LEARNING OUTCOMES

On completion of this element, you should be able to demonstrate understanding of the content by applying what you have learnt to familiar and unfamiliar situations. In particular, you should be able to:

1. Explain the principles of assessing and managing contractors, including the roles of parties involved.
2. Outline the tools, standards, measurement, competency requirements and controls applicable to Process Safety Management (PSM) in the oil and gas industries.
3. Explain the role and purpose of a permit-to-work system.
4. Explain the key principles of safe shift handover.
5. Explain the importance of safe plant operation and maintenance of hydrocarbon-containing equipment and processes.
6. Outline the hazards, risks and controls to ensure safe start-up and shut-down of hydrocarbon-containing equipment and processes.
Contractor Management

KEY INFORMATION

Contractors play a significant part in oil and gas operations, and it is vital to understand:

- The scale of contractor use.
- Contractor management, ownership and site supervision/representation.
- Safe handover and the hazards associated with it.

SCALE OF CONTRACTOR USE

A contractor is anyone you bring into the organisation to carry out work on your behalf who is not an employee/worker directly employed by the company. Contractors are widely used to carry out construction, installation, repairs, maintenance, demolition and deconstruction. Often, support vessels and diving services, as well as work on drilling and exploration rigs, are run by contracted service companies. Accidents involving contractors are common in these areas.

It is quite usual to have more than one contractor on an installation at one time, so it is important to understand and control how the work they do affects directly employed workers and other persons on the installation.

CONTRACTOR MANAGEMENT, OWNERSHIP AND REPRESENTATION

The work that contractors do must be covered by your own usual methods of safe working, or accidents will happen. To achieve this:

- Ensure the hazards of the contractors’ job have been identified and steps taken to reduce the risks.
- Ensure a representative of the owner or operator is available to make sure contractors follow the rules of the installation.
- Ensure all contractor workers know who the site or installation contact person is, and how they can be contacted.
- Have procedures in place that ensure close and safe working with contractors at all times.

Poor communication is one of the major causes of accidents for contractors working on a site or installation, especially if directly employed workers are not aware of who the contractors are and what they are doing there. Likewise, the contractors must know the dangers of the site or installation.

For these reasons, contractors must be included in all health and safety procedures of the operation, and are required to adhere to employers’ working practices and procedures, permit-to-work systems, etc. Good practice may be assured from your own directly employed workers, but don’t necessarily expect it from contractors. For this reason, induction training for the site or installation is critical.

Induction training is carried out at each onshore and offshore installation, and each company has its own induction process. Induction training must therefore be carried out for contractors at each installation, as induction programmes will vary. To support this, contractor meetings should be held both onshore and offshore before contractors begin any work at any location.

Contractors should be made aware that failure to comply with induction training, employers’ safe systems of work, permit procedures, etc. can result in disciplinary action being taken against individuals, as well as contract penalties being imposed on the main contract management.
The UK Health and Safety Executive demonstrates a simple five-step approach to managing contractors:

**Managing Contractors - Five Steps**

**STEP 1 – PLANNING**

- Define the job
- Identify the hazards
- Assess the risks
- Eliminate or reduce the risks
- Specify health and safety conditions
- Discuss with contractor (if selected)

**STEP 2 – CHOOSING A CONTRACTOR**

- What safety and technical competence is needed?
- Ask questions (use questionnaire)
- Get evidence
- Go through information about:
  - the job
  - the site or installation and site rules
- Ask for a safety method statement
- Decide whether sub-contracting is acceptable. If it is, how will health and safety be ensured?

**STEP 3 – CONTRACTORS WORKING ON SITE**

- All contractors sign in and out
- Name a site or installation contact
- Reinforce health and safety information and site rules
- Check the job and allow work to begin

**STEP 4 – KEEPING A CHECK**

- Assess the degree of contact needed:
  - how is the job going?
  - as planned?
  - is the contractor working safely as agreed?
  - have any incidents occurred?
  - have there been changes in personnel?
- Are any special arrangements required?

**STEP 5 – REVIEWING THE WORK**

- Review the job and the contractor:
  - how effective was your planning?
  - how did the contractor perform?
  - how did the job go?
- Record the lessons


**TOPIC FOCUS**

The competence of contractors has to be assessed by the client. This is usually done using a checklist, covering areas such as:

- Are they experienced in the type of oil or gas process work to be carried out?
- Are they experienced and trained in offshore safety requirements?
- Are a suitable health and safety policy, organisation and arrangements in place?
- What is the quality and extent of their risk assessments?
- What is their recent health and safety performance (number of accidents, etc.)?
- Has any enforcement action been taken against them?
- Do they provide suitable, up-to-date method statements?
- Do they monitor health and safety and carry out site inspections?
- What are the qualifications and skills that they bring to the project?
- Are they members of a professional body or trade association?
- Do they have employers’ liability and public liability insurance?
- Do you have any references from previous clients?
- How do they appraise and select sub-contractors?
- What are their client liaison arrangements?

