

HYDROGEN SULFIDE

*DETECT
AND DEFEND*



DANGER
HYDROGEN
SULFIDE (H₂S)

LEADER'S GUIDE

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ABOUT THIS COURSE

Hydrogen sulfide is a leading cause of inhalation-related deaths in the workplace. It's toxic, flammable, and can even be explosive. It often cannot be detected with your senses alone. If you're at risk of exposure and don't know how to protect yourself, hydrogen sulfide can be a dangerous killer. In this course, ***Hydrogen Sulfide: Detect and Defend***, we'll identify the dangers of hydrogen sulfide and show you how to defend yourself against the hazards of exposure. We'll describe how hydrogen sulfide is produced, its chemical properties and how to respond to its health and safety hazards. We'll identify various hazard prevention strategies and finally, show how to avoid exposure by using personal protective equipment.

The program is 15 minutes long and can be viewed straight through by selecting "Play Program" from the DVD main menu. To view the program in chapters, which permits discussion during viewing, select "Program Outline."

Overview of Course

Introduction

Overview and Objectives

Production

Production of Hydrogen Sulfide

Properties and Labeling

Physical and Chemical Properties

Health and Safety Hazards

Health Hazards and First Aid

Hazard Prevention Strategies

Safe Work Permits

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Personal Protective Equipment

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Training Materials

There are a few things you'll need for an effective training session:

- A training room located away from major distractions or interruptions
- A comfortable arrangement of chairs and tables, preferably in a circular pattern, with an opening for a TV monitor and other visual aids. (Be certain all participants can see the TV monitor and other visual aids.)
- Adequate lighting that can be adjusted while viewing the program
- A location, possibly including a podium and/or a flip chart, from which the trainer/speaker can lead discussion
- The training program *Hydrogen Sulfide: Detect and Defend*
- TV or DVD player/computer with projector and remote
- Copies of the daily schedule
- A copy of the handbook, paper and pencil for each participant
- A flip chart or dry-erase board and appropriate markers
- A computer with PowerPoint® software and the PowerPoint® Presentation
- Copies of the Quiz and the Course Evaluation, both printable from the DVD.

Session Checklist

Preparation Activities a few days before session begins:

- ☐ Ensure room is reserved.
- ☐ Identify location and quantity of all required materials.
- ☐ Obtain class roster; ensure student notifications and administrative issues are handled.
- ☐ Make name tags or table tents for students' name or provide blank ones and markers.
- ☐ Obtain parking passes for participants, if appropriate.
- ☐ Print the sign-in sheet.
- ☐ Verify that audio-visual equipment operates properly.
- ☐ Check your instructor materials and notes.
- ☐ Reproduce any additional handouts, e.g., daily schedule, evaluation forms.
- ☐ Rehearse your presentation. Practice using the instructional aids and conducting any demonstrations. Make notes and write down any additional points you plan to discuss.

Preparation the day of training:

- ☐ Set up the classroom; arranging tables, chairs for your intended purpose.
- ☐ Check audio-visual equipment.
- ☐ Distribute class supplies (paper, pens, workbooks, etc.).
- ☐ Consider refreshments.
- ☐ Make sure the classroom environment is pleasant and comfortable (temperature, lighting, etc.).
- ☐ Write your name on the board.

Opening the Session

- ☐ Greet the students at the door; establish relationships, set the tone.
- ☐ Welcome formally; establish positive atmosphere.
- ☐ Explain agenda and objectives for the session.
- ☐ Discuss participant materials.
- ☐ Use an ice breaker to motivate audience.
- ☐ Provide "big picture" of the training session.

After session action:

- ☐ Clean up the classroom.
- ☐ Thank those who supported your session.
- ☐ Summarize student evaluation forms.
- ☐ Send out any promised information.
- ☐ Review your instructor notes and write down any observations of what you would change or do differently the next time.

