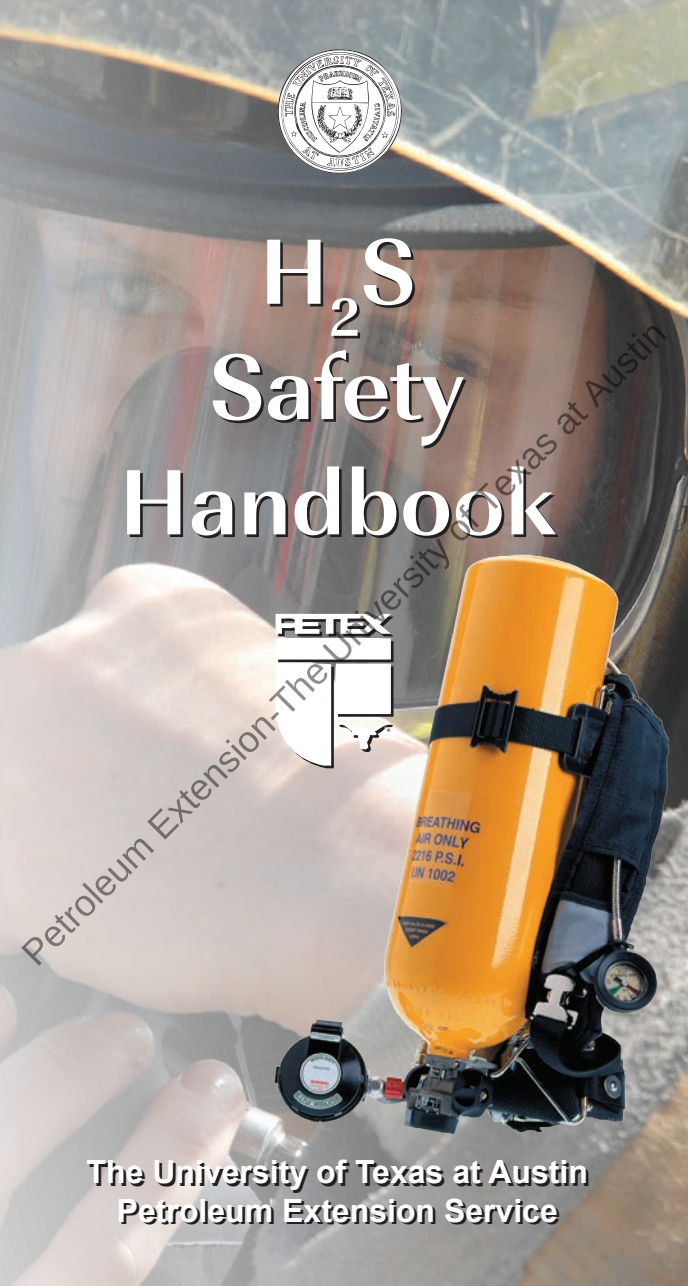
H_2S Safety Handbook



The University of Texas at Austin
Petroleum Extension Service

Contents

Introduction

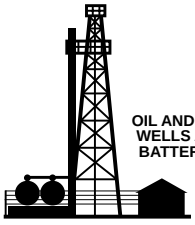
Hydrogen sulfide (H_2S) gas is one of the most dangerous and deadly hazards. It is also known as sour gas and sulfureted hydrogen. Workers in the oil and gas industry are aware of its poisonous properties and must proceed with extreme caution when work conditions involve possible exposure. Sewer maintenance crews, blasters, and miners can also encounter this gas.

Every employer whose workers might become exposed to H_2S gas should make sure they can recognize its presence and protect themselves and others from its lethal effects. Employers should receive and provide the proper training to rescue and administer first aid to victims who are overcome by the gas.

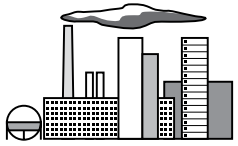
The purpose of this booklet is to help employers and workers use appropriate procedures to identify hazards and minimize risk of exposure.

Be aware.
Take every precaution.

