



Australian Government

PMAOPS220 Monitor chemical reactions in the process

Release: 1

PMAOPS220 Monitor chemical reactions in the process

Modification History

Release 1. Supersedes and is equivalent to PMAOPS220B Monitor chemical reactions in the process

Application

This unit of competency covers the skills and knowledge required to operate a reaction system which forms an integral part of a production process.

The reactor and its control will be relatively simple, operated in a stand-alone manner. The reaction may, or may not, include the use of catalyst (either homogeneous or heterogeneous phase).

The vessel in which the reaction is occurring may be a purpose built 'kettle' or other reaction vessel or it may simply be a stirred tank. These are typically found in small batch plants, although appropriate examples might also exist in larger plants. Processes may be batch or continuous.

This unit of competency applies to operators who are required to monitor the reactor operation, make adjustments to process or product properties as directed or to procedure and identify operational problems and take appropriate action.

This unit of competency applies to an individual who may work alone although under routine direction and supervision. They may work as part of a team or group and will work in liaison with other shift team members and the control room operator, as appropriate.

This competency does not cover operating a control panel. Where this is required the appropriate control unit should be used.

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 plant item |
| | | 1.6 | Note any outstanding/incomplete work |
| | | 1.7 | Check operational status of equipment |
| 2 | Operate reaction system in accordance with procedures | 2.1 | Identify the type of reactor and duty |
| | | 2.2 | Complete routine checks, logs and paperwork taking appropriate action on unexpected readings |
| | | 2.3 | Adjust reactor, as appropriate to type and duty |
| | | 2.4 | Change rate, grade or specification smoothly |
| | | 2.5 | Charge/discharge reactor |
| 3 | Recognise and take action on abnormal situations in accordance with procedures | 3.1 | Monitor reactor frequently and critically throughout shift using measured/indicated data and senses |
| | | 3.2 | Identify impacts of any changes upstream and downstream |
| | | 3.3 | Recognise situations which may require action |
| | | 3.4 | Resolve routine problems |
| | | 3.5 | Take actions on other abnormal situations to make safe and have the situation resolved |
| 4 | Isolate and de-isolate plant | 4.1 | Complete any required pre-start checks |
| | | 4.2 | Start up/shut down /changeover reactor according to the plant type and duty in liaison with other personnel |
| | | 4.3 | Isolate reactor |

- 4.4 Make safe for required work
- 4.5 Check reactor is ready to be returned to service
- 4.6 De-isolate and prepare reactor 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.

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

Procedures are written, verbal, visual, computer-based or in some other form, and 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

Hazards

Hazards include one or more of the following:

- electricity
- gas
- 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, noise, 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 must be resolved by applying known solutions.

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

- variations in material composition
- variation in ambient conditions
- control of reaction temperature
- adjustments to meet product specifications

Known solutions are drawn from one or more of the following:

- procedures
- training

- remembered experience

Non-routine problems must be reported according to relevant procedures.

Action	Action in accordance with procedures includes the following: • 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
Start up/shut down as required	Start up/shut down as required 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
Operate	Operate is to monitor, adjust/change the plant item/unit/system to meet specifications, by one or more of the following: • manually in the plant • using local controller in the plant • using the process control system in the control room

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 PMAOPS220 Monitor chemical reactions in the process

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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:
- start up and shut down reaction system
- monitor and control reaction conditions
- weigh, measure and/or control the addition of reactants and other materials
- recognise early warning signs of equipment/processes needing attention or with potential problems
- determine the most likely cause of routine problems
- take appropriate action to ensure a timely return to full performance
- isolate and de-isolate equipment

identify hazards and apply hazard control procedures.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- the type of reactor(s) used and its/their characteristic/s
- the nature/condition of materials at each stage of the reaction, the changes which have occurred in that stage and why they have occurred
- chemical reactions, including the effect of changing reaction variables, such as temperature, concentration and pH
- the application of basic chemical equations
- methods of controlling the reaction, including rate and yield
- types and causes of problems within operator's scope of skill level and responsibility
- 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 operation of an operating plant
 - will typically include a supervisor/third-party report or other evidence, 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 an appropriate industrial item of equipment requiring demonstration of operation, start-up and shutdown procedures and responding to problems
 - may use industry-based simulation for part only of the unit 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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