KEY POINTS OF TRAINING COURSE AND DISCUSSION TOPICS

Introduction

Overview and Objectives

Change attitudes by increasing workers' safety awareness of hydrogen sulfide (H₂S), specifically on the topics of production and properties, health and safety hazards, and hazard prevention strategies.

Production

Production of Hydrogen Sulfide

Objective: Describe how hydrogen sulfide is produced.

Key Points

- Hydrogen sulfide is a toxic, colorless gas that is produced naturally as well as industrially
- Identify how hydrogen sulfide is produced, both in nature and industrially
- Identify areas that pose a significant risk for exposure.

Discussion Topic

- Identify areas and examples of where and how you could be exposed to hydrogen sulfide, both at work and off the job.

Properties and Labeling

Physical and Chemical Properties

Objective: Describe physical and chemical properties of hydrogen sulfide.

Key Points

- Identify the Globally Harmonized System (GHS) classification and labeling for hydrogen sulfide
 - » Give examples of GHS label components
 - Product identifier
 - Signal word
 - Hazard statement
 - Precautionary statement
 - Pictograms
 - Name, address, and telephone number of the manufacturer, importer or other responsible party.

Discussion Topic

- Locate an example of a Safety Data Sheet (SDS) or Hazard Communication label for hydrogen sulfide in your facility or work area, and share it with the group. Discuss each part of the label and the importance of the information provided.

Health and Safety Hazards

Health Hazards and First Aid

Objective: Describe the health hazards and first aid.

Key Points

- Inhalation exposure
 - » Symptoms – Irritated nose, throat and lungs; headaches; dizziness; breathing difficulty, coughing; nausea; coma and even death
 - » Treatment – Leave area immediately, get to fresh air and seek medical attention
- Eye exposure
 - » Symptoms – Burning, discomfort, watering and redness
 - » Treatment – Flush eyes continuously for at least 15 minutes, seek medical attention
- Skin exposure
 - » Symptoms – Irritated eyes; burning, discomfort, frostbite or redness of skin
 - » Treatment – Remove clothing, wash skin, and seek medical attention
- Locate safety showers and eyewash stations and test these regularly
- Know your company's emergency procedures.

Discussion Topic

- Review your company's emergency procedures. Ask participants if they know what to do in the event of hydrogen sulfide exposure.

Hazard Prevention Strategies

Safe Work Permits

Objective: Describe the safe work permits, practices, and air monitoring.

Key Points

- Safe work permits are implemented as hazard prevention techniques to prevent H₂S release or exposure
- Examples of where safe work permits are needed:
 - » Confined spaces
 - » Lockout/tagout
 - » Welding and hot work
 - » Excavation and trenching
- Precautionary measures like lockout/tagout and air monitoring must be practiced as part of the safe work permit.

Discussion Topics

- What safe work permits are needed for the jobs/tasks performed at your facility?
- Discuss how workers obtain safety training and safe work permits for their jobs.

General Safe Work Practices

Objective: Identify examples of safe work permits that help prevent hydrogen sulfide exposures.

Key Points

- Never work alone – use a buddy system
- Good communication is important
- Note which way the wind is blowing so you know the safest escape route
- Check for ignition sources and personnel in downwind areas
- Ensure air monitoring and ventilation system are working properly
- Stay alert and aware of potential hazards.

Discussion Topic

- Ask participants to share safe work practices they use to ensure they and their co-workers remain safe when H₂S is present.

Air Monitoring

Objective: List requirements for air monitoring.

Key Points

- Never rely on your sense of smell – make sure air is tested by a qualified person
 - » Test equipment may include detector tubes or multi-gas meters
- Fixed gas monitors
 - » Can be located where the possibility of widespread contamination exists
- Portable gas monitors
 - » Allow you to check the atmosphere in any location
- Never rely solely on your gas monitor
 - » If you suspect H₂S is present, evacuate immediately and move to a safe location.

Discussion Topic

- Discuss the types of gas monitors you use. Point out locations of any fixed gas monitors throughout the facility, and go over how to use a portable gas monitor.

