



Higher National Unit specification

General information for centres

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

Unit code: F80Y 34

Unit purpose: The purpose of this Unit is to give candidates the knowledge and understanding required to operate process plant and equipment in a safe and effective manner according to recognised practices during start-up, operating and shutdown procedures.

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

- 1 Explain the procedures for plant and equipment start-up for processing operations.
- 2 Explain the procedures for controlling, monitoring and adjusting processing operations.
- 3 Explain the procedures to safely shut-down a processing operation and their effects on other operational plant.
- 4 Explain the procedures for preparing and reinstating work areas for the maintenance of process plant and equipment.

Credit points and level: 1HN credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**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 Access 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit is at the discretion of the centre. However, candidates will find it beneficial to have some knowledge and understanding of the oil and gas process context to which this Unit appertains, which may be evidenced by the possession of the following Unit: *F811 34: Petroleum Industry: Organisation, Products and Process*

Core Skills: There are opportunities to develop the Core Skill of *Communication* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: This Unit was developed as an optional Unit within the context of the HNC/HND award in Petroleum Process Technology, Operations and Control. If this Unit is delivered as part of another group award, it is recommended that it should be taught and assessed within the subject area of the group award to which it contributes.

General information for centres (cont)

Assessment: Outcomes 1, 2, 3 and 4 may be assessed individually. Alternatively, Outcomes 1, 2 and 3 may be integrated into a single assessment with Outcome 4 retained as a separate assessment.

Assessment of all Outcomes should be composed of a suitable balance of short answer, restricted response questions together with the use of practically based case studies or simulation exercises.

Assessment must be carried out under controlled, closed-book, supervised conditions which represent a realistic operating environment in respect of documentation availability. Any documentation requirement for assessments should be provided as part of the assessment information.

Candidates must achieve all of the minimum evidence specified for each outcome in order to pass the Unit.

Higher National Unit specification: statement of standards

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

Unit code: F80Y 34

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

Explain the procedures for plant and equipment start-up of processing operations

Knowledge and/or Skills

- ◆ Start-up procedures
- ◆ Permits
- ◆ Risk assessment
- ◆ P and IDs
- ◆ Toolbox talk

Evidence Requirements

Evidence for this Outcome will be provided by the candidate being required to provide evidence for all of the five Knowledge and/or Skills items.

Candidates will be required to provide evidence to demonstrate their Knowledge and/or Skills by showing they can:

- ◆ Explain the need and process for a start-up procedure to ensure a safe and efficient operation.
- ◆ Explain the safety implications of the Permit to Work system, and generate a cold work permit requesting operation of the plant. This should be completed using the relevant, local procedures and paperwork.
- ◆ Explain the use of, and generate, a Risk Assessment for operation of the plant. This should be completed using the relevant, local procedures and paperwork.
- ◆ Explain codes and symbols and the use of P and IDs, and provide a marked up example for operation of the plant. The marked up P and ID should highlight the flow path, and the positions of all relevant valves.
- ◆ Explain the use of the toolbox talk, with comment on the topics discussed therein.

Higher National Unit specification: statement of standards (cont)

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

Assessment Guidelines

Assessment on Outcome 1 may be conducted individually or together with Outcomes 2 and 3. Assessment for Outcome 1 should be composed of a suitable balance of short answer, restricted response questions together with a report of practically based case study or simulation exercises.

The assessment for Outcome 1 can be a separate assessment of approximate planned duration of no more than one hour with the report of the practical/simulated assignment being of approximately 500 words in length.

The assessment should be completed under controlled, closed-book, supervised conditions. Any documentation required for the assessment should be provided as part of the assessment information.

Outcome 2

Explain the procedures for controlling, monitoring and adjusting processing operations.

Knowledge and/or Skills

- ◆ Relationship between process variable, set point and output.
- ◆ Readings to be taken on live plant and the use of these.
- ◆ Adjustments to make of controllers on live plant.

Evidence Requirements

Evidence for this Outcome will be provided by the candidate being required to provide evidence for all three of the Knowledge and/or Skills items.

