When Should You Monitor for H2S?

» All areas where H2S is present and may exceed 10 ppm must be checked to ensure H2S concentrations are below 10 ppm.
» All personal and remote monitors shall be set to alarm at 10 ppm.
» Consideration should be given to wearing personal monitors in all areas where H2S may be encountered, except where remote sensing is present.
» Consideration should be given to supplement remote sensing with personal monitors if very high H2S may occur.

What Types of Equipment are to be used to Measure H2S?

» GAS DETECTOR TUBES: The detector tubes contain chemical granules, which change color when air containing hydrogen sulfide is pulled through the tube by the hand pump. Common manufacturers include Draeger, RAE and Gastec. Only tubes and hand pumps made by the same manufacturer may be used together. A new tube must be used for each test and the user must be trained in their use and limitations.

» FIXED CONTINUOUS H2S MONITORS: are often installed in operational areas, which have a high risk of H2S release. These monitors usually consist of a detector, or sensing head, beacon light and a horn installed out in the operational area, and an indicating meter and alarm inside the control room. When H2S levels exceed 10 ppm, a signal passes from the detector to the meter and an alarm is sounded in the control room and operations area.

» PORTABLE CONTINUOUS H2S MONITORS: can be worn or carried. These detectors measure H2S concentration electrically, and have an audio alarm that sounds when levels above 10 ppm are detected. Some types test for more than one gas (e.g., flammable gases, carbon monoxide and oxygen in addition to H2S).

How Do You Test for H2S?

Only conduct testing if you have been trained in the use and limitations of monitoring equipment.

When you suspect a gas leak:

» Wear pressure-demand self-contained breathing apparatus (SCBA) or supplied air-breathing apparatus (SABA).
» Use portable continuous H2S monitors or gas detector tubes to find the source of the leak.

When you must enter a CONFINED SPACE* which may contain H2S or H2S Critical Tasks (see Appendix A) which require SCBA/SABA (see GS Selection and Use of RPE):

» Wear pressure-demand self-contained breathing apparatus (SCBA) or supplied air-breathing apparatus (SABA) and a safety belt with a lifeline attached.
» Test each compartment in the confined space, using a portable continuous monitor or a new tube for each test.
» Perform gas tests more than once during the operation. Stirred up sludge may release H2S.
» Use a sampling pump with the extendible probe to test in confined spaces and in areas that are difficult to get to.
» You may also need to check for other gases in addition to H2S.

*Note: a confined space is any enclosed place or area having limited means of entry and exit. This includes tanks, columns, towers, pipelines, sewers, sumps, valve boxes, and excavations.

When you are do any other H2S Critical Tasks (see Appendix A)?

» Use a portable continuous monitor that has been calibrated and maintained in accordance with manufacturer’s specifications.

What Happens if an H2S Alarm Sounds?

» Follow the site Emergency Response Plan for H2S release (GS Advice for Implementers - Emergency Planning).
» The plan will differ depending on the operation, but basically each operation employee must know how to:

1. Sound an alarm to warn other people in the area.
2. Put on a breathing apparatus to protect yourself and the others immediately.
3. Evacuate to a safe upwind location after checking the wind direction.

» Concentrations above 10 ppm require communication with other personnel to warn of an H2S hazard and to ensure that further testing is performed.
How do you know if Monitors are Working Properly?

Portable and fixed continuous monitors MUST be regularly checked and maintained, or they may fail to sound an alarm when a gas release occurs. Routine maintenance also decreases the chance of a false alarm from the monitor.

» Monitors must be checked at least quarterly by a qualified person or more frequently if recommended by the manufacturer (faulty monitors should be reported to be fixed immediately).
» A known concentration of H2S must be used to calibrate the monitor.
» A regular schedule must be observed to calibrate the monitors. Keep a record of Calibration dates.
» When a fixed monitor is being tested, EVERY PERSON in the area should be informed that a Test, and not an actual gas emergency, is in progress.
» Before each use portable monitors must be checked to ensure batteries and the units are functioning. Only conduct maintenance and repair of these units in non-hazardous locations to prevent accidental ignition of combustible gases.
» The presence of other gases may lead to false readings: typically high concentrations of sulphur dioxide result in higher than actual H2S readings on the meter while high concentrations of nitrogen dioxide or chlorine result in lower than actual readings H2S readings on the meter. Check with the manufacturer of your monitor if these gases are present at your worksite.

