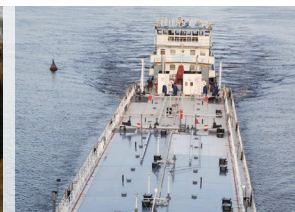




## Critical Considerations for Monitoring Low Levels of Hydrogen Sulfide

by Jacob Spector and Kirk Johnson

## Critical Considerations for Monitoring Low Levels of Hydrogen Sulfide



### A New Threshold of Safety

#### Critical Considerations for Monitoring Low Levels of Hydrogen Sulfide

When it comes to gas detection in today's industrial safety environment, it's not just about what can hurt you right away – it's what can hurt you over a long period of time. That's why experts are becoming increasingly concerned about the long-term health effects of hydrogen sulfide ( $H_2S$ ).

Indeed, the American Conference of Governmental Industrial Hygienists (ACGIH) in 2010 found that prolonged exposure to even small amounts of the gas could damage health. As a result, the ACGIH has dramatically adjusted its recommendation on acceptable  $H_2S$  exposure. The new guideline is leading to a heightened safety culture in industrial organizations, as federal governments such as Canada have already issued new rules with other nations likely to follow suit.

#### Understanding Thresholds and Alarms

Most portable gas monitors are equipped with several alarms to detect immediate or longer-term threats to gas exposure:

- Time-weighted average (TWA) measures the average gas reading over an eight-hour period. For example, if a worker is standing in a 1 ppm concentration of  $H_2S$  gas for eight consecutive hours, the TWA reading will be 1 ppm. Based on the ACGIH recommendations, the gas monitor will produce a TWA alarm.

Likewise, if the worker is standing in  $H_2S$  gas with a concentration of 2 ppm for four consecutive hours, the TWA alarm reading will also be 1 ppm. The monitor will extrapolate the eight-hour exposure and sound the alarm after four hours.

- Short-term exposure limit (STEL) signifies the average gas reading over a 15-minute span. For example, if a worker is standing in  $H_2S$  gas at a 5 ppm concentration for 15 consecutive minutes, the monitor's STEL reading will be 5 ppm. Based on the ACGIH recommendations, the gas monitor will produce a STEL alarm.
- The instantaneous alarm threshold alerts workers as soon as it detects gas concentrations above a specific setting.

“Time-weighted average (TWA) measures the average gas reading over an eight-hour period.”



## Critical Considerations for Monitoring Low Levels of Hydrogen Sulfide



In the new ACGIH guideline, the allowable time-weighted average (TWA) exposure for  $\text{H}_2\text{S}$  over an eight-hour period went from 10 parts per million (ppm) to a mere 1 ppm. Meanwhile, the short-term exposure limit (STEL) was reduced from 15 ppm to 5 ppm for a 15-minute period.

Against this backdrop, accuracy in gas detection is all the more critical to prevent health risk. However, the electrochemical sensing technology in most portable gas monitors has been known to trigger nuisance alarms (sometimes referred to as false alarms), which can cause needless evacuations, confusion and significant productivity losses. Even more, continued nuisance alarms can damage the credibility of a detector, prompting workers to disregard the warnings altogether.

### Ensuring accurate detection without nuisance alarms

Because of their portability, electrochemical sensors provide excellent technology to detect  $\text{H}_2\text{S}$ . However, electrochemical sensors may also exhibit a limitation, as abrupt changes in temperature or humidity — temperature shock — can cause sensors to “drift,” creating inaccurate readings until the sensors stabilize in the new temperature/humidity at low levels of  $\text{H}_2\text{S}$ .

For example, if a worker moves from room temperature to a very hot environment, the sensor may temporarily generate an inappropriately high gas reading. On the other hand, if the worker moves from room temperature to a very cold environment, the detector could potentially show a low, possibly even negative, reading. Either outcome is problematic, as an artificially high reading can generate a nuisance alarm and an artificially low reading can underestimate actual exposure.

One step manufacturers of portable gas detection devices take toward correcting sensor drift is to use a process called “blanking,” which effectively is an algorithm that helps compensate for sensor drift typical of electrochemical sensors.