The installation owner or operator may choose not to use a contractor who cannot meet these requirements, and exclude one from future lists if their performance is seen to be poor.
Step 1 – Planning
Determine the work that is to be carried out by the contractors and look at how it can be carried out safely. This will require hazard identification and an assessment of the risks involved, both to contractors’ workers and your directly employed installation workers. Establish what the likelihood is of anything going wrong, and, if it does, how serious it will be. From this you can, together with the contractor, determine the risk controls needed. This may include the use of formal permit-to-work systems, which will help safeguard contractors and your own workers on site.

Contractors’ responsibilities include the provision of their own risk assessment, which should fit in with yours. This will confirm the adequacy of your own risk assessment and provide you with information on how the contractor can be expected to perform. The contractor will also be expected to fully adhere to the requirements of any permit-to-work system they are working under.

Step 2 – Choosing a Contractor
The Topic Focus above highlights the information you need to determine the competence and suitability of the contractor for a particular project. In some cases, the contractor may already be known to you, or may have carried out work for you in the past. Selection of contractors should not be based on cost alone – use all criteria (cost, experience, availability, reliability, and their health and safety records and performance).

You also need to decide whether to allow your selected contractor to sub-contract work himself. This can cause all sorts of problems, and needs very close management and agreed rules beforehand.

Step 3 – Contractors Working on Site
Contractors should go through the company health and safety and other induction programmes and, if working offshore, all necessary escape, evacuation and rescue training that directly employed workers have. Their work programmes (onshore and off) should be managed to the extent that they have an attendance control system the same as directly employed workers, and while on-site their whereabouts is known at all times.

A site contact should be established who can liaise with the contractors on a routine basis, and pass on all information about the project they are involved with (job changes, programme changes, timing, etc.). The purpose here is not to control the job but to ensure that the contractor does.

Step 4 – Keeping a Check
Remember, the intention is to ensure that the contractor has full control of their work, not to control it for them. The amount of contact is important: not enough and you are likely to miss essentials, too much and you are in the way. The best way is to establish a plan, and meet regularly to monitor its progress. Make sure all safe systems of work (method statements, permits-to-work, etc.) are closely followed, and that all incidents are reported and investigated.

Step 5 – Reviewing the Work
The job is not finished when the contractor says so, but when you mutually agree, after rigorous checks, that it is concluded to your satisfaction. You must evaluate the standard and quality of the contractor’s work, their ability to follow the plan, meet deadlines, etc., and the safety of their performance throughout. Punch lists are produced on completion of contracted work and before handover of equipment to ensure that the equipment has been accepted by the company, particularly where problems may still exist.

Record the contractor’s performance (it may help with your next contractor selection) and note any lessons learned from this experience in a record of the review.

MORE...
If you wish to look at further guidance on managing contractors you can refer to the UK HSE’s publication HSG159, Managing Contractors: A Guide for Employers, which you can access at: www.hse.gov.uk
Remember that this is a UK publication and may refer to Regulations that do not apply in other countries.
SAFETY HANDOVER – UNDERSTANDING THE HAZARDS

We will look in more detail at shift handovers later, but be aware that the process of changing from one operational team (shift) to another can have significant problems, especially where 12-hour shifts operate. There will be issues such as:

- Not enough time allowed for shift handover.
- No formal shift handover meetings held.
- Off-going/on-coming members failing to attend shift handover meeting.
- Outgoing shift wanting to get off.
- Incoming shift seeing problems ahead and wanting to get on with them.
- Conflict between the shifts (how much the off-going shift actually achieved, etc).
- A tendency for the off-going shift to leave work they don’t want to do.
- Failure to meet face-to-face to discuss the issues.
- Failure to use adequate written communication.
- Not keeping good shift records.
- Off-going shift failing to hand over records, or leaving things out.
- No continuation between parties to ensure permits-to-work are handed over properly.
- Lack of continuity with contractors.

REVISION QUESTIONS

1. What four factors must we consider to ensure that the work that contractors do is covered by our own usual methods of safe working, to prevent accidents?
2. Identify the simple “Five Steps” used to manage contractors.

(Suggested Answers are at the end.)
The process industry uses the Dow Fire and Explosion Hazard Index (Dow Chemicals 1964) and the Mond Fire and Explosion and Toxicity Index (ICI, 1979), which deal with fire and explosion hazard-rating of process plant. The Dow and Mond indices are rapid hazard assessment methods for use on chemical plant during process and plant development, and in the design of plant layout.