Personal Protective Equipment (PPE)

PPE Controls

Objective: Describe Personal Protective Equipment (PPE) hazard controls.

Key Points

- Respiratory protection – protects you against three types of exposures
 - » Lower concentrations – below 100 parts per million or ppm
 - Use an air purifying respirator with a cartridge
 - » High concentrations – at or above 100 parts per million or ppm – or unknown concentrations
 - Use a full-face, pressure-demand, self-contained breathing apparatus (SCBA) – a minimum service life of 30 minutes or
 - Use a combination of full-face piece, pressure-demand, supplied-air respirator with auxiliary self-contained air supply
 - » Emergency escape
 - If there is a risk of gas leak emergency, carry an escape SCBA with you
- Eye and face protection
 - » Use safety goggles or face shield combined with safety glasses
- Skin protection
 - » Wear protective gloves, coveralls, boots and full-face protection
- Personal hygiene
 - » Remove exposed clothing and dispose of it according to your employer's guidelines
 - » Never eat, drink or smoke while working around toxic chemicals
 - » When you leave the site, wash your hands before eating, drinking, smoking or applying cosmetics.

Discussion Topic

- Identify what types of PPE are needed in your facility. Ensure the participants are familiar with the PPE needed for their jobs, and how to use them properly.

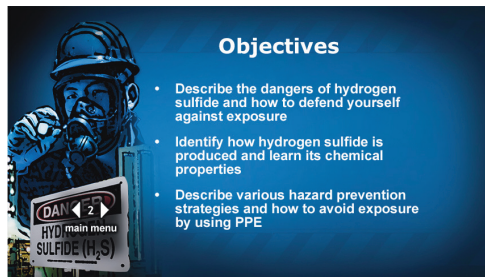
Summary

Now that you know the importance of following all the safety guidelines for working around hydrogen sulfide, it's up to you to follow them. Safety is about being constantly aware of what's going on around you and staying focused on every detail of the job you've been trained to perform. By following the right procedures and staying aware, you can keep your workplace productive and safe.

TRAINING POINTS AND POWERPOINT® OVERVIEW



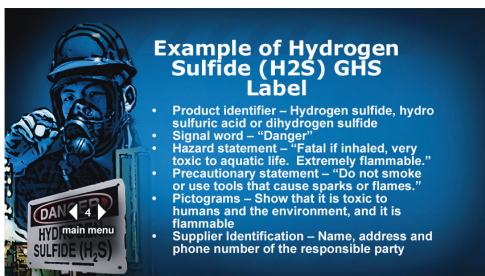
Title Slide



Slide 2



Slide 3



Slide 4

TRAINING POINTS AND POWERPOINT® OVERVIEW Continued



Health and Safety Hazards

- Inhalation exposure
 - Symptoms – Irritated throat, nose and lungs; headaches; dizziness; shortness of breath, coughing; nausea; coma and even death
- Eye exposure
 - Symptoms – Burning, discomfort, watering and redness
- Skin exposure
 - Symptoms – Irritated eyes; burning, discomfort, frostbite or redness of the skin


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Safe Work Permits

- Are designed to make the location safe before authorized work is started in areas where H₂S may be present
- Examples of where safe work permits are needed:
 - Confined spaces
 - Lockout/tagout
 - Welding and hot work
 - Excavation and trenching
- Lockout/tagout and air monitoring must be practiced as part of the safe work permit

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Safe Work Practices

- Never work alone – use buddy system
- Good communication is important
- Note which way the wind is blowing so you know the safest escape route
- Check for ignition sources and personnel in downwind areas
- Ensure air monitoring and ventilation system are working properly
- Stay alert and aware of potential hazards

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Air Monitoring

- Ensure air is tested by a qualified person – do not rely on sense of smell
 - Test equipment may include detector tubes or multi-gas meters
- Fixed gas monitors
 - Can be located where the possibility of widespread contamination exists
- Portable gas monitors
 - Allow you to check the atmosphere in any location
- If you suspect H₂S is present, evacuate immediately to a safe location

