

SQA Advanced Unit Specification

General information for centres

Unit title: Petroleum Recovery Techniques

Unit code: HV9J 48

Unit purpose: On completion of the Unit candidates will be able to analyse methods and techniques used for the recovery of petroleum, from well clean up to initial stimulation. Candidates will cover techniques for stimulation and formation control. Candidates will evaluate the systems used to improve the recovery of petroleum and this will include an explanation of the principles and application of enhanced extraction systems.

On completion of the Unit the candidate should be able to:

- 1 Analyse a petroleum recovery process from a given brief.
- 2 Evaluate the systems required to enhance petroleum recovery.

Credit points and level: 1 SQA Credit at SCQF level 8: (8 SCQF credit points at SCQF level 8*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

Recommended prior knowledge and skills: Entry to the Unit is at the discretion of the centre however it would be beneficial if candidates have a general knowledge of reservoir engineering. This knowledge and understanding could be evidenced by possession of the following SQA Advanced Unit:

- ◆ HV4T 47 *Petroleum Reservoir Engineering: An Introduction*

Core Skills: There are opportunities to develop the following Core Skill and Core Skill components in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

- ◆ the Core Skill *Communication* at SCQF level 6
- ◆ the components *Critical Thinking and Reviewing and Evaluating of the Core Skill Problem Solving* at SCQF level 6

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Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: Outcome 1 is assessed using sampling and must be conducted under unseen, closed-book, supervised conditions. Candidates could produce a report from a case study.

Outcome 2 is assessed using sampling and must be conducted under unseen, closed-book, supervised conditions. Candidates could produce evidence in response to an appropriate balance of short answer, restricted response and structured questions.

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Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Analyse a petroleum recovery process from a given brief

Knowledge and/or Skills

- ◆ Acidising techniques
- ◆ Fractures and fracturing treatments
- ◆ Sand production and control methods
- ◆ Chemical consolidation methods
- ◆ Remedial clean up techniques

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can analyse a petroleum recovery process in response to a given brief.

Evidence for the Knowledge and/or Skills items in Outcome 1 will be assessed through sampling. Candidates will be assessed on one from the first two bullet points and two from the remaining bullet points in the Knowledge and/or Skills items from Outcome 1. The assessment must be carried out under unseen, closed-book and supervised conditions and as such candidates should not be allowed to bring any textbooks, handouts or notes to the assessment.

Candidates must provide evidence and meet the standard for the Knowledge and/or Skills items being assessed. The standard for each Knowledge and/or Skills item is given below:

- ◆ analyse the use of acidising techniques which must include a minimum of two acid types and these must be appropriate to the reservoir type
- ◆ analyse fractures and fracturing treatments and this will include fracture extension and growth
- ◆ analyse sand production and control methods, which must include aspects of material size
- ◆ explain chemical consolidation methods which must include plastic and resin materials
- ◆ explain remedial clean up techniques which must include the use of emulsions

Assessment Guidelines

The assessment for Outcome 1 could be assessed through a single case study. The findings of the case study could be presented in the form of a report. Candidates could be allocated approximately 2 hours to produce the report.

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Outcome 2

Evaluate the systems required to enhance petroleum recovery

Knowledge and/or Skills

- ◆ Principles and equipment for extraction systems
- ◆ Fluid systems applications
- ◆ Chemical flooding systems
- ◆ Thermal recovery systems

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can evaluate the systems required to enhance petroleum recovery.

Evidence for the Knowledge and/or Skills items in Outcome 2 will be assessed through sampling. Candidates will be assessed on bullet point one and two from the remaining bullet points in the Knowledge and/or Skills items for Outcome 2. The assessment must be carried out under unseen, closed-book and supervised conditions and as such candidates should not be allowed to bring any textbooks, handouts or notes to the assessment.

Candidates must provide evidence and meet the standard for the Knowledge and/or Skills items being assessed. The standard for each Knowledge and/or Skills item is given below:

- ◆ Explain the principles and equipment for extraction systems. Candidates must cover one of the following extraction systems:
 - sucker rod pumping
 - electrical hydraulic multi-stage pumps
 - gas lift systems
- ◆ Evaluate fluid systems applications which must immiscible and miscible fluid systems.
- ◆ Evaluate the application of chemical flooding systems.
- ◆ Evaluate the application of thermal recovery systems. Candidates must cover one of the following:
 - steam displacement
 - in-situ combustion

Assessment Guidelines

This evidence could be presented in response to specific questions and take the form of a single assessment paper lasting one and a half hours. Such a paper could be composed of an appropriate balance of short answer, restricted response and structured questions. It is recommended that Outcome 2 is assessed after the delivery of Outcome 1.

