



Australian Government

Department of Education, Employment and Workplace Relations

PMAOPS324A Operate a gas turbine

Revision Number: 1

PMAOPS324A Operate a gas turbine

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit covers the operation of a stationary gas turbine in a typical power generation or compression operation.
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Application of the Unit

Application of the unit	In a typical scenario a gas turbine and its ancillary equipment is used to drive a power generation unit, high pressure pump or compressor. It is a complex, independent item of equipment with a specialised start-up and shutdown procedure. It may have its own control panel and inbuilt vibration monitoring equipment. The operation of a gas turbine may require a 'ticket' (special licence) to operate. Check local requirements. This unit includes starting up/shutting down and monitoring the performance of the equipment and a full understanding of OHS requirements, including emergency situations. The operations technician would: • identify and report operational problems • be aware of and contribute to a safe working environment • contribute to the safe and productive operation of the turbine • monitor, shut down and start up turbine and ancillary equipment using relevant procedures. 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.
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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 equipment for operation.	1.1. Check that the turbine is not subject to maintenance or that other permitted activities are not taking place near the equipment 1.2. Check the control panel to ensure that all indications support the safe starting of the turbine 1.3. Conduct required safety checks and pre-starts to determine or verify the operational condition of the equipment.
2. Start the gas turbine.	2.1. Commission turbine protection devices prior to the start-up of equipment 2.2. Achieve operational flows and temperatures of ancillary equipment before bringing the system on line for use 2.3. Start the gas turbine according to procedures.
3. Monitor and assess gas turbine systems.	3.1. Check operation and function of the gas turbine by applying principles of operation and procedures 3.2. Monitor and correct fuel and energy systems and flows to ensure that the system provides the proper operational mixture for turbine use 3.3. Ensure adequate supplies of clean air at the stated rate or temperature are delivered to the turbine to allow for successful operation to be achieved 3.4. Check exhaust gas and turbine operating temperatures to ensure correct temperature gradients in the turbine 3.5. Monitor lubrication systems to verify that operational parts are functioning efficiently and effectively, and to ensure that all moving parts are operating in a friction free and clean environment 3.6. Monitor and adjust cooling systems to allow for the most efficient operating temperature to be maintained throughout all operating conditions 3.7. Monitor governing systems to allow correct operational speeds of equipment to be maintained and regulated.
4. Conduct operational maintenance.	4.1. Conduct routine inspections and checks to ensure normal or stated turbine operation is maintained 4.2. Identify equipment faults through observation of the operational equipment and periodic sampling and testing 4.3. Determine action and communicate maintenance requirements to appropriate personnel 4.4. Record operational data to provide a historical record of the operating condition of equipment.

ELEMENT	PERFORMANCE CRITERIA
5. Prepare equipment for maintenance.	5.1.Shut down gas turbine in line with procedures 5.2.Isolate turbine for maintenance in accordance with procedures
6. Control hazards.	6.1.Identify hazards in the work area 6.2.Assess the risks arising from those hazards 6.3.Implement measures to control those risks in line with procedures and duty of care.
7. Respond to gas turbine problems.	7.1.Monitor plant frequently and critically throughout shift using measured/indicated data and senses (sight, hearing, etc) as appropriate 7.2.Recognise turbine operational problems 7.3.Analyse cause of operational problems within scope of skill level 7.4.Take timely and appropriate action to solve operational problems.

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 the ability to distinguish between causes of problems/alarms/fault indications such as:

- turbine failure or malfunction
- electrical failure or malfunction
- mechanical failure/malfunction
- quality measurement inaccuracy, eg analyzer, manual sampling deficiencies
- air/fuel quality

Required knowledge

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

- identify all items on a schematic of the turbine and describe the function of each
- turbine operating parameters and capacities
- turbine operating principles, including fuel injection, lubrication, cooling, ignition, induction and exhaust power supply
- equipment operation, including, pressures temperatures and speeds
- turbine equipment terminology
- process drawings, eg PID, PFS. cause and effect
- safety systems and procedures

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 for this unit of competency will be on an operating plant. 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 timely assessment of parts of this unit of competency (eg Elements 1, 2 and 4). 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 the turbine and its 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

EVIDENCE GUIDE	
	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 turbine, incidents on similar turbines around the world, hazard analysis activities and similar sources.
Context of and specific resources for assessment	As a general rule assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating competence 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.
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 unit of competency includes all such items of equipment and unit operations which form part of the operating system. For your plant this may include (select relevant items): • gas turbine engines • electric motors • governing systems • power supply • safety and shutdown systems • cooling systems. Typical problems for your plant may include: • variation in power/fuel supply • vibration • overheating • fouling of turbine/engine/exchangers • lubrication quality • ancillary equipment failures.
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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