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TRAINING POINTS AND POWERPOINT® OVERVIEW Continued



PPE Controls – Respiratory Protection

- When entering lower concentrations
 - Use an air purifying respirator with a cartridge
- When entering high or unknown concentrations
 - Use a full-face, pressure-demand, self-contained breathing apparatus (SCBA)
 - Use a full-face piece, pressure-demand, supplied-air respirator with self-contained air supply
- For emergency escape
 - Carry an escape SCBA with you and use during emergencies

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PPE Controls

- Eye and face protection
 - Use safety goggles or face shield combined with safety glasses
- Skin protection
 - Wear protective gloves, coveralls, boots and full-face protection
- Personal hygiene
 - Remove exposed clothing and dispose of it according to your employer's guidelines
 - Never eat, drink or smoke while working around toxic chemicals

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Summary

- It's your responsibility to know and follow safety guidelines when working around H₂S
- Stay safe by being constantly aware and staying focused

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CUSTOMIZING A POWERPOINT® PRESENTATION

The PowerPoint® presentations included on the DVD products are customizable when used on a computer loaded with Microsoft PowerPoint® software. (Note: In the following instructions, “click” implies a click with your left mouse button. If a “right” click is necessary, it will be so indicated.) Microsoft PowerPoint® has many features. The following steps will help you customize our presentations quickly.

To customize a presentation:

If the “Customizable Version” icon is displayed on the landing screen, click on this option. If this option is not available, click on the PowerPoint® presentation to open it.

Save this presentation to another location, such as your hard drive or a folder on the network. You will make your customizations on the saved version.

To add, copy, hide or remove a slide, or to change the order of the slides in the presentation:

Click on “View” on the menu bar.

Click on “Slide Sorter” from the “View” menu. Or, under the “Normal” view, you may use the “Outline” on the left side of the screen.

To add a slide, place your cursor in front of the slide where you want to add a slide. Click on “Insert” on the menu bar. Then, click on “New Slide” on the “Insert” menu. Or, click on the “New Slide” tool on the tool bar. Choose a slide format to fit your desired content, and follow the prompts given.

Sometimes it’s easier to copy a slide, and then change the content of the slide, than to create a new one. To copy a slide, click on the original slide. Click on “Edit” on the menu bar, and choose “Duplicate.” A new copy will be created to the right of the original slide. Or, click on “Edit” on your menu bar, and choose “Copy.” You may then “Paste” the slide wherever you want it to appear.

To hide a slide from your presentation, but to keep it for future use, right-click on the slide you wish to hide, and choose “Hide Slide” from the menu. Or, click on the “Hide Slide” tool on the tool bar.

To remove a slide from the presentation, click on the slide you want to remove. Click on “Edit” on the menu bar. Then, click on “Delete Slide” on the “Edit” menu. Or, click on the slide, and press the “Delete” key on your keyboard.

To change the order of the slides in the presentation, click on the slide to be moved and while holding the mouse button depressed, drag the slide to its new location. Release your mouse button to place the slide.

If you wish to change or remove the animation effect as you move from slide to slide:

Double-click on the slide you want to change the animated transition on.

Double-click on the text box of the slide. A border and white handles appear around the text box.

Click on “Slide Show” on the menu bar. Then, click on “Preset Animation.” To turn off the effect, choose “Off.” If you wish to change the effect, there are many options to consider.

To edit content of any slide:

Double-click on the slide you want to change.

Double-click on the text box of the slide. A border and white handles appear around the text. Type the desired changes.

Remember to save any changes made to your presentation!

TIPS FOR THE INSTRUCTOR

Presentation Tips

Overcoming anxiety

The best way to overcome anxiety about speaking before a group is to be prepared. Although it's natural to be nervous, your sweaty palms will disappear once you focus on what you are saying. Concentrate on what you want people to understand and your presentation will flow naturally.

