



Australian Government

PMAOPS340 Operate cryogenic processes

Release: 1

PMAOPS340 Operate cryogenic processes

Modification History

Release 1. Supersedes and is equivalent to PMAOPS340B Operate cryogenic processes

Application

This unit of competency covers the skills and knowledge required to operate and maintain a complex refrigeration/cryogenic system.

This unit of competency includes all such items of equipment and unit operations which form part of the complex refrigeration/cryogenic system. A unit/system comprises two or more components of plant/equipment that are operated together to produce product, including as appropriate to the facility:

- large refrigeration systems that produce low temperatures
- multi-stage centrifugal compressors
- heat exchangers
- computer control
- monitoring systems.

This unit of competency applies to operations technicians who are required to demonstrate a significant understanding of the process and the equipment operation in order to identify and rectify operational problems, perform isolations, start-up and shutdown procedures, and operate, monitor and maintain equipment.

This unit of competency applies to an individual operating independently in a plant with local control or in liaison with the control room operator in a plant with a centralised control panel, such as distributed control system (DCS) type controls. In the case of large complex plant, the operations technician would be part of a team during start-up and shutdown procedures.

This unit of competency applies to an individual working alone or as part of a team or group and working in liaison with other shift team members and the control room operator, as appropriate.

This competency does not require the operation of a central control panel.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Operations

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

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| 1 | Prepare for work | 1.1 | Receive and give shift handover |
| | | 1.2 | Identify work requirements |
| | | 1.3 | Identify and control hazards |
| | | 1.4 | Coordinate with appropriate personnel |
| | | 1.5 | Check for recent work undertaken on cryogenic process |
| | | 1.6 | Note any outstanding/incomplete work |
| | | 1.7 | Check operational status of cryogenic process |
| | | | |
| 2 | Operate cryogenic process | 2.1 | Describe the type of cryogenic plant, the component plant items and their duties |
| | | 2.2 | Complete routine checks, logs and paperwork taking action on unexpected readings |
| | | 2.3 | Change rate, grade or specification smoothly as required |
| | | 2.4 | Adjust cryogenic process and its component plant items as appropriate to their type and duty to maximise performance |
| | | | |
| 3 | Diagnose and take action on abnormal situations in accordance with procedures | 3.1 | Monitor cryogenic process and its component plant items frequently and critically throughout shift using measured/indicated data and senses as appropriate |
| | | 3.2 | Recognise conditions likely to give rise to brittle fracture and take action required by procedures |
| | | 3.3 | Identify critical exposure temperature (CET) and take action to minimise its impact |
| | | 3.4 | Describe impacts of any changes upstream and downstream |

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|---|-------------------------------------|-----|--|
| | | 3.5 | Recognise actual and developing situations which may require action |
| | | 3.6 | Apply operational knowledge to resolve problems |
| | | 3.7 | Take other actions on abnormal situations which cannot be resolved during the shift to ensure safety and the resolution of the situation |
| | | 3.8 | Follow through items initiated until final resolution has occurred |
| 4 | Isolate and de-isolate plant | 4.1 | Complete any required pre-start checks, including safety systems |
| | | 4.2 | Start up/shut down cryogenic process according to the cryogenic plant type and duty in liaison with other personnel |
| | | 4.3 | Monitor the start-up process and take action to ensure operating parameters are achieved |
| | | 4.4 | Start up/shut down/changeover component plant items within unit according to their type and duty in liaison with other personnel |
| | | 4.5 | Isolate entire cryogenic process and/or any component plant item |
| | | 4.6 | Make safe for required work |
| | | 4.7 | Check cryogenic process plant/plant item is ready to be returned to service |
| | | 4.8 | De-isolate and prepare cryogenic process plant unit/plant item for return to service |

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used, and include one or more of the following:

- legislative requirements, including work health and safety (WHS)
- industry codes of practice and guidelines
- environmental regulations and guidelines
- Australian and other standards
- licence and certification requirements

All operations to which this unit applies are subject to stringent health, safety and environment (HSE) requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence.