Candidates will be required to provide evidence to demonstrate their Knowledge and/or Skills by showing they can:

- ◆ Explain the basics of a typical flow control loop, labelling all relevant constituents.
- ◆ Explain the need to produce a set of clear, concise and accurate readings on live plant, the type of readings to be taken and the use of these readings.
- ◆ Explain the adjustment of controllers as required according to procedures and the considerations that must be taken when making adjustments.

Assessment Guidelines

Assessment on Outcome 2 may be conducted individually or together with Outcomes 1 and 3. Assessment for Outcome 2 should be composed of a suitable balance of short answer, restricted response questions together with a report of practically based case study or simulation exercises.

The assessment for Outcome 2 can be a separate assessment of approximate planned duration of no more than 1 hour with the report of the practical/simulated assignment being of approximately 500 words in length.

The assessment should be completed under controlled, closed-book, supervised conditions. Any documentation required for the assessment should be provided as part of the assessment information.

Higher National Unit specification: statement of standards (cont)

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

Outcome 3

Explain the procedures to safely shut-down a processing operation and their effects on other operational plant

Knowledge and/or Skills

- ◆ Preparations to be made to shutdown a process system in a safe and effective manner.
- ◆ Normal procedure to shutdown a live process system in a safe and effective manner.

Evidence Requirements

Evidence for this Outcome will be provided by the candidate being required to provide evidence for both of the Knowledge and/or Skills items.

Candidates will be required to provide evidence to demonstrate their Knowledge and/or skills by showing they can:

- ◆ Explain who needs to be informed of the shutdown.
- ◆ Explain the processes involved in the continued running of other operational plant.
- ◆ Explain the desired position of valves, and the settings of equipment.
- ◆ Explain how a successful shutdown of live plant should be conducted.

Assessment Guidelines

Assessment on Outcome 3 may be conducted individually or together with Outcomes 1 and 2. Assessment for Outcome 3 should be composed of a suitable balance of short answer, restricted response questions together with a report of practically based case study or simulation exercises.

The assessment for Outcome 3 can be a separate assessment of approximate planned duration of no more than one hour with the report of the practical/simulated assignment being of approximately 500 words in length.

The assessment should be completed under controlled, closed-book, supervised conditions. Any documentation required for the assessment should be provided as part of the assessment information.

Higher National Unit specification: statement of standards (cont)

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

Outcome 4

Explain the procedures for preparing and reinstating work areas for the maintenance of process plant and equipment.

Knowledge and/or Skills

- ◆ Procedure to prepare for plant and equipment maintenance.
- ◆ Procedure to reinstate plant and equipment following maintenance.

Evidence Requirements

Evidence for this Outcome will be provided by the candidate being required to provide evidence for both of the Knowledge and/or Skills items.

Candidates will be required to provide evidence to demonstrate their Knowledge and/or Skills by showing they can:

- ◆ List and explain the main steps taken prior to maintenance intervention. This should include all Permit to Work paperwork, hazard identification, risk assessment, planning, preparation, toolbox talk, isolation, and testing.
- ◆ List and explain the reasoning behind the main steps taken prior to and during reinstatement. This should include pre-commission testing, de-isolation, and the introduction of process fluids.

Assessment Guidelines

Outcome 4 should be assessed separately by means of short answer questions, or of a report of a case study assignment. Either assessment approach should include the completion of an isolation risk assessment.

The assessment for Outcome 4 should have a planned duration of no more than one hour. If a case study is used as the basis of this assessment then the associated report of the case study assignment should be of approximately 500 words in length in addition to the risk assessment.

The assessment should be completed under controlled, closed-book, supervised conditions. Any documentation required for the assessment should be provided as part of the assessment information.

Administrative Information

Unit code:	F80Y 34
Unit title:	Petrochemical Process Operations: Plant and Equipment Operating Practices
Superclass category:	YC
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History of changes:

Version	Description of change	Date

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Higher National Unit specification: support notes

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

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 has been designed as an optional in the HNC/HND award in Petroleum Process Technology, Operations and Control.