# Critical Considerations for Monitoring Low Levels of Hydrogen Sulfide

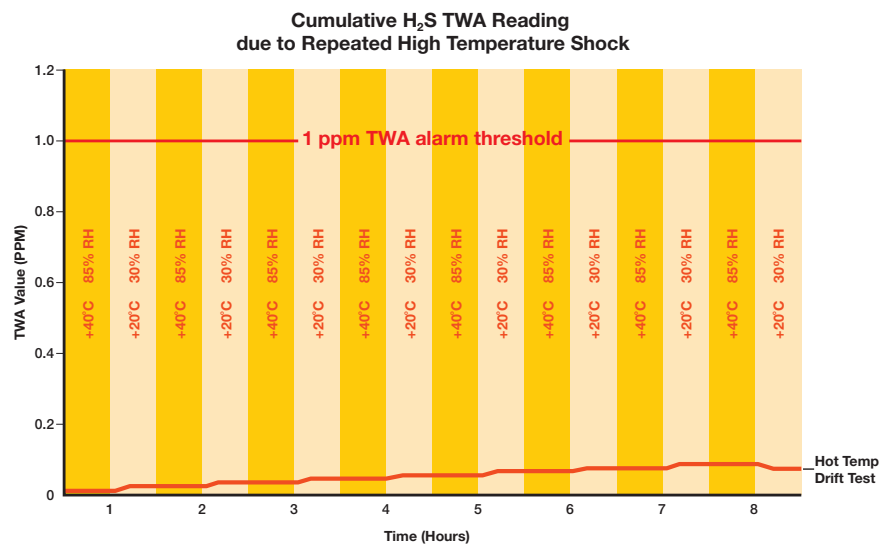


The GasAlertQuattro multi-gas detector: a focus on quality and integrity  
However, many technologies are only as good as the quality of their testing — which is why it's important to use a portable gas detection monitor that has been thoroughly tested to work over a wide range of temperatures and levels of humidity. BW Technologies by Honeywell, for example has put the GasAlertQuattro multi-gas detector through rigorous testing to ensure it accurately detects low levels of H<sub>2</sub>S — in numerous environments, without false alarms.

To verify that the GasAlertQuattro can weather sudden, dramatic changes in temperature and humidity, while maintaining peak reliability, our trials pitted the detector against worst-case temperature fluctuations in real-life work situations. For example, what if a worker uses a truck to visit multiple job sites? While the truck is highly climate-controlled, the sites could be extremely hot or extremely cold.

To replicate this scenario, we conducted a series of tests inside a temperature chamber. One group of tests put the detector at room temperature for an hour, followed by an hour at -20 °C (-4 °F) and then back to room temperature for a third hour. Another series tested the opposite conditions: an hour at room temperature, an hour at 40 °C (104 °F) and an hour back at room temperature. Yet another series alternated the detector between room temperature and intensely hot or cold conditions every half hour for eight hours.

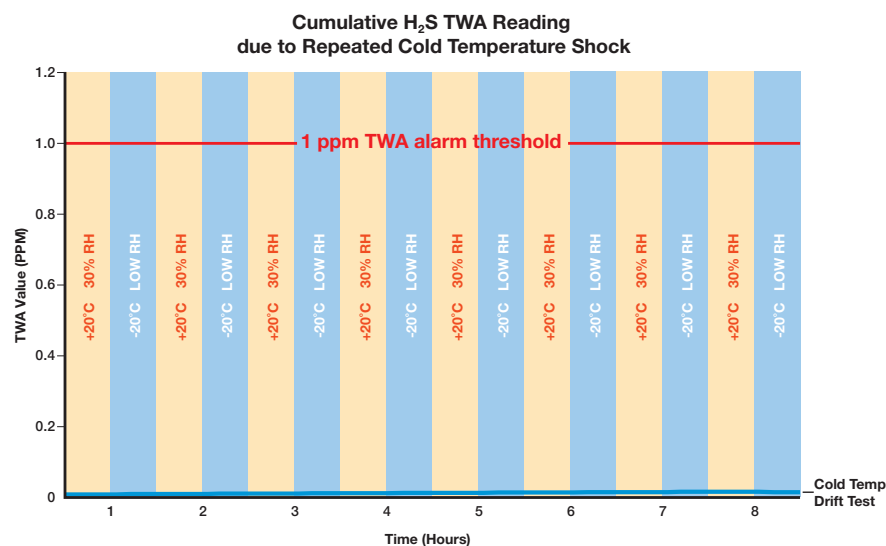
After repeated cycles of high temperature shock, measurable drift in the GasAlertQuattro did not exceed 0.1 ppm