Hazards

Hazards include one or more of the following:

- extreme cold
- brittle fracture
- electricity
- gases and liquids under pressure
- structural hazards
- structural collapse
- equipment failures
- industrial (machinery, equipment and product)
- equipment or product mass
- noise, rotational equipment or vibration
- plant services (steam, condensate and cooling water)
- working at heights, in restricted or confined spaces, or in environments subjected to heat, dusts or vapours
- flammability and explosivity
- hazardous products and materials
- unauthorised personnel
- sharp edges, protrusions or obstructions
- slippery surfaces, spills or leaks
- extreme weather
- other hazards that might arise

Routine problems Routine problems are predictable and have known solutions and include one or more of the following:

- operating temperatures not maintained
- unstable/sub-optimal operation (e.g. icing, moisture and fouling)
- critical variables and outputs out of range

Non-routine problems Non-routine problems are unexpected problems, or variations of previous problems and must be resolved by applying operational knowledge to develop new solutions, either individually or in collaboration with relevant experts, to:

- determine problems needing action
- determine possible fault causes
- develop solutions to problems which do not have a known solution
- follow through items initiated until final resolution has occurred
- report problems outside area of responsibility to designated person

Operational knowledge includes one or more of the following:

- procedures
- training
- technical information, such as journals and engineering specifications
- remembered experience
- relevant knowledge obtained from appropriate people

Start up/shut down Start up/shut down includes the following:

- start up and shut down to/from normal operating conditions
- start up and shut down to/from isolated, cold or empty
- start up and shut down to/from other conditions/situations experienced on the plant

Procedures All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, include one or more of the following:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)

- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant

Operate Operate is to monitor, adjust/make change to the production unit and/or its component items to meet specifications, by one or both of the following:

- manually in the plant
- using local controller in the plant

Product Product includes anything produced by a process step and so includes:

- intermediate products, such as the product from one process step, which then becomes the feed for another

Unit Mapping Information

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Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=9fc2cf53-e570-4e9f-ad6a-b228ffdb6875>

Assessment Requirements for PMAOPS340 Operate cryogenic processes

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria, and include the ability to:

- use data and own senses to monitor plant and ensure steady operating conditions and maximise performance
- perform pre-start checks, start-up/shutdown procedures, and isolations and de-isolations
- identify early warning signs of equipment/processes needing attention or with potential problems and taking action
- identify hazards and risks and apply risk control procedures.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- all items on a schematic of the system and functions of each
- principles of operation of items of equipment in the system, and the basis of cryogenic operations
- process-specific science (physics) to the level of being able to interpret the science and extract factors controlling the process and product, and by-product production rate and quality, types of industrial refrigerants and their applications, including self refrigerants, brittle fracture, stress limits and the effects of thermal shock on materials of construction, vapourisation, condensation and impact on process
- systems' operating parameters, integrity limits, product specifications and tolerances, temperature, pressure and flow
- process control philosophies and strategies, and methods of controlling refrigeration systems (e.g. pressure regulation)
- function and troubleshooting of major components and their problems and problem solutions
- hierarchy of control
- hazards that may arise in the job/work environment, and:
 - their possible causes
 - potential consequences
 - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence based on a holistic assessment of the evidence.
- The collection of performance evidence:
 - should occur over a range of situations which include typical disruptions to normal, smooth operations
 - will typically include a supervisor/third-party report focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
 - must include the use of industrial type cryogenic systems allowing operation
 - may use industry-based simulation for part of the unit particularly where safety, lack of opportunity or significant cost is an issue.
- Assessment should occur in operational workplace situations. Where this is not possible, or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment reflecting realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from one or more of:
 - walk-throughs
 - pilot plant operation
 - demonstration of skills
 - industry-based case studies/scenarios
 - 'what ifs'.
- Knowledge evidence may be collected concurrently with performance evidence (provided a record is kept) or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept).
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.

- In addition, the assessor or anyone acting in subject matter expert role in assessment must demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they must assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
 - relevant VET or other qualification/Statement of Attainment
 - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
 - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
 - being currently employed undertaking the type of work being assessed
 - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation's policies and procedures
 - having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
 - conducting on-the-job training/assessments of the type of work being assessed
 - being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

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