Sources of H_2S



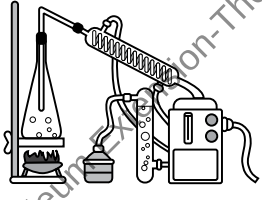
OIL AND GAS WELLS AND BATTERIES



GAS PLANTS, REFINERIES, PETROCHEMICAL PLANTS, SULFUR-RECOVERY PLANTS, PULP MILLS

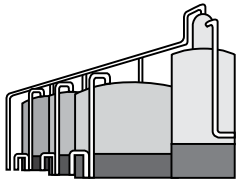
SEWERS

UNDERGROUND MINES



COMMERCIAL LABORATORIES

BLASTING WITH BLACK POWDER



WATER TANKS, FISHERY TANKS

Hazards

H_2S is a highly toxic, colorless gas that is heavier than air and often smells like rotten eggs. If ignited, it turns into a blue flame and produces sulfur dioxide, which is even more toxic than H_2S gas.

H_2S forms explosive mixtures with air. The concentration level at which gas might explode is called the explosive limit. The upper and lower limits are measures of the percent of gas in the air by volume. At concentrations below the lower limit and above the higher limit, the gas is not explosive. An explosion hazard exists if gas in the air measures between the two limits. The lower explosive limit of H_2S is 4.3 percent, and the upper explosive limit is 46.0 percent.

H_2S is most frequently encountered in:

- Producing and refining high-sulfur petroleum
- Natural gases
- Gypsum
- Sulfur mining
- Rock strata
- Underground water (because it is soluble in water)
- Blasting with black powder
- Gas manufacture
- Artificial silks and chemicals manufacture

Detection

There are several ways you can be alerted to the presence of H_2S gas. Your nose often detects the foul odor, but sometimes it might not. Your sense of smell can detect as little as one part of H_2S in 1 million parts of air. If the concentration of gas is in the 100–150 ppm range, your sense of smell is quickly lost, thus inhibiting detection.

When testing for H_2S gas, be prepared for lethal concentrations.

Warning:
You cannot rely on smell to tell you how much H_2S gas is present. Wear breathing apparatus.

To determine the amount of H_2S present in your work area, the following means of detection might be used:

Lead acetate, ampoules, or coated strips

These strips change color (usually to brown or black) in the presence of H_2S. The degree of color indicates concentration. This detection method should be used only as an indicator of the presence of H_2S.

Electronic detectors

This type of personal device is belt-mounted or hand-held. It sounds an audible alarm or gives a readout indicating exposure to a known level of H_2S. Many detectors use microprocessor transmitters to detect H_2S in the air and emit an analog output signal.

Protection

The Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, provides valuable information on H_2S safety as demonstrated in this section from the OSHA Fact Sheet on Hydrogen Sulfide (H_2S).

Protection Against H_2S Exposure*

Before entering areas where H_2S may be present:

1. Air must be tested for the presence and concentration of H_2S by a qualified person using air monitoring equipment, such as H_2S detector tubes or a multi-gas meter that detects gas. Testing should also determine if fire/explosion precautions are necessary.
2. If the gas is present, the space/area must be ventilated continually to remove the gas.
3. If the gas cannot be removed, the person entering the space/area must use appropriate respiratory protection and any other necessary personal protective equipment, rescue, and communication equipment.

   OSHA's Confined Spaces standard contains specific requirements for identifying, monitoring, and entering confined spaces.

To obtain additional training materials, contact:

PETEX
THE UNIVERSITY OF TEXAS AT AUSTIN
PETROLEUM EXTENSION SERVICE
10100 Burnet Road, R8100
Austin, TX 78758

Telephone: 512-471-5940
or 800-687-4132
FAX: 512-471-9410
or 800-687-7839
E-mail: petex@www.utexas.edu
or visit our Web site: www.utexas.edu/ce/petex

To obtain information about our training courses, contact:

PETEX
LEARNING AND ASSESSMENT CENTER
THE UNIVERSITY OF TEXAS
4702 N. Sam Houston Parkway West, Suite 800
Houston, TX 77086

Telephone: 281-443-7144
or 800-687-7052
FAX: 281-443-8722
E-mail: petexhtc@www.utexas.edu
or visit our Web site: www.utexas.edu/ce/petex

ISBN 13: 978-0-88698-224-9
ISBN 10: 0-88698-224-3
9 780886 982249

Catalog no. 2.73020
ISBN 0-88698-224-3
978-0-88698-224-9