



Australian Government

Department of Education, Employment and Workplace Relations

PMAOPS205B Operate heat exchangers

Release: 1

PMAOPS205B Operate heat exchangers

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This competency is typically performed by an operator and covers the operation of heat exchangers, including heat exchangers that form part of a heating, cooling or refrigeration system, and solving of heat exchanger problems.
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Application of the Unit

Application of the unit	In this competency, an operator would typically start up and shut down heat exchangers in accordance with procedures, and make adjustments to flow rate, temperature and pressure, depending on the type of heat exchanger. Generally the operator would be part of a team during start up and shut down procedures and would be expected to be capable of demonstrating competence in all parts of this unit. At all times they would be liaising and cooperating with other members of the team. This competency does not cover super heaters or waste heat boilers, which are treated as part of steam generating equipment.
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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. Operate heat exchangers.	2.1. Identify the type of heat exchanger 2.2. Start up and shut down heat exchanger according to the heat exchanger type and duty 2.3. Adjust flow rates, temperatures and pressure as appropriate to type of heat exchanger 2.4. Complete routine checks, logs and paperwork, taking action on unexpected readings and trends.
3. Isolate and de-isolate plant.	3.1. Isolate plant 3.2. Make safe for required work 3.3. Check plant is ready to be returned to service 3.4. 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.

Operation of heat exchanger and the ability to recognise and resolve operational problems. This could include any of the following remedial actions:

- making adjustments
- carrying out minor maintenance
- identifying and reporting problems outside operator's scope of responsibility
- identifying and controlling hazards related to heat exchangers and their integral equipment, including pressure vessels.

Required knowledge

Comprehensive understanding of heat exchanger principles to a level needed to control the operation. In particular, the operator needs to understand the factors affecting efficient operation of a heat exchanger in order to make appropriate adjustments or recognise when maintenance is required. These also includes a knowledge of:

- all items on a schematic of the heat exchanger system and the function of each
- principles of operation of heat exchangers
- correct methods of starting, operating and shutting down heat exchangers
- issues related to pressure vessels (regulations, requirements)
- physics and chemistry relevant to the process unit
- 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
- routine problems, faults and their resolution
- relevant alarms and actions
- plant process idiosyncrasies
- causes of head loss and change in heat transfer coefficient/rates
- corrective action appropriate to the problem cause
- function and troubleshooting of major internal components and their problems, such as tubes and baffles.

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 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,

EVIDENCE GUIDE	
	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 units covering: • fluid flow • utilities and services • communication. 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 includes all types of heat exchangers such as: • plate • Utube • spiral • bayonet • air cooled fin • shell and tube (all variants of design) • scraped surface • vessel jackets/coils. This competency does not cover super heaters or waste heat boilers, as these are treated as part of steam generating equipment.
Heat exchanger duties	Heat exchanger duties include: • heating • cooling • cryogenic • reboilers • condensers • gas dryers • gas coolers • refrigeration (evaporators/condensers).
Problems	Typical problems include: • damage to heat exchanger due to overheating and/or under/over pressurising • factors that affect heat exchanger efficiency (scale build-up, fouling, internal leakage, air lock, turbulence, corrosion) • leakage or gasket problems • recognising when maintenance is required.

RANGE STATEMENT	
Start up shut down as required	Start up shut down as required includes: • start up and shut down to/from normal operating conditions • start up and shut down to/from isolated, cold, empty • all other conditions experienced on the plant. ie from any condition to any condition experienced on the plant.
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.
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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