## Critical Considerations for Monitoring Low Levels of Hydrogen Sulfide



After repeated cycles of cold temperature shock, measurable drift in the GasAlertQuattro was negligible



Despite these extreme, worst-case scenarios, the GasAlertQuattro produced reliable readings of H<sub>2</sub>S at low levels — without a nuisance STEL or TWA alarm. While the extreme temperature changes did cause a small measurable drift, the compensating blanking algorithm successfully minimized the impact of these occurrences. Furthermore, low level fluctuations in sensor output did not hamper the monitor's ability to accurately read dangerous conditions, and temperature-generated positive readings did not produce false alarms. These detailed test results, which are available upon request, verify the GasAlertQuattro's reliability in the face of extreme temperature and humidity fluctuations.



### Tips for Monitoring Low Levels of H<sub>2</sub>S

While portable gas monitors are designed to work automatically, you can take these steps to maintain accuracy and reliability:

- Calibrate the monitor at least every 180 days.
- Bump test before each use to ensure sensors are performing properly.
- When you enter extreme temperatures or humidity, perform a fresh-air "auto zero" adjustment, which will help mitigate sensor drift.
- Avoid setting the monitor's instantaneous alarm too low, which could generate false alarms.

# Honeywell Analytics Gas Detection Offerings

Honeywell Analytics gas detectors protect people, assets and environment from toxic and combustible gas hazards, helping to create safer, more comfortable, secure and productive environments. Our strength derives from Honeywell's leadership in sensor technology; in fact Honeywell operates four sensor manufacturing plants, supplying an entire industry with its core detective element.



## Getting into action

While the revised ACGIH H<sub>2</sub>S Threshold Limit Value (TLV) safety recommendations pose a technological challenge, they also create opportunities to further protect worker health, mitigate liability, control healthcare expenses and reduce lost time. That landscape spells an important call to action for gas detection users: It's time to embrace the new H<sub>2</sub>S standards as part of an evolving safety culture.

To get started, take the time to fully understand the ACGIH recommendations, your local regulations and the capabilities of your gas monitors. In today's environment of lower H<sub>2</sub>S thresholds — combined with ongoing pressure to improve productivity and reduce costs — it's never been more important to ensure accurate gas detection without false alarms.

For more information on the GasAlertQuattro, please visit [www.gasalertquattro.com](http://www.gasalertquattro.com) or contact BW Technologies by Honeywell.

Canada  
2840 2nd Ave SE  
Calgary, Alberta, Canada T2A 7X9  
tel +1.403.248.9226  
toll free 1.800.663.4164

America  
405 Barclay Blvd.  
Lincolnshire, IL, USA 60069  
tel +1.847.955.8200  
toll free 1.888.749.8878

Latin & South America  
Marginal de Dodovia dos Bandeirantes,  
100 Distrito Industrial  
Sao Paulo - Brasil  
CEP: 13213-008  
tel +55.11.3309.1030

Europe  
Life Safety Distribution AG  
Javastrasse 2  
8604 Hegnau  
tel +41 (0) 44.943.4300

### Please Note:

While every effort has been made to ensure accuracy in this publication, no responsibility can be accepted for errors or omissions. Data may change, as well as legislation, and you are strongly advised to obtain copies of the most recently issued regulations, standards, and guidelines. This publication is not intended to form the basis of a contract.

WP\_Quattro1ppm\_V2 10/15  
© 2015 Honeywell International Inc.

The Honeywell logo, consisting of the word 'Honeywell' in a bold, red, sans-serif font.