



Australian Government

Department of Education, Employment and Workplace Relations

PMAOPS601A Debottleneck plant

Revision Number: 1

PMAOPS601A Debottleneck plant

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	In a typical scenario, it is desired to increase the throughput of a plant. A study is undertaken to identify the rate limiting step/process/plant unit (bottleneck) and then changes are made to plant or process conditions to increase the throughput of this unit. The making of plant modifications is not part of this unit (see <i>PMAOPS600C Modify plant</i>). This competency may require the technician to work with technical experts to complete the debottlenecking project. Typically this unit would be applied to either a small plant or a section/area of a larger plant.
------------------------	--

Application of the Unit

Application of the unit	This competency assumes that the technician responsible for the debottlenecking takes the overall responsibility for the project, but would work with the support of other company and external experts. This extends to the coordination of the required modifications/changes. This unit does not cover the optimisation of plant by modification of process, procedures or practice (see <i>MSAPMOPS400A Optimise process/plant area</i>). This unit does not cover work requiring special certification (eg, registered structural engineer) but may include working with such people and providing process and product expertise.
--------------------------------	--

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. Identify rate limiting step/process.	1.1. Determine throughput of plant/area 1.2. Determine capacity of units within plant/area based on design and/or performance data 1.3. Identify which unit(s) is operating at capacity/is the bottleneck
2. Investigate bottleneck.	2.1. Analyse the science of what is occurring in the bottle neck unit 2.2. Analyse the engineering/design specification of the bottle neck unit 2.3. Determine the root cause of the capacity limitation of the bottleneck unit 2.4. Investigate methods of increasing the capacity of the bottle neck unit 2.5. List solutions to the bottle neck.
3. Select technically best solution.	3.1. Investigate impact of solutions on the other units of the plant/area 3.2. Identify any 'knock on' effects of solution 3.3. Determine process/quality benefits and costs of solutions 3.4. Determine economic benefits and costs of solutions 3.5. Short list and rank the best solutions.
4. Compare hazard profile of possible solutions.	4.1. Organise a hazard analysis (eg HAZOP) for the solutions according to company procedures 4.2. Ensure that all stakeholders are represented on the hazard analysis team 4.3. Brief the hazard analysis team on the problem and solution alternatives under evaluation 4.4. Eliminate alternatives which do not meet hazard requirements 4.5. Rank remaining competing items by safety performance.
5. Make final choice of solution.	5.1. Seek further information where necessary to allow a rational selection to be made 5.2. Choose the solution which meets all required minimum standards and will provide the best solution 5.3. Verify choice in discussion with production and engineering managers and other key stakeholders 5.4. Obtain necessary approvals/authorisations

ELEMENT	PERFORMANCE CRITERIA
6. Check solution.	6.1. Initiate and monitor the implementation of the solution. 6.2. Ensure all checks and acceptances are done to procedures 6.3. Conduct trials/test runs as required 6.4. Collect and analyse data.
7. Complete modification.	7.1. Evaluate performance of solution 7.2. Make adjustments as required 7.3. Ensure plant procedures and training material updated 7.4. Ensure plant drawings and engineering specifications are updated 7.5. Complete all other required paperwork.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

This competency includes the following skills:

- analysis
- mathematics
- communication
- prioritisation
- leadership

Required knowledge

Competence in this unit includes the following knowledge:

- the operations of the plant and each major unit in it
- the principles of operation of the equipment being investigated to the extent required to interpret technical specifications in a meaningful manner
- material and/or energy balances
- the basics of plant economics and whole of life costing
- hazard analysis principles (while it is beneficial, it is not expected that the candidate will be able to undertake HAZOP (or similar) analyses but will understand basic principles and be able to interpret and use the outcomes)
- typical hazards with the type of processes being investigated
- OHS legislative requirements related to plant, including registration and documentation requirements related to modification of registered plant

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 specify the requirements and then select the best solution to meet the necessary and desirable requirements.

In particular look to see that:

- safety, technical and economic aspects are all considered
- the decision made can be justified on those criteria
- all key stakeholders are kept well informed and agree with the decisions
- the modification, and particularly its timelines, are a good fit for the overall plant requirements
- obvious problems in related plant areas are recognised and an appropriate contribution made to their solution.

EVIDENCE GUIDE	
	This will typically be assessed by a modification project on an operating plant. One complex project, or a number of simple projects, are required to demonstrate competence.
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. It may be appropriate to assess this unit concurrently with units which deal with: • plant documentation • assessing risk. • energy and mass balances • plant modifications
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	The need for the modification may arise from a continuous improvement project, as a result of an analysis of plant performance or from any other source. Required minimum standards include: • OHS legislative requirements related to plant • industry and enterprise OHS standards • enterprise standards related to maintenance • output requirements • economic performance
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		
--------------------	--	--