Choosing your vocabulary

It's best to use the same comfortable language that you would use when speaking one-on-one. Avoid jargon and overly complicated words or phrases.

Getting rid of the “umms”

One of the most annoying mistakes a speaker makes is saying “umm” every time there is a break between thoughts. Remain silent while you think about what you're going to say next. The silence will seem longer to you than it will to the audience. If you remember this, you'll feel less pressure to fill the silence. You can control your “umms” by jotting down notes beforehand. If you want to include personal anecdotes or examples, write down a few notes to trigger your memory. Beware of writing down too much, however. You'll deliver your message to your note cards instead of your audience.

Controlling the speed and tone of your voice

You'll put your audience to sleep if you speak too slowly, and they won't be able to keep up with the content if you speak too quickly. Approximately 150 words per minute is the best speed (that's about two-thirds of a page, typed, double-spaced). Vary your tone often, especially when making an important point. Adding emotion to your presentation will keep your audience involved. Again, strive for a conversational tone.

Sticking to the schedule

Begin class on time and restart the session promptly at the end of the break. Except for emergencies, participants should not be interrupted for messages.

Question and Answer Techniques

Asking questions is an instructional technique that can maximize the amount of interpersonal interaction in an educational/training session. Generally, the more learners participate and contribute to a discussion, the more they learn from the interaction.

Specific advantages to asking questions to a group of learners include:

- The burden of learning is transferred to the learner.
- The learner becomes more involved in the learning process leading to a relevant and meaningful exchange of thoughts and ideas.
- Both learner and instructor get useful feedback. They learn how effectively a concept has been communicated, whether any misunderstanding exists, and how to clarify certain confusions.
- Questions help explore the content to new, more profound depths.
- Questions may reveal underlying attitudes and opinions of the trainees, as well as provide the instructor with insight into how best to help the trainee learn.

Types of Questions

- Open-ended questions allow respondents to answer in any manner they want. These usually begin with words like *what are*, *where did*, *why are*, *how can*, *tell me*, and so forth.
 - » **Reflective questions** are used to seek confirmation that what you have heard is what was meant, and to encourage learners to clarify their interpretation. Examples are:
“So, what you are saying is that, in your opinion.... Is this correct?”
“If I heard you correctly, you said.... Is that right?”
 - » **Hypothetical questions** ask “what if?” They encourage the learner to guess what would happen in a given situation. An example is:
“What would happen if...?”
- Closed-ended questions limit the response to a specific answer, such as “yes” or “no.” They can be used to recall facts but are not conducive to discussion and interaction from the audience.
 - » **Leading questions** prompt the learner to agree with the questioner. It is a way of questioning that really states the viewpoint of the questioner.
For example:
“But you really wouldn’t do that, would you?”

Effective Questioning Strategies

1. Use leading questions as a means of introducing a new topic or making a transition from one topic to another.
2. Ask the question first and later direct it to an individual. This prompts all participants to consider the question, before you call on someone to provide an answer.
3. Redirect questions whenever possible. You can maximize learner involvement by asking others in the session to answer questions that another student has asked.
4. Be willing to admit if you do not know the answer. Honesty is the best policy; you will lose credibility if you try to bluff your way to an answer. Once you acknowledge you do not know the information, follow up with “I will find the answer!” and later share what you find with all participants.

Evaluation Methods

Following the practice of Donald Kirkpatrick's *Four Level Evaluation Model*, two types of evaluation/assessment instruments are provided.

Level 1 – Reaction

Use a Course Evaluation form to assess how the learner felt about the training or learning experience. Print sufficient copies to distribute to all the learners and collect them after the class ends.

Level 2 – Learning

Use the 10-item multiple choice Quiz to measure the learner's increase in knowledge about this subject matter. Print copies, distribute, and review the Quiz with the learner so that corrective feedback is provided and the learner recognizes what content he or she has mastered. An Answer Key follows the Quiz.