This Unit is about ensuring that candidates have the knowledge, understanding and skills to bring process plant and equipment in and out of operation to meet requirements and confirm status before, during and in shutting down process operations for petrochemical products. Through this Unit, candidates will learn aspects of controlling, monitoring and adjusting plant and equipment during process operations. The scope of this Unit also includes preparation of process plant and equipment for maintenance activities and the reinstatement of the plant and equipment on completion of a maintenance activity. Critical to the achievement of this Unit will be the candidate's ability to source and correctly interpret procedures, technical information and operational requirements of plant and equipment to meet the output specification of a petrochemical process operation.

Developing a sound knowledge and understanding of associated health, safety and environmental aspects of process operations are a critical part of this Unit.

A list of topics for each Outcome is given below.

Outcome 1: Candidates will be expected to explain the procedures for plant and equipment start-up of processing operations

- ◆ Type of process; process information and performance specification; policies, codes of practice; standards and schedules.
- ◆ Information on availability of associated plant and equipment; plant and equipment layout; interpretation of P and IDs; functional and safety checks on plant and equipment.
- ◆ Start-up operating procedures; obtain and establish process start-up operation requirements; monitoring and control; confirm status of start up.
- ◆ Maintenance of appropriate documentation; record keeping.
- ◆ Safe working practices — codes of practice; appropriate Personal Protective Equipment; Permit to Work scheme; scope of individual's responsibilities.

Higher National Unit specification: support notes (cont)

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

Outcome 2: Candidates will be expected to explain the procedures for controlling, monitoring and adjusting processing operations.

- ◆ Type of process; process information and performance specification; policies, codes of practice; standards and schedules.
- ◆ Functional and safety checks on plant and equipment.
- ◆ Maintenance of steady-state conditions to meet process operation requirements; monitoring and control; make adjustments as appropriate; report deviations from expected norms.
- ◆ Maintenance of appropriate documentation; record keeping.
- ◆ Safe working practices — codes of practice; appropriate PPE; Permit to Work scheme; scope of individual's responsibilities.

Outcome 3: Candidates will be expected to explain the procedures to safely shut-down a processing operation.

- ◆ Type of process; process information and performance specification; policies, codes of practice; standards and schedules.
- ◆ Shutdown operating procedures; obtain and establish process shutdown requirements; monitoring and control; confirm status of procedure.
- ◆ Control of waste and/or residual materials.
- ◆ Maintenance of appropriate documentation; record keeping.
- ◆ Safe working practices — codes of practice; appropriate PPE; permit to work scheme; scope of individual's responsibilities.

Outcome 4: Candidates will be expected to explain the procedures for preparing and reinstating work areas for the maintenance of process plant and equipment

- ◆ Type of maintenance; maintenance information, instructions and schedules; standards and performance requirements.
- ◆ Co-ordination of the isolation and handover of plant and equipment for maintenance.
- ◆ Co-ordination of the handover and reinstatement of plant and equipment to include functional testing as appropriate.
- ◆ Control of waste and/or residual materials as appropriate.
- ◆ Maintenance of appropriate documentation; record keeping.
- ◆ Safe working practices — minimise risks to personnel, environment, plant and equipment; codes of practice; appropriate PPE; lifting and handling equipment; Permit to Work scheme; scope of individual's responsibilities.

Higher National Unit specification: support notes (cont)

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

Guidance on the delivery and assessment of this Unit

This Unit was developed as an optional Unit within the context of the HNC/HND award in Petroleum Process Technology, Operations and Control. It may be delivered in isolation or as part of another group award. If delivered as part of this group award, this Unit will provide a sound basis for the integration of learning derived from other process technology, operations and control Units within this award. As such, it is preferable to deliver this Unit towards the end of the course after the specialist Units have been delivered.

It is intended that the Unit be delivered in the broad context of the whole petrochemical industry, with a detailed focus given to a particular process of the petrochemical industry relevant to the needs of the candidates.

This Unit is designed primarily to develop candidates' knowledge and understanding of the operation of process plant and equipment. As a knowledge-based Unit, it lends itself to a variety of delivery modes that include lectures, tutorials, case studies, group discussions, research activities, and industry visits. However, although there are no requirements for practical work on full scale live plant or equipment, candidates' learning experience will be greatly enhanced if the knowledge and understanding of each Outcome could be supported by practical work where relevant. This may be facilitated through exposure to small scale live plant within a controlled environment such a teaching laboratory or by the use of process operations simulator. It is recommended that the Unit be delivered in the order in which the Outcomes are stated as this provides a logical progression through the topics of learning.

