



Safety Alert No. 464  
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## Unexpected H<sub>2</sub>S Detection at Offshore Facilities

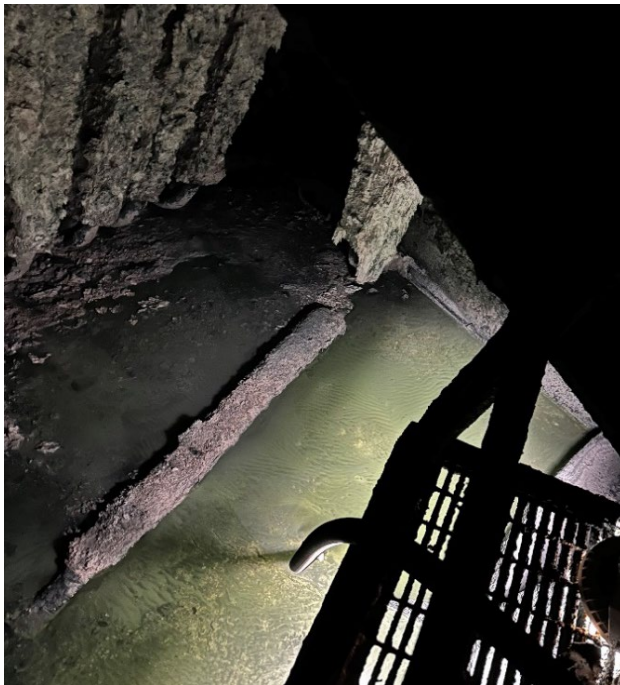


Figure 1: Ballast tank in which H<sub>2</sub>S was detected.

Over the previous two years, offshore oil and natural gas operators have unexpectedly encountered dangerous concentrations of hydrogen sulfide (H<sub>2</sub>S) in both process and non-process areas. These all occurred on facilities producing from fields determined to be “H<sub>2</sub>S absent;” therefore, the offshore energy facilities did not have H<sub>2</sub>S contingency plans in place. Although H<sub>2</sub>S is mostly associated with production from sour petroleum reservoirs, H<sub>2</sub>S can also form in low-oxygen environments from microbial activity during the decomposition of organic material, or by microbial reduction of sulfates. As a result, H<sub>2</sub>S production may occur unexpectedly in areas such as bilges, storage tanks, ballast tanks (Figure 1), chemical totes, and out-of-service process equipment.

### Below are summaries of recent unexpected H<sub>2</sub>S incidents:

- During normal production operations, personnel reported a H<sub>2</sub>S odor downwind of the floatation cell. Using a portable multi-gas detector, a reading of 124 parts-per-million (ppm) H<sub>2</sub>S was observed at the vacuum breaker. Readings taken 5 feet away were observed at 10 ppm, and at 10 feet the level dropped to 0 ppm. The team isolated the block valve, barricaded the area, and introduced biocide treatments to kill the bacteria and eliminate the presence of H<sub>2</sub>S.

H <sub>2</sub> S Levels impacting Personnel Safety	
<b>Immediately Dangerous to Life and Health (IDLH):</b>	100 ppm
<b>*Permissible Exposure Limit (PEL):</b>	20 ppm
<b>*Recommended Exposure Limit (REL):</b>	10 ppm
<b>Typical alarm set points for...</b>	
<b>Stationary detectors:</b>	20 ppm
<b>Portable detectors (handheld/wearable):</b>	10 ppm

\*For more information, please refer to NIOSH or OSHA websites for H<sub>2</sub>S PEL/REL time limits.

- During routine samplings, operators encountered a reading of 40 ppm H<sub>2</sub>S in the process stream via Draeger Tube measurements. The following day a reading of 250 ppm was found in the cargo tanks. Through investigations, it was determined that the source of the H<sub>2</sub>S was bacterial activity and not from the wells. The operator took immediate action to remediate the H<sub>2</sub>S in both the liquid and gas phase.
- During a transfer of a defoamer between day tanks, workers recognized a sour/rotten egg odor. A reading of 136 ppm H<sub>2</sub>S was taken near the tank's opening using a 4-gas monitor. The tank was quickly secured, and exposed personnel were sent in for evaluation as a precautionary measure.
- After observing an initial H<sub>2</sub>S reading of 0 ppm, a worker entered a ballast tank for cleaning. After agitating the sludge layer, the 4-gas monitor began alarming with H<sub>2</sub>S readings as high as 128ppm. The worker immediately exited the tank and work was suspended until an entry plan could be developed to include H<sub>2</sub>S mitigating procedures.

**Therefore, BSEE recommends operators and contractors consider the following:**

- Ensuring personnel understand that H<sub>2</sub>S may be encountered as a by-product of non-hazardous materials even in non-sour service facilities.
- Conducting periodic inspections of stagnant holding tanks to ensure no H<sub>2</sub>S presence.
- Periodically including crew drills focused on unexpected H<sub>2</sub>S encounters, even on non-sour facilities.
- Staying upwind when opening chemical tanks and utilizing a multi-gas detector with H<sub>2</sub>S capabilities to survey for the presence of H<sub>2</sub>S.
- Assessing the presence of H<sub>2</sub>S at the bottom of the tank when personnel are planning to enter it and agitate any sludge that may be present.
- Ensuring operating procedures include routine sampling where oil compositions present an increased potential for souring in the production system.
- Ensuring robust risk assessments when conducting facility level hazards analysis to adequately assess the threat of H<sub>2</sub>S production in vessels, tanks, or other areas that may routinely hold stagnant liquids with low oxygen levels.
- Ensuring the Job Safety Analysis includes a discussion of unexpected encounters of H<sub>2</sub>S and any mitigation necessary when conducting work in areas that have a higher threat of bacterial-generated H<sub>2</sub>S production (i.e., ballast tanks).
- Reviewing [Safety Alert 366](#) "Dangerous Levels of H<sub>2</sub>S Detected at Offshore Facilities."
- Following H<sub>2</sub>S guidelines per 30 CFR 250.490 and [NTL 2009-G31](#).

– BSEE –

A **Safety Alert** is a tool used by BSEE to inform the offshore oil and gas industry of the circumstances surrounding a potential safety issue. It also contains recommendations that could assist avoiding potential incidents on the Outer Continental Shelf.

**Category: H2S, Personnel Safety**