COURSE EVALUATION

Your input is IMPORTANT in helping us evaluate and improve our training programs. Thank you for taking time to think about and respond to the following questions.

Course: _____ Date: _____ Facilitator: _____

About the Course

1. Were the objectives of the course clearly stated? ☐ YES ☐ NO
2. How well were the objectives met by the course?
Were not met 1 2 3 4 5 Were met very well
3. How applicable will this training be to your job?
☐ Almost none of the material will be applicable to my job.
☐ Some will be applicable, but some was confusing or irrelevant.
☐ Absolutely applicable! I look forward to seeing results soon!
4. Was the information presented in a logical and understandable order?
☐ Didn't seem logical at all.
☐ Some was, some wasn't.
☐ Yes, all of it seemed logical and understandable.
5. How useful were the discussions and the exercise(s) in helping you learn the information?
☐ Not useful at all ☐ Somewhat useful ☐ Very useful
6. To what extent did this training meet your expectations?
☐ Did not meet ☐ Met ☐ Exceeded
7. What would you add or change to improve this course?

About the Facilitator

8. Was the facilitator positive and professional? ☐ Very much so ☐ Could improve
9. How well was the facilitator prepared and able to explain the information?
NOT well prepared 1 2 3 4 5 VERY well prepared
10. Did the facilitator create an atmosphere that encouraged questions and learning?
☐ Yes ☐ No – Facilitator should have: _____
11. Did the facilitator explain the material in ways that made it applicable to your job?
☐ Very much so ☐ Sometimes ☐ Almost none was connected to my job
12. Your comments on the facilitator: _____

QUIZ

1. Hydrogen sulfide is:
 - A. A colorless gas
 - B. Nontoxic
 - C. Only produced industrially
 - D. A milky white liquid

2. In nature, hydrogen sulfide is produced:
 - A. During mining operations
 - B. During the petroleum refining process
 - C. By decaying organic matter
 - D. By food processing

3. The statement “H₂S is fatal if inhaled, very toxic to aquatic life. Extremely flammable.” Is an example of a:
 - A. Signal word
 - B. Pictogram
 - C. Precautionary Statement
 - D. Hazard Statement

4. The chemical formula for hydrogen sulfide is:
 - A. H₂O
 - B. HS₂
 - C. H₂S
 - D. None of the above

5. Which of the following is an example of a Signal Word that would be found on a hydrogen sulfide GHS label?
 - A. Danger
 - B. Preservation
 - C. Nontoxic
 - D. Gaseous

6. Which of the following is a type of exposure you can get when working around hydrogen sulfide?
 - A. Inhalation exposure
 - B. Ultra-violent exposure
 - C. Audible exposure
 - D. Aquatic exposure
7. Which type of safe work permit is least likely to involve hydrogen sulfide?
 - A. Lockout/tagout permit
 - B. Crane/lifting permit
 - C. Confined space permit
 - D. Excavation permit
8. Which of the following is a safe work practice you should follow to avoid exposure to hydrogen sulfide:
 - A. Never work alone
 - B. Continually check and remain aware of potential hazards
 - C. Make sure air monitoring and ventilation systems are working properly
 - D. All of the above
9. Two common types of multi-gas meters are:
 - A. Portable and transparent
 - B. Motionless and fixed
 - C. Fixed and portable
 - D. Transparent and fixed
10. What is your best defense against inhalation of hydrogen sulfide?
 - A. Respirator
 - B. Chemical safety goggles
 - C. Coveralls
 - D. Protective gloves

ANSWER KEY

1. A
2. C
3. D
4. C
5. A
6. A
7. B
8. D
9. C
10. A

This Leader's Guide is not intended as a substitute for first-hand knowledge of the applicable regulations. As a developer of high quality training materials, we emphasize the spirit and intent of OSHA regulations and other regulatory bodies.

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HYD002-ENG



Certificate of Completion

given to

for having successfully completed the course

**Hydrogen Sulfide:
Detect and Defend**

Signed by:

Date: