




NEBOSH International Technical Certificate in Oil and Gas Operational Safety



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RMS Publishing
Victoria House, Lower High Street, Stourbridge DY8 1TA


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First Edition July 2012

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4 Fire protection and emergency response




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4 – Fire protection and emergency response

Learning outcomes

- 4.1 Outline appropriate control measures to minimise the effects of fire and explosion in the oil and gas industries
- 4.2 Outline the principles, procedures and resources for effective emergency response




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4 – Fire protection and emergency response

Content

- 4.1 Fire and explosion risk in the oil and gas industries
- 4.2 Emergency response




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4 – Fire protection and emergency response

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- 4.1 Fire and explosion risk in the oil and gas industries
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4 – Fire protection and emergency response

Leak and fire detection systems

- Fire and gas detection systems in Oil and Gas installations are designed to mitigate unexpected events
- Designers need to know what is available in order to choose the correct systems for their plants
- There are two principal types of detector which are commonly in use in off-shore installations:
 - 1) Heat, flame & smoke
 - 2) Flammable gas instruments




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Gas detection

Infrared absorption combustible gas detection

- The technology uses the absorption characteristics of the hydrocarbon molecules to infra-red light
- This technology is more expensive than catalytic detection
- It is used for many applications
- Point infra red detectors record the gas concentration at the detector location
- They need to be placed where a release of gas is considered possible




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Gas detection

Infrared absorption combustible gas detection

- Infrared open-path gas detectors send out a beam of infrared light, detecting gas anywhere along the path of the beam
- This linear 'sensor' is typically a few metres up to a few hundred metres in length
- An open path detector usually costs more than a single point detector
- The open path detector excels in outdoor situations




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Gas detection

Infrared point gas detector



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Gas detection

Catalytic gas detectors

- Catalytic detectors rely upon burning gas in a sintered chamber
- For this reason they are only available as a point detector or as part of a multi-point aspirating system



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Gas detection

Toxic gas detection

- Technologies available include chemical cell and semiconductor point detectors
- Many different types of gas can be detected



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Leak detection

- Leak detection may not be considered to be part of the fire and gas detection system
- Leak detection is often regarded as a supervisory or maintenance facility, or an adjunct to the fire and gas system by using them in conjunction with other detection methods



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Leak detection

Ultrasonic leak detectors

- Devices are available for detecting the sound of leaks at ultrasonic frequencies
- Mainly used for outdoor environments where weather conditions can easily dissipate



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Fire detection

Infrared (IR) flame detectors


- The detector relies on infrared radiation produced by flames

Ultra-violet (UV) flame detectors

- These detectors rely on the effective detection of ultra-violet radiation produced by flames



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Smoke detection

Point smoke detectors


- Detect smoke at a fixed point
- They need to be placed where smoke realistically could travel in the event of a fire



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Smoke detection

Ionisation point smoke detectors


- These detectors use a small radioactive source and detect decreased conduction caused by the ionisation of smoke particles in a detection chamber

Optical point smoke detectors

- These detectors generally detect smoke particles inside a chamber by an increase of light scatter caused by smoke particles or by the smoke particles obscuring a light beam




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Heat detection


- Heat detection is used where ambient temperatures or environment preclude the use of smoke detection



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Heat detection

Point heat detection

- These detect high temperatures at a given point
- They are still commonly described as “Rate of rise, and fixed heat detectors”
- Example uses include: kitchens, turbine hoods

Linear (line) heat detectors

- These detectors detect heat somewhere along the length of the device
- Example uses include: tank rim seals; cable tunnels



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Passive fire protection

Types of PFP

- Spray coatings
- Enclosures
- Fireproof cladding
- Seals and sealants
- Cable coating
- Fire walls
- Compartmentalisation



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Active fire protection

- Active fire protection systems such as water sprinkler and spray systems are widely used in the process industries for protection of storage vessels and process plant
- The duty of the fire protection system may be to extinguish the fire, control the fire, or provide exposure protection to prevent domino effects
- Systems can be fixed (for example, deluge or sprinkler systems) or portable (extinguishers)



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Choice of fire fighting media

Fixed water based systems

- A source of water: sea water, tank, river, wells
- A pump: designed to deliver at the required flow rate and pressure, with quick or automatic activation
- Fire water mains: a piping system to transport the water from the pump to where it is needed (for example, fire hydrants, risers, sprinkler heads)
- Water systems primarily operate by cooling the fire
- Suitable environments containing solid combustible materials (class A fires)



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Choice of fire fighting media

Fixed foam systems

- Similar to fixed water based systems, except that a foam concentrate is injected into the fire water system from a separate vessel
- Foam is a stable mass of small, air-filled bubbles that have a lower density than oil, petrol, or water
- Foam can be used on fire involving solid combustible materials and is highly effective on flammable liquid fires (for example: hydrocarbon fuel fires)



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Choice of fire fighting media

Fire monitor converted for foam use



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Choice of fire fighting media

Foam monitor: may be used to protect tanks or jetties



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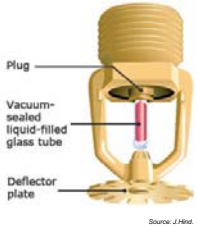


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Choice of fire fighting media


Sprinkler systems

- The purpose of an automatic sprinkler system is to detect the fire, extinguish or control the fire and to raise the alarm
- Each sprinkler head will open when it reaches a specific temperature and spray water on to a fire



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Choice of fire fighting media


Deluge systems

- Deluge water spray systems are similar to sprinkler systems, except all nozzles are open and will discharge together when the system is activated



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Choice of fire fighting media


Water mist systems

- Water mist is a fine spray with 99 percent of water volume contained in water droplets less than one millimetre (1,000 microns) in diameter



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Choice of fire fighting media

Dry powder installations (chemical)

- Dry powders, in common with vaporising liquids, offer the advantage of a quick knock-down of fire, but unlike vaporising liquids, they have negligible toxic effects
- A dry powder installation consists of dry powder containers linked by pipework to discharge nozzles covering the areas of risk

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