



Australian Government

Department of Education, Employment and Workplace Relations

PMAOPS340B Operate cryogenic processes

Revision Number: 1

PMAOPS340B Operate cryogenic processes

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This competency covers the skills needed to operate and maintain complex refrigeration/cryogenic systems that involve multi-stage centrifugal compressors (or similar) and associated equipment, including computer control and monitoring systems. It does not cover small packaged refrigeration systems, which are covered by <i>MSAPMOPS100A Use equipment</i>.
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Application of the Unit

Application of the unit	In this competency the operations technician would have a good understanding of the principles of refrigeration systems to a level that allows the operations technician to make adjustments to the system to achieve the required level of performance. The operations technician would typically understand: • different types of refrigerants and the relationship between vapour pressure and temperature • operating principles of each component of a large refrigeration system • methods of controlling refrigerant temperature • the objectives of refrigeration control. In a typical application, the operations technician would monitor the operation of the refrigeration system and: • make adjustments at the control panel/computer system to maintain the required operating parameters • carry out minor maintenance in accordance with procedures • identify situations requiring maintenance or repair outside the operator's skill level. The operations technician would also be responsible for starting up and shutting down the system, and making relevant checks on all parts of the system, including safety systems. In particular, the operations technician would identify hazardous situations arising from a malfunction of the system and take appropriate timely remedial action. At this level, the operations technician would also recognise and solve problems with the refrigeration system. This includes recognising indications of potential problems and taking appropriate and timely remedial action to ensure minimal loss of production time. This competency also covers identifying and controlling hazards related to large refrigeration systems.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units	
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Employability Skills Information

Employability skills	This unit contains employability skills.
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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare for work.	1.1. Identify work requirements 1.2. Identify and control hazards 1.3. Coordinate with appropriate personnel
2. Start up and shut down refrigeration system.	2.1. Carry out pre-start up checks of all items of the system, including safety systems 2.2. Start-up to procedures 2.3. Monitor the start-up process and take action as required to ensure operating parameters are achieved 2.4. Carry out general housekeeping of the system to procedures 2.5. Shut down to procedures 2.6. Perform emergency shut down of equipment (if required) 2.7. Record and/or communicate relevant information (if required).
3. Monitor and control refrigeration system.	3.1. Complete routine checks, logs and paperwork, taking appropriate action on unexpected observations, readings and trends 3.2. Recognise indications of actual or potential problems and take appropriate action to minimise the impact of problems on production time, safety, health and the environment 3.3. Recognise conditions likely to give rise to brittle fracture and take appropriate action 3.4. Identify critical exposure temperature (CET) and take appropriate action to minimise its impact 3.5. Monitor critical variables throughout the system and take appropriate action to maintain system operation 3.6. Make adjustments to maximise plant efficiency 3.7. Predict the need to make a change to meet process requirements 3.8. Make changes as required in a smooth and timely manner 3.9. Predict and communicate the impact on other parts of the plant that are reliant on the refrigeration system.
4. Isolate and de-isolate plant.	4.1. Isolate plant 4.2. Make safe for required work 4.3. Check plant is ready to be returned to service 4.4. Prepare plant for return to service.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills

- efficient and effective operation of plant/equipment
- hazard analysis
- completing plant records
- communication
- problem solving

Required knowledge

Competence includes a comprehensive understanding of the role of the refrigeration system and its integral equipment in the overall operation of the plant. In particular it includes the ability to:

- identify and describe the function of all items of the refrigeration system

Competence includes a comprehensive understanding of the principles of refrigeration such as:

- block diagram of a refrigeration system
- basic principles of refrigeration
- types of industrial refrigerants and their applications
- the use of 'self refrigerants', ie the process fluid, such as ethylene or propylene, is also the refrigerant
- methods of controlling refrigeration systems, eg pressure regulation
- factors affecting performance.

