H₂S limits in the near future.

**Most Believe Detection Below 1ppm Is Important, But Few Think Existing Instruments Can Do It**

Most safety engineers surveyed (64%) believe that it is important that instruments can detect below 1ppm. However, only 41% believe that a 1 ppm H₂S resolution can be seen with accuracy in personal monitoring instruments and 74% are concerned that with the 1 ppm resolution there will be an increase in false readings.

**Majority Think New Standards Would Increase Costs**

The majority (70%) of responders think that adopting the 1ppm levels in their workplace would affect worker-protection costs.

**Almost All Use Personal Monitoring Instruments**

Ninety-two percent of those companies surveyed use personal monitoring instruments as a part of their Industrial Hygiene program. Sixty-two percent of these companies require a daily bump test. Most of those who don’t require a daily bump test have other requirements, such as daily or weekly testing.

**Bump Testing & Calibrations**

For bump tests and calibrations:

- 55% use an internal electronic/mechanical docking station to complete checks and record results.
- 31% manually calibrate the instruments via direct flow of calibration gas and record the results.
- 14% use a third party to conduct calibrations and a manual application of gas for bump tests.

Only 18% allow third-party devices to collect and transmit industrial hygiene data from calibration and bump test stations on their corporate networks to a central device for review at a later time. 56% do not allow it under any circumstance, and 9% allow it only with approval of senior management.

**Knowledge of Using Pentane & Methane**

When survey participants were asked if they were aware of the concerns with using pentane as the only gas source for calibration of catalytic sensors in gas monitoring instruments a little more than
half (53%) were unaware of the concerns or that this practice is recommended. Forty-seven percent were aware that methane should be used for periodic testing as well.

**Summary of Free Form Responses**

The most common responses are grouped below.

- “It’s overkill”: A TWA of 8 hours at 1ppm is hard to monitor and enforce. Standard practice in upstream oil and gas has monitors set at 10ppm with the emergency response plan to evacuate immediately to a safe muster point. The STEL is more realistic; an alarm set at 5 ppm with evacuating the location is better.
- “Will require coordination”: Implementation requires coordination with customers because potential exposures can occur at their sites.
- Recommendation not intended for healthy workers: The ACGIH Committee that established the revised TLV based their 1ppm level on the premise that 15% of the US adult working population has asthma and have negative reactions to H₂S at 1ppm. It was never the committee’s intent to change the standards for healthy workers.
- Unrealistic: Ambient H₂S concentrations in oilfields are frequently found at 3-5 ppm, so a move to 1 and 5 ppm levels is unrealistic for oil & gas. Normal ranges in sour gas facilities usually range between 1 to 3ppm levels.
- Won't be adopted because it’s not the law: while safety professionals generally want a more stringent standard, it won’t be adopted because of direct or indirect costs and the belief that tougher standards will be cumbersome and lead to poor audit pass rates.
- Current standard shows no harm to workers: For decades, oil fields have operated using 10ppm as the PEL/TLV with no quantifiable effect on workers.
- Shorter sensor lifespan: H₂S gas used in calibration of multigas meters shortens the life span of the LEL sensor.
- Not physically possible: current equipment is not yet consistent on 1 ppm resolution.
- Not based on industry knowledge: the committee made these recommendations without adequate H₂S knowledge or work history.

**Summary**

In summary, while the new H₂S limits are recommendations and carry no legal obligations at this time, the message is clear. There is a strong belief by agencies such as ACGIH that these exposure levels will create a safer work environment. Therefore, it is likely that there will be a wider acceptance and implementation among industrial hygienists as more data becomes available. Forward-thinking companies will be preparing for evolution of these standards by considering steps that support these lower limits before they become mandatory. The potential benefits – both in terms of worker safety and cost savings – are significant.

Dräger wishes to thank the membership of the ASSE for their participation in this survey. We hope this summary provides a useful perspective on the current perspective of ASSE members regarding the lower hydrogen sulfide threshold.
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