



Australian Government

PMAOPS301 Operate a distillation unit

Release: 1

PMAOPS301 Operate a distillation unit

Modification History

Release 1. Supersedes and is equivalent to PMAOPS301B Produce product by distillation

Application

This unit of competency covers the skills and knowledge required to monitor and control a distillation unit, which is separating two or more components, to achieve finished product that meets a predetermined specification.

The distillation column may be trayed or packed and may be performing cryogenic gas distillation, liquid distillation, azeotropic distillation, fractional distillation, vacuum distillation or molten metal distillation.

This unit of competency applies to operations technicians who are required to identify and correct operational problems, determine the impact of composition changes and adjust accordingly, and direct members of the operational team under start-up and running conditions.

In a typical scenario an operations technician would be monitoring and controlling the distillation section of a plant from a central control room. The process may involve one or more distillation columns and their associated equipment, piping and controls.

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.

Operators undertaking this unit of competency should also be competent in operating fluid flow equipment and heat exchangers.

Competency in this unit requires the ability to integrate the operation of all the component parts as a whole.

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.

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 the distillation unit
		1.6	Note any outstanding/incomplete work
		1.7	Check operational status of distillation unit and its component units
2	Operate distillation unit	2.1	Describe the type of distillation unit, the component plant items and their duties
		2.2	Complete routine checks, logs and paperwork taking appropriate action on unexpected readings
		2.3	Change rate, grade or specification smoothly as required
		2.4	Adjust distillation unit and its component plant items as appropriate to their type and duty to maximise performance
3	Diagnose and take appropriate action on abnormal situations	3.1	Monitor distillation unit and its component plant items frequently and critically throughout shift using measured/indicated data and senses as appropriate
		3.2	Describe impacts of any changes upstream and downstream
		3.3	Recognise actual and developing situations which may require action
		3.4	Apply operational knowledge to resolve problems

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| | | 3.5 | Take other appropriate actions on abnormal situations which cannot be resolved during the shift to ensure safety and the resolution of the situation |
| | | 3.6 | Follow through items initiated until final resolution has occurred |
| 4 | Isolate and de-isolate distillation unit and its component plant items | 4.1 | Complete any required pre-start checks |
| | | 4.2 | Start up/shut down distillation unit according to its type and duty in liaison with other personnel |
| | | 4.3 | Start up/shut down/changeover component plant items within unit according to their type and duty in liaison with other personnel |
| | | 4.4 | Isolate entire distillation unit and/or any component plant item |
| | | 4.5 | Make safe for required work |
| | | 4.6 | Check distillation unit /plant item is ready to be returned to service |
| | | 4.7 | De-isolate and prepare distillation 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 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:

- 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

Non-routine problems

Non-routine problems 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

Non-routine problems are unexpected problems, or variations of previous problems and include one or more of the following:

- recognising and acting on unstable/sub-optimal operation, such as:
 - flooding
 - channelling (packed column)
 - dumping
 - entrainment
- control of critical variables and outputs
- variations in feed rates and/or quality

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

Appropriate actions on abnormal situations

Appropriate actions on abnormal situations 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

Operate

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

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

- columns/towers
- trays/packing
- boilers/reboilers
- condensers
- refrigerant compressors
- pumps
- valves

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 PMAOPS301 Operate a distillation unit

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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 the ability to:

- start up, and stabilise the components of the distillation system to meet specifications
- apply process knowledge to monitor and predict the need for adjustments to system components
- predict impact of a change in one unit/area on other plant units/areas and take appropriate action
- identify hazards and risks and apply risk control procedures
- communicate effectively with team, group, supervisors and other personnel
- identify early warning signs of equipment/processes needing attention or with potential problems
- isolate the causes of problems and distinguish between causes of problems/alarm/fault indications, including:
 - process feed variations
 - instrument failure/wrong reading
 - electrical failure
 - mechanical failure
 - operational problem
- resolve non-routine problems
- take appropriate action to ensure a timely return to full performance.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- all items on a schematic of the distillation unit and the function of each
- principles of operation of plant/equipment, including column, tray/packing, condensor and reboiler operations, and distillation principles, including stripping and rectification
- interactions between plant items/processes
- systems' operating parameters and limits, such as temperature, pressure, flow and system integrity limits
- methods of changing production rate, product specifications and process variables
- impact of external factors (e.g. variations in weather)
- problems that may arise, the range of possible causes and processes to develop solutions

- process-specific science (physics, chemistry and biochemistry) 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 (e.g. for chemistry interpret the equation for factors controlling rate and yield and also interfering reactions such as salts and hydrates)
- 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.
- Where competency has not already been achieved in
 - PMAOPS201 Operate fluid flow equipment
 - PMAOPS205 Operate heat exchangersthey may be co-delivered and co-assessed.
- 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 operation of an industrial style distillation unit
 - may use industry-based simulation for all or 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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