Hydrogen sulphide

Control approach R
Respiratory protective equipment

What this sheet covers
This sheet describes good practice for work in areas where hydrogen sulphide may arise. It covers the key points you need to follow to help reduce exposure to an acceptable level, as part of your COSHH assessment.

Hazards
✓ Hydrogen sulphide (H₂S) may be present in hydrocarbon process systems, particularly when reservoirs begin to mature and water out.
✓ In addition to process plant, H₂S may arise in well fluids, drilling muds, sewage, etc
✓ H₂S is a very toxic, flammable gas. It is pungent (rotten egg odour) and irritates the eyes, nose and throat. It rapidly destroys the sense of smell and can cause unconsciousness and death.
✓ It is heavier than air and may accumulate in low-lying areas.
✓ The workplace exposure limits (WELs), for H₂S are 5 ppm (8-hour time-weighted average (TWA)) and 10 ppm (15-minute TWA).

Caution: Odour is unreliable as a means of detecting H₂S.

Access
✓ Restrict access to areas where H₂S is known or suspected.
✓ Post H₂S warning notices at points of access to Category 0 and Category 1 areas.
✓ Fit air direction and air movement indicators or windsocks in areas that rely on natural ventilation for H₂S control.

Equipment and procedures
Planning
✓ Label and colour-code plant and equipment that may contain H₂S.
✓ Classify areas and decide the use of fixed/portable H₂S detectors. See below and Offshore Information sheet 6/2009 – see ‘Further information’.
✓ Prepare a contingency plan that covers H₂S emergencies.
✓ Mark up site plans with H₂S and safe areas.

Area classification
■ Category 0: H₂S is present during normal operations, eg in vessels and confined spaces.
■ Category 1: H₂S may be present during normal operations, eg mud tanks and shale shaker areas.
- Category 2: Area is normally free of \( \text{H}_2\text{S} \), but breach of containment or leaks may create risk:
  - Category 2A: Less than 500 ppm \( \text{H}_2\text{S} \) in the process stream.
  - Category 2B: More than 500 ppm \( \text{H}_2\text{S} \) in the process stream.

**Control**

- Remove \( \text{H}_2\text{S} \) through chemical treatment methods, e.g. \( \text{H}_2\text{S} \) scavengers, use of biocides to prevent growth of sulphate reducing bacteria.
- Isolate and depressurise enclosed systems before breaking containment.
- Purge residues and ventilate to remove \( \text{H}_2\text{S} \).
- Provide forced ventilation, e.g. on air blower where there is no through draught.
- Respiratory protective equipment is normally required.

Provide detection and alarms

- Category 0 area: Portable/personal \( \text{H}_2\text{S} \) detectors
- Category 1 area: Fixed \( \text{H}_2\text{S} \) detectors and portable/personal \( \text{H}_2\text{S} \) detectors for entry.
- Category 2A area: Fixed hydrocarbon detectors and portable/personal \( \text{H}_2\text{S} \) detectors for breaking containment.
- Category 2B area: Fixed \( \text{H}_2\text{S} \) detectors and portable/personal detectors for breaking containment.

**Emergency procedures**

- Store protective and emergency equipment in safe areas.
- Provide positive pressure emergency breathing apparatus (BA) sets wherever there is a risk of \( \text{H}_2\text{S} \) gas release.
- Establish and train emergency rescue teams (ERT). Hold regular practices.
- Include resuscitation of \( \text{H}_2\text{S} \) victims in first aid training.
- See *Face fitting for emergency BA SPC 2000/5*.

**Personal protective equipment (PPE) – see OCM3**

- Ensure that all items of PPE are compatible.
- RPE will be required for work in all areas where \( \text{H}_2\text{S} \) concentrations exceed the WEL.

**Respiratory protective equipment (RPE) – see OCM4**

- Provide CE-marked positive pressure BA with an assigned protection factor of at least 40.

**Maintenance, examination and testing**

**Checking and maintenance**

- Before use, check the air lines for supplied-air BA.
- Before each use, check that portable/personal gas monitors are fully charged and working properly.
- Follow the planned maintenance regime (PMR).
- Ensure that fixed \( \text{H}_2\text{S} \) detectors and alarms are working properly and fail to the ‘alarm’ state.
- Keep this information in your testing logbook.
Examination and testing – RPE

✓ Examine and test RPE thoroughly at least monthly and for infrequently used RPE at least three monthly. Replace worn parts.
✓ Check the airflow and air quality to air-fed RPE at least once every three months, or before use. Check in-line filters.
✓ Ensure that breathable air compressors take in clean air.

Records

✓ Keep records of all examinations and tests for at least five years

Cleaning and housekeeping

✓ Clean the area after the task, or as specified in working procedures.

Personal decontamination and skin care

✓ Provide warm water, mild skin cleansers, nailbrushes, and soft paper, fabric towels or hot air for drying. Avoid abrasive cleansers.

Training and supervision

✓ Provide supervision – ensure that safe work procedures are followed.
✓ Explain the dangers of H₂S.
✓ Supervise the use of control measures for H₂S work.
✓ Training includes toolbox talks on:
  ■ how to use the right safe working procedures;
  ■ how to react to alarms and evacuate safely;
  ■ how to use RPE in particular correct donning procedures;
  ■ check that it is working; and
  ■ what to do if something goes wrong.
✓ Involve managers and supervisors in health and safety training

Essential information

OCE6 Advice for managers
OCM3 Personal protective equipment (PPE)
OCM4 Respiratory protective equipment (RPE)
OCM5 Emergency planning
OCE14 if mercury is present
ORE1 if NORM is present.

Employee checklist

☐ Is your portable/personal alarm fully charged and working properly?
☐ Is your respirator working properly? Check it every time.
☐ Look for signs of wear and damage to equipment.
☐ If you find any problem, get it fixed. Don’t just carry on working.

Further information

Respiratory protective equipment at work: A practical guide HSG53 (Third edition)
HSE Books 2005
ISBN 978 0 7176 2904 6
www.hse.gov.uk/pubns/books/hsg53.htm

Workplace exposure limits EH40
www.hse.gov.uk/coshh/table1.pdf

Face fitting for emergency BA SPC 2000/05 HSE

Managing hydrogen sulphide detection offshore Offshore Information Sheet 6/2009 HSE
www.hse.gov.uk/offshore/infosheets/is6-2009.htm

Fit testing of respiratory protective equipment facepieces OC 282/28 HSE

You can find the full Offshore COSHH essentials series at www.hse.gov.uk/ccosh/index.htm

This guidance was developed by representatives from the UK offshore oil and gas industry and trade unions, with HSE.