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Administrative information

Unit code:	HV9J 48
Unit title:	Petroleum Recovery Techniques
Superclass category:	YB
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Version	Description of change	Date

Source: SQA

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Unit specification: support notes

Unit title: Petroleum Recovery Techniques

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit is available on a standalone basis, however it is also a mandatory Unit within the SQA Advanced Diploma in Petroleum Engineering.

The following list gives guidance on content that could be covered in Outcome 1 and Outcome 2:

Outcome 1

- ◆ acid treatments and equipment could include:
 - increase permeability of reservoir
 - minimise damage to reservoir
 - fracture acidising
 - matrix acidising
- ◆ acidising techniques for carbonate reservoirs could include:
 - diverting and bridging agent
 - sequestering and suspending agents
 - surfactant and fluid loss agents
- ◆ acidising techniques for sandstone reservoirs could include:
 - diverting and bridging agents
 - sequestering and suspending agents
 - surfactant and fluid loss agents
- ◆ fractures and fracturing treatments could include:
 - well stimulation
 - fracture initiation
 - mechanics of fracturing
 - fluids and additives
- ◆ sand production and control methods could include:
 - critical flow, drag and strength prediction
 - mechanical screens
 - gravel packing
- ◆ chemical consolidation methods could include:
 - Resin sand pack
 - Scale consolidation
- ◆ remedial clean up techniques could include:
 - Wax and scale techniques
 - Wax and scale and emulsion equipment and materials

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Outcome 2

- ◆ principles and equipment for sucker rod pumping systems could include:
 - effect of fluids
 - operation
 - components
- ◆ the principles and equipment for pump systems could include:
 - jet, reciprocating and positive displacement pumps
 - components
- ◆ the principles and equipment for gas lift systems could include:
 - operating principles and flow requirements
 - continuous and intermittent flow
 - valve and control systems
- ◆ applications of immiscible and miscible fluid systems could include:
 - water and gas injections
 - water supply and quality
 - rich and lean gas supply
 - miscibility, phase behaviour displacement efficiency
- ◆ the application of chemical flooding systems could include:
 - mobility ratios
 - polymers, surfactants and biopolymers
 - high pH systems
- ◆ the application of thermal recovery systems could include:
 - heat losses and fluid properties
 - recovery factors
 - plant and facilities

Guidance on the delivery and assessment of this Unit

This Unit will probably be delivered as part of a Group Award designed to provide candidates with technical knowledge and skills for employment in the petroleum engineering industries.

While the use of case study material is particularly recommended for both learning and teaching components of this Unit, other suggested teaching and learning methods for this Unit could include: the use of visual aids, information communication technology, group lectures and discussion, practical demonstrations, question and answer sessions, directed study, industrial/site visits.

Formative work for this Unit could include group discussion and role play emphasising workplace health and safety issues and events specific to petroleum engineering. Such an approach could be beneficial to those candidates without industrial experience.

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Outcome 1

Candidates could undertake a case study contextualized from a scenario of petroleum recovery from a reservoir. If candidates provide evidence in the form of a report, it would be beneficial if guidance were given on the format, style, structure and the effective presentation of written and graphic information.

Outcome 2

The assessment for Outcome 2 could be in the form of a single one assessment paper. This single assessment paper could be taken at a single assessment event lasting one and half hours. Such a paper could be composed of an appropriate balance of short answer, restricted response and structured questions.

It is recommended that assessment of Outcome 2 is taken after delivery of Outcome 1.

Opportunities for developing Core Skills

Candidates are required to use analytical and evaluative skills and therefore may have the opportunity to develop the components Critical Thinking and Reviewing and Evaluating of the Core Skill *Problem Solving* at SCQF level 6.

If candidates produce evidence in the form of a written report, then they may have the opportunity to develop the component Written Communication of the Core Skill at SCQF level 6. If candidates presented their findings in the form of an oral presentation, then they could develop the component Oral Communication at SCQF level 6.

Open learning

If this Unit is delivered by open or distance learning methods, additional planning and resources may be required for candidate support, assessment and quality assurance. A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes.

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

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General information for candidates

Unit title: Petroleum Recovery Techniques

This Unit will allow you to be able to analyse methods and techniques used for the recovery of petroleum.

You will cover techniques for stimulation and formation control and the principal methods of extraction. You will also evaluate the systems used to improve the recovery of petroleum.

You will gain knowledge and understanding of the following:

- ◆ in Outcome 1 you will cover acidising techniques, fractures and fracturing treatments, sand production and control methods, chemical consolidation methods and remedial clean up techniques
- ◆ in Outcome 2 you will cover the principles and equipment for extraction systems, fluid systems applications, chemical flooding systems and thermal recovery systems

Assessments for this Unit could take the form of a case study for Outcome 1 based on a given project brief, and a single assessment paper for Outcome 2.