Australian Government

Department of Education, Employment and Workplace Relations

UEPOPS407A Start and Run up a Gas Turbine

Release: 1

UEPOPS407A Start and Run up a Gas Turbine

Modification History

Not Applicable

Unit Descriptor

Unit Descriptor **1**)

This unit deals with the skills and knowledge required for the purging, ignition and establishment of combustion and run-up of a gas turbine to operational, synchronous speed. The Gas Turbine may be operated as an individual unit on open cycle or as a component of a combined cycle plant consisting of a gas turbine, heat recovery steam generator and steam turbine.

Application of the Unit

Application of the Unit **3**)

This unit is intended to augment formally acquired competencies.

License to practise **3.1**)

The skills and knowledge described in this unit may require a licence to practise in the workplace in some States or Territories. There may also be additional assessment activities required by regulatory authorities for the issue of the licence to practise.

However, practice in this unit is subject to regulations directly related to Occupational Health and Safety.

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite Unit(s) **2)**

Competencies **2.1)**

There are no prerequisite units

Employability Skills Information

Refer to the Evidence Guide

Elements and Performance Criteria Pre-Content

5) Elements describe the essential outcomes of a unit of competency

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA	
1 Plan and prepare work	1.1	Safety issues are identified to comply with enterprise/site requirements
	1.2	Work requirements are identified from relevant personnel and documentation
	1.3	Pre operational checks are carried out on plant according to manufacturer's recommendations and site requirements
	1.4	Where appropriate, the teams and individuals roles and responsibilities within the team are identified and, where required, assist in the provision of the on-the-job training

ELEMENT	PERFORMANCE CRITERIA	
2 Operate plant	2.1	Pre-operational conditions are established in accordance with enterprise standards and site requirements
	2.2	Where the gas turbine is a component of a combined cycle unit pre-operational conditions of the Heat Recovery Steam Generator, associated steam mains and Steam Turbine are established in accordance with enterprise standards and site requirements.
	2.3	Starting procedures are commenced and correct purge, ignition and run-up sequence observed
	2.4	Minimum operation of gas turbine is established and supported in accordance with enterprise, manufacturer's and site requirements.
	2.5	Where the gas turbine is a component of a combined cycle unit monitoring and control of Heat Recovery Steam Generator drum level, feedwater flow, steam and metal temperature rates of rise, steam pressure rate of rise, steam flow and drainage are carried out in accordance with manufacturer's and site requirements
	2.6	Gas Turbine exhaust gas temperature and flow to the Heat Recovery Steam Generator and Gas Turbine power output are monitored and adjusted to achieve required steam conditions and demand, observing operating requirements
	2.8	Plant is operated within limits of plant design, enterprise or site requirements.
	2.9	Plant is monitored and observed to detect deviations from required operating conditions.
	2.10	Corrective action is taken to rectify abnormalities in accordance with manufacturer's and enterprise/site procedures
3 Test plant operation	3.1	Tests are performed in accordance with defined procedures applicable to the operational test
	3.2	System and plant is observed for correct operational response

ELEMENT		PERFORMANCE CRITERIA	
		3.3	Corrective action is taken when response is not in accordance with documentation, plant integrity or personnel safety requirements
		3.4	Plant is returned to required operational status upon completion of test
4	Identify and respond to plant operation anomalies	4.1	Cause/s of abnormal plant operating conditions are identified by analysing the technical and operational information in a logical and sequential manner
		4.2	Corrective action taken is in accordance with enterprise/site procedures
		4.3	Plant integrity and personnel safety is maintained through consultation with appropriate personnel, and reference to plant, technical and operational documentation
		4.4	Appropriate personnel are notified when defects are detected
5	Complete documentation	5.1	Documentation is updated and plant problems, movements, abnormalities and status are reported and logged in accordance with enterprise/site procedures

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Evidence shall show that knowledge has been acquired starting and running up a gas turbine.

The extent of the Essential Knowledge and Associated Skills required follows:

Evidence shall show that knowledge has been acquired for safe working practices of:

- Relevant Occupational Health and Safety regulations

REQUIRED SKILLS AND KNOWLEDGE

- Relevant statutory legislation; environmental legislation
- Relevant enterprise/site safety procedures; enterprise/site emergency procedures and techniques
- Enterprise recording procedures; communication principles
- Control and data acquisition systems; computers and software
- Mechanical and electrical supervisory, alarm, protection and control equipment
- Enterprise/site standard operating procedures; safe operating principles.
- Mathematics, Mechanics, Physics, Chemistry and Electrical Principles.
- Motor performance characteristics; pump and compressor performance characteristics
- Valve, damper and actuator types and performance characteristics.
- The principles of safe and efficient fuel combustion
- The purpose, function and operation of fuel storage, conditioning, transfer and firing equipment
- The objectives, sequence of operations, critical operating parameters and safety precautions associated with a gas turbine start up; gas turbine efficiency
- The gas turbine main and auxiliary systems' components and their interaction with other plant and equipment external to that covered by this competency.
- AC and DC electrical distribution systems; electric motors; switchgear.
- Station water distribution systems; fire protection control systems; compressed air systems; auxiliary supply systems.

Specific skills needed to achieve the Performance Criteria:

- Apply relevant Occupational Health and Safety regulations
- Apply relevant statutory legislation
- Apply relevant enterprise/site safety procedures

REQUIRED SKILLS AND KNOWLEDGE

- Apply enterprise/site emergency procedures and techniques
- Apply enterprise/site standard operating procedures and safe operating principles
- Apply enterprise recording procedures
- Use and interpret diagrams, drawings and symbols
- Communicate effectively
- Plan and prioritise work; organise resources
- Identify plant status
- Prepare plant/equipment for operation
- Use relevant hand tools
- Operate gas turbine and associated plant and equipment
- Apply diagnostic and testing techniques
- Identify and respond to abnormal plant operating conditions
- Apply data analysis techniques and tools
- Coordinate the operation of equipment in such a manner as to maintain plant integrity, personnel safety, continuity of supply and optimum efficiency

Evidence Guide

EVIDENCE GUIDE

8) This provides essential advice for assessment of the competency standard unit and must be read in conjunction with the Performance Criteria and the Range Statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this competency standard unit and shall be used in conjunction with all components parts of this unit and, performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment

8.1)

Longitude competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with Industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Hence, sources of evidence need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an

assessment method and developing assessment instruments. Sample assessment instruments are included in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

8.2)

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated Performance Criteria shall be demonstrated on at least two occasions in accordance with the "Assessment Guidelines - UEP06". Evidence shall also comprise:

- A representative body of Performance Criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:

- Implement OHS workplace procedures and practices including