Outcomes 1, 2 and 3 may be assessed separately as one-hour assessments or, much more preferably, together as a three hour assessment. Assessments could be composed of extended response questions and/or short answer questions which should be carried out under controlled, supervised conditions. Centres may wish to use a practical case study assignment or a simulation exercise in whole or part of the Unit assessment, especially to enhance the learning and assessment experience focussing on the details of a particular process of the petrochemical industry.

The single integrated assessment should be carried out at the end of the delivery of Outcomes 1, 2 and 3. Separate individual assessments should be carried out at the end of the delivery of each Outcome. Assessment of Outcome 4 should be carried out at the end of the Unit.

It should be noted that the candidates must achieve all the minimum evidence specified for each Outcome in order to pass the Unit. Details on approaches to assessment are given under Evidence Requirements and Assessment guidelines under each Outcome in the Higher National Unit specification: Statement of Standards section. It is recommended that these sections be read carefully before proceeding with assessment of candidates. Where sampling of knowledge and skills items is used for assessment, the sampling should be selected to meet the specific needs of the candidate cohort within the context of their current employment or progression goals.

Details on approaches to assessment are given under Evidence Requirements and Assessment guidelines under each Outcome in the Higher National Unit specification: Statement of Standards section. It is recommended that these sections be read carefully before proceeding with assessment of candidates.

Higher National Unit specification: support notes (cont)

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

Opportunities for developing Core Skills

There may be opportunities to gather evidence toward the Core Skill of *Communication* at SCQF level 6 within this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of on-line support. With regard to assessment, planning would be required of the centre concerned to ensure the sufficiency and authenticity of candidate evidence. Arrangements would be required to be put in place to ensure that assessments were conducted under controlled, supervised conditions. Agreement would have to be made to ensure that a single assessment for the end test is delivered in a supervised environment under controlled conditions.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

General information for candidates

Unit title: Petrochemical Process Operations: Plant and Equipment Operating Practices

This Unit has been designed to allow you to develop the knowledge, understanding and skills involved in start-up, controlling and adjusting, shutdown of process plant and equipment. The Unit will contribute to your development as a process operations technician or a measurement and control technician within the petrochemical industry.

The vocational focus of this Unit combines the necessary blend of key petrochemical processing related technological principles with knowledge of their industrial process applications in a safety and environmentally critical context.

The Unit comprises the following broad outcomes:

- 1 Explain the procedures for plant and equipment start-up for processing operations.
- 2 Explain the procedures for controlling, monitoring and adjusting processing operations.
- 3 Explain the procedures to safely shut-down a processing system.
- 4 Explain the procedures for preparing and reinstating work areas for the maintenance of process plant and equipment.

These outcomes are linked to National Occupational Standard that form part of the suite of Scottish/National Vocational Qualifications (S/NVQs) in Process Operation: Hydrocarbons and Process Engineering Maintenance at Technician level.

Within this Unit, you will also have opportunities to develop the transferable Core Skills of *Communication*, *Problem Solving* and *Working with Others*, although these are not separately certificated.

Access to this Unit is fully inclusive and at the discretion of your SQA approved delivery centre. However, you may find it beneficial to have a prior knowledge of this area as provided by the SQA HN Unit *F811 34: Petroleum Industry: Organisation, Products and Processes*.

This Unit can be delivered on a full-time, block release, open or blended learning, part-time day or part-time evening basis at the discretion of your SQA approved delivery centre. Learning and teaching methods may include lectures, tutorials, group work, practical/laboratory assignments, computer-based simulations and case studies. The use of flexible learning through on-line materials and methodologies may be used to supplement and support the learning that takes place in the delivery centre.

Formal assessment of this Unit may take a number of different forms such as written tests, simulation exercises, practical exercises and case studies. Assessments will normally be conducted at the end of the delivery of each Outcome. Where assessments are combined, these may be conducted toward the end of the Unit.