



Australian Government

Department of Education, Employment and Workplace Relations

PMAOPS301B Produce product by distillation

Revision Number: 1

PMAOPS301B Produce product by distillation

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit covers the monitoring and controlling of a distillation unit, which is separating two or more components to achieve finished product, which meets a predetermined specification. The process may or may not be controlled from a central control room.
------------------------	--

Application of the Unit

Application of the unit	<p>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.</p> <p>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.</p> <p>Each tower may be provided with:</p> <ul style="list-style-type: none"> • reboiler/heater • feed at an appropriate temperature • over head product condenser • reflux equipment • tower internals • instrumentation. <p>The operations technician will be able to:</p> <ul style="list-style-type: none"> • identify and correct operational problems • determine the impact of composition changes and adjust accordingly • direct members of the operational team under start-up and running conditions. <p>Generally the operations technician 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.</p> <p>This unit does not require the operation of a central control panel.</p>
--------------------------------	--

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units

Employability Skills Information

Employability skills	This unit contains employability skills.
-----------------------------	--

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.
---	--

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 distillation system.	2.1. Perform pre-start up checks 2.2. Bring into operation equipment required for distillation 2.3. Correctly sequence all equipment required before commencing the process 2.4. Monitor temperature increase during start up and take appropriate action 2.5. Stabilise distillation system to produce specified rate and quality within minimum time.
3. Monitor distillation process.	3.1. Continually monitor process systems to ensure that product specifications are maintained 3.2. Minimise the risk of product specification deviations during the process by applying process knowledge 3.3. Adjust process variables to ensure the product remains within specification 3.4. Identify issues likely to impact on plant performance and take appropriate action 3.5. Predict impact of a change in one unit/area on other plant units/areas and communicate this to relevant people 3.6. Record product movements as a historical record of the quantity and quality of the finished product.
4. Change production rates and/or product specification.	4.1. Predict the need to make change to meet process requirements 4.2. Manipulate unit temperatures to achieve product specifications 4.3. Trim plant in a manner which prepares it for the transition 4.4. Manage transitions smoothly and in a timely manner 4.5. Minimise out of specification material as a result of a transition.
5. Shut down distillation systems.	5.1. Determine type of shut down required 5.2. Give advanced warning of shut down where possible 5.3. Change over individual items of equipment 5.4. Shut down individual items of equipment and the

ELEMENT	PERFORMANCE CRITERIA
	entire reaction system 5.5. Shut down to a stand-by condition if required 5.6. Shut down in an emergency when required 5.7. Reset trips and alarms after a shut down 5.8. Leave plant in a condition ready to restart 5.9. Make plant safe for maintenance work where required.
6. Prepare distillation unit for maintenance.	6.1. Inform plant personnel of impending maintenance activity 6.2. Prepare unit for maintenance/vessel entry as required according to procedures 6.3. Test trips and alarms as required 6.4. Accept plant back from maintenance 6.5. Prepare plant for the introduction of process materials and operation.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

Competence includes:

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

Competence also includes the ability to isolate the causes of problems to an item of equipment within the distillation system and to distinguish between causes of problems/alarm/fault indications such as:

- process feed variations
- instrument failure/wrong reading
- electrical failure
- mechanical failure
- operational problem.

Required knowledge

The knowledge referred to in the Evidence Guide for this unit includes:

- principles of operation of plant/equipment
- physics and chemistry relevant to the process unit and the materials processed
- process parameters and limits, eg temperature, pressure, flow, pH
- process control philosophies and strategies
- outside process/production operations, including column, tray/packing and reboiler operations, and distillation principles (including stripping and rectification)
- heating and cooling principles
- stabilisation principles
- 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
- 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

REQUIRED SKILLS AND KNOWLEDGE

- 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, role plays and 3D virtual reality interactive systems. In the case of evacuation training or of training for competencies practised in life threatening situations, simulation may be used for the bulk of the training.

This unit of competency requires an application of the knowledge contained in the use of distillation units and their integral equipment, to the level needed to maintain control and recognise and resolve problems. This can 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

EVIDENCE GUIDE	
	<p>to full performance</p> <ul style="list-style-type: none"> obvious problems in related plant areas are recognised and an appropriate contribution made to their solution. <p>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, hazard analysis activities and similar sources.</p>
Context of and specific resources for assessment	<p>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.</p>
Method of assessment	<p>In all plants it may be appropriate to assess this unit concurrently with relevant teamwork and communication units. Consider co-assessment with:</p> <ul style="list-style-type: none"> <i>PMAOPS201B Operate fluid flow equipment</i> <i>PMAOPS222B Operate and monitor pumping systems and equipment</i> <i>PMAOPS205B Operate heat exchangers.</i> <p>In a major hazard facility, it may be appropriate to assess this unit concurrently with:</p> <ul style="list-style-type: none"> <i>MSAPMOHS200A Work safely.</i>
Guidance information for assessment	<p>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.</p>

Range Statement

RANGE STATEMENT	
<p>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.</p>	
Codes of practice/ standards	Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used.
Appropriate action	<p>Appropriate action includes:</p> <ul style="list-style-type: none"> • 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.
Context	<p>This unit of competency includes all such items of equipment and unit operations which form part of the distillation system. For your plant this may include (select relevant items):</p> <ul style="list-style-type: none"> • columns/towers • trays/packing • boilers/reboilers • condensers • heat exchangers • refrigerant compressors • pumps • valves. <p>Typical problems for your plant may include:</p> <ul style="list-style-type: none"> • flooding • channelling (packed column) • dumping • entrainment.
Procedures	<p>Procedures may be written, verbal, computer-based or in some other form. They include:</p> <ul style="list-style-type: none"> • all work instructions • standard operating procedures • formulas/recipes

RANGE STATEMENT

	<ul style="list-style-type: none"> • batch sheets • temporary instructions • any similar instructions provided for the smooth running of the plant. <p>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.</p>
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
--------------------	-----------------------

Competency field

Competency field	
-------------------------	--

Co-requisite units

Co-requisite units	<i>PMAOPS201B</i>	<i>Operate fluid flow equipment</i>
	<i>PMAOPS205B</i>	<i>Operate heat exchangers</i>