Fire and Explosion Hazards

H2S is a flammable gas and many of the gases and vapours that accompany H2S are flammable as well. As such, controlling for and monitoring of flammable atmospheres is also important. In particular when workers are in an environment greater than 10 ppm and using supplied-air respiratory protection, measurement of the atmosphere for flammability is still required. This introduces a challenge as high H2S can poison combustible beed lower explosive limit (LEL) sensors; however, an infrared LEL sensor can be used that is not negatively affected by the presence of H2S.

Information Training and Supervision:

**Employer responsibilities**

» Ensuring the availability of required H2S monitoring equipment and calibration supplies.
» Ensuring that monitoring equipment is maintained in accordance with manufacturer’s specifications.
» Developing and implementing an emergency response plan for H2S at their work site.

**Supervisor responsibilities**

» Ensuring the availability of the Guidance Sheets required by the Safety Protocol for Chemical Management (GS Hydrogen Sulphide (H2S) Gas Monitors).
» Organizing the work to limit the time workers are exposed to hydrogen sulfide.
» Educating workers about the hazards of and on hydrogen sulfide through completion of H2S Alive training.
» Providing backup personnel that have both of H2S Alive training and training in local emergency response and rescue personnel if entry into atmospheres with more than 100 ppm.
» Providing required respiratory protective and gas monitoring equipment

**Worker responsibilities**

» Workers must participate in training and monitoring programs in the workplace
» Workers must use and maintain all controls and equipment used to reduce exposure properly
» Workers must use respiratory protective and gas monitoring equipment if required.

**PRECAUTIONS YOU SHOULD TAKE**

- Ask your employer about the risks, what precautions to take and what to do in an emergency;
- Follow the safe working procedures laid down by your employer;
- Keep your H2S Alive Training current;
- Use the gas monitoring equipment and personal protective equipment provided, i.e. respiratory protection and H2S monitors,
- Don’t enter any area that may contain H2S before it has been tested.
- Report to your employer or safety representative any damaged or defective H2S monitoring systems or protective equipment; and at your workplace.
Appendix A: Examples of Critical H2S Tasks

The following table should be used as a guide to operations where high hydrogen sulfide exposures may be expected. However, it is not comprehensive. A risk assessment of the work operation should be performed, taking into account the following:

- H2S content of the process stream;
- previous exposure monitoring results;
- operation factors (e.g., purging, degassing, temperature/pressure of process stream), and;
- ventilation

<table>
<thead>
<tr>
<th>Task</th>
<th>H2S Monitors Required</th>
<th>SCBA/SABA Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any task where a risk assessment has determined that hazardous H2S concentrations may be present</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Any time when H2S concentration in the air is known or suspected to be &gt;10 ppm</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Any time there is an indication of equipment failure or product leak</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Entering a confined space where H2S may be present or contains sour liquids</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Entering caissons, sewer, deep excavations or other low-lying areas where H2S may be present</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Routine operation of sewage-treatment facilities</td>
<td>Yes</td>
<td>no</td>
</tr>
<tr>
<td>Responding to H2S alarms</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Entering buildings with H2S alarms/beacons activated</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Well maintenance (valve, pump jack servicing, etc.)</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Piggling</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Breaking equipment integrity or when &gt; 10 ppm H2S in air</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Maintenance on equipment without breaking integrity</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Filter changes</td>
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<td>yes</td>
</tr>
<tr>
<td>Entering compressor basements</td>
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<td>yes</td>
</tr>
<tr>
<td>Responding to H2S alarms</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Sampling with open containers</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Sampling with closed containers</td>
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<td>no</td>
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<tr>
<td>Gauging tanks</td>
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<td>yes</td>
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<tr>
<td>Maintenance on purged equipment</td>
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<tr>
<td>Entering dikes/fire walls</td>
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<td>no</td>
</tr>
<tr>
<td>Routine operations</td>
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<td>no</td>
</tr>
<tr>
<td>General trucking sour fluids</td>
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<td>no</td>
</tr>
<tr>
<td>Uncoupling lines containing sour products</td>
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<td>yes</td>
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<tr>
<td>Sulphur truck loading with degassing</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>without degassing</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Sulphur rail car loading</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>