The Dow Fire and Explosion Index is probably the most frequently used method to evaluate hazards of fire and explosion in plant and installations. It divides plant into units and calculates the hazards in each unit from chemical substances. Both indices give a realistic value to the risk of each individual process unit due to potential fires and explosion. Issues such as facilities handling and the storage of flammable liquids show up a potential fire risk. Fires associated with flammable liquids can be pool fires, jet fires, flash fires, or boiling-liquid expanding-vapour explosions (BLEVEs). The potential for these events depends on the type of containment, the type of release that may occur and the available sources of ignition.

Fire-hazard analysis should identify separate hazards and determine suitable preventive measures where losses could occur from events such as:
- The concentration of combustible materials (both in storage and in use).
- The configuration of combustible materials, buildings, furnishings, etc. that allow fire spread.
- Exposure to fire, heat, smoke, steam, etc., which may require areas to be evacuated for safety functions.
- Fires occurring in control rooms or other safety-critical areas.
- Lack of (or poor) access, which could affect fire-fighting in safety-critical areas.
- Lack of (or poor) smoke removal or control in safety-critical areas.
- Lack of explosion prevention or relief measures.
- Failure or loss of electrical supplies.
- Inadvertent operation of fire-suppression systems.

The fire analysis must consider a fire spreading from one unit to another, so work should progress in stages, starting with simple scenarios and moving to the more detailed fire potential later in the analysis.

The analysis will allow designers and engineers to minimise the potential for fire on the installation at an early stage. The mitigations used can include:
- Limiting any inventories of flammable or combustible materials to an absolute minimum.
- Separating redundant safety-related units so that one fire cannot affect all units in operation (e.g. storage vessel, item of plant, drilling floor, unloading facility).
- Isolating critical areas from non-critical areas so that a single fire in a non-critical area cannot adversely affect performance or operation in any other areas.
- Implementing administrative management systems and procedures to control hazardous operations and the introduction of flammable and combustible materials.
MANAGEMENT OF CHANGE CONTROLS

Formal written procedures should be put in place that ensure all changes to process systems are assessed for the impact the changes will have on safe process operation. Some of the changes will require formal change control, whereas others may already have been evaluated to determine if there will be an increased level of risk associated with the change, which may have been built in to the original design and is accounted for in normal operating procedures.

Suitable arrangements must be put in place to ensure the effective management of changes to process systems. Procedures must identify the scope of the changes, the roles and responsibilities of those managing and making the changes, how risk analysis is to be undertaken, and methods to be used to communicate the changes to, and train, personnel involved.

When making hardware or software modifications, all changes that are not already part of the process system design should undergo change control, taking into account the plant design limits, allowable modes of operation, control and safety system settings. Documentation that may be involved in the evaluation includes:

- Original process system designs (basis for design).
- Process flow diagrams.
- Cause and effect diagrams.
- List of control, alarm and trip settings.
- Process equipment specifications.
- Mechanical equipment specifications.
- Drawings detailing classification of hazardous areas.
- Line list.

For temporary changes to process systems, such as the use of an override, or inhibit on a safety-related system, control can be effected through a separate procedure covering this, but must be kept under review in the change procedure.

Change control will be required when equipment is replaced with non-identical parts, or when new items of equipment are added to the system whether they are for safety-related purposes or not.

Change control will be needed if changes are made to the operating procedures, unless they take place within an established design basis and safe operating envelope (see later in Element 3).

Roles and Responsibilities – Making the Change

When making changes in line management and functional responsibilities, gaps can be prevented by careful mapping of the organisational changes. Personnel and their skills must be matched to the requirements of the task. This will identify the need for further training, and it is useful to phase the changes in (rather than do it in one change) to ensure transfer is made safely and the competence of operators is matched to the level and phase of the change.

The UK HSE Loss of Containment Manual, originally published to help inspectors, suggests that the opportunity for initiating changes should be widely available to people associated with process systems. It should be done by using a purpose-designed change-proposal document that gives a full description of the proposed change, the date the proposal is made, and the reasons supporting the change, including all health, safety and welfare issues.

The proposal document should clearly identify those persons who can authorise different types of change, and should involve personnel with suitable backgrounds and experience to make sure that changes will not result in operations outside established safe limits, e.g. if changes are proposed for an offshore installation, onshore guidance may be necessary.

Good monitoring needs to ensure that application of the procedures is not short-circuited, nor any of the elements missed out. Independent auditing of safety management systems should take place, with good communication and feedback, particularly where proposals for change are not approved.

REVISION QUESTION

3. What is the Dow Fire and Explosion Index?
(Suggested Answers are at the end.)