It also requires a knowledge of:

- principles of operation of each item of equipment, eg heat exchangers, compressors, condensers, vaporisers, refrigerant drains, valves
- physics of operation
- brittle fracture, stress limits and the affects of thermal shock on materials of construction
- vapourisation, condensation and impact on process
- good operating practices
- contamination issues
- methods of resolving problems
- HAZCHEM symbols and codes.
- chemistry/physical chemistry relevant to the process unit and the materials processed
- process parameters and limits, eg temperature, pressure, flow, pH
- duty of care obligations
- hierarchy of control
- communication protocols, eg radio, phone, computer, paper, permissions/authorities

REQUIRED SKILLS AND KNOWLEDGE

- routine problems, faults and their resolution
- relevant alarms and actions
- plant process idiosyncrasies
- all items on a schematic of the plant item and the function of each
- correct methods of starting, stopping, operating and controlling process
- corrective action appropriate to the problem cause
- function and troubleshooting of major components and their problems
- types and causes of problems within operator's scope of skill level and responsibility.

Evidence Guide

EVIDENCE GUIDE

The Evidence Guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for the Training Package.

Overview of assessment

Assessment of this unit should include demonstrated competence on actual plant and equipment in a work environment. The unit will be assessed in as holistic a manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.

Simulation may be required to allow for assessment of parts of this unit. Simulation should be based on the actual plant and will include walk-throughs of the relevant competency components. Simulations may also include the use of case studies/scenarios and role plays.

This unit of competency requires a significant body of knowledge which will be assessed through questioning and the use of what-if scenarios both on the plant (during demonstration of normal operations and walk-throughs of abnormal operations) and off the plant.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Competence must be demonstrated in the ability to recognise and analyse potential situations requiring action and then in implementing appropriate corrective action. The emphasis should be on the ability to stay out of trouble rather than on recovery from a disaster.

Consistent performance should be demonstrated. In particular look to see that:

- early warning signs of equipment/processes needing attention or with potential problems are recognised
- the range of possible causes can be identified and analysed and the most likely cause determined
- appropriate action is taken to ensure a timely return to full performance
- obvious problems in related plant areas are recognised and an appropriate contribution made to their solution.

These aspects may be best assessed using a range of

EVIDENCE GUIDE

	scenarios/case studies/what-ifs as the stimulus with a walk through forming part of the response. These assessment activities should include a range of problems, including new, unusual and improbable situations which may have been generated from the past incident history of the plant, incidents on similar plants around the world, hazard analysis activities and similar sources.
Context of and specific resources for assessment	Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios/case studies/what-ifs will be required as will a bank of questions which will be used to probe the reasoning behind the observable actions.
Method of assessment	In all plants it may be appropriate to assess this unit concurrently with relevant teamwork and communication units. For many plants, it might be appropriate for this unit to be assessed with: • <i>PMAOPS304B Operate and monitor compressor systems and equipment.</i> In a major hazard facility, it may be appropriate to assess this unit concurrently with: • <i>MSAPMOHS200A Work safely.</i>
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Range Statement

RANGE STATEMENT

The Range Statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the Performance Criteria, is detailed below. Add any essential operating conditions that may be present with training and assessment depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts.

Codes of practice/ standards	Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used.
Context	This competency unit includes items of equipment such as: • large refrigeration systems that produce low temperatures • multi-stage centrifugal compressors • heat exchangers
Typical problems	Typical problems include: • maintaining required operating temperatures • recognising and acting upon unstable/sub-optimal operation, eg icing, moisture, fouling • controlling critical variables and outputs.
Appropriate action	Appropriate action includes: • determining problems needing action • determining possible fault causes • rectifying problem using appropriate solution within area of responsibility • following through items initiated until final resolution has occurred • reporting problems outside area of responsibility to designated person.
Procedures	Procedures may be written, verbal, computer-based or in some other form. They include: • all work instructions • standard operating procedures • formulas/recipes • batch sheets • temporary instructions • any similar instructions provided for the smooth running of the plant. For the purposes of this Training Package, 'procedures' also includes good operating practice as may be defined by industry codes of practice (eg Responsible Care) and government regulations.

RANGE STATEMENT**Health, safety
and
environment
(HSE)**

All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State 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.

Unit Sector(s)

Unit sector	Operational/technical
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Competency field

Competency field	
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Co-requisite units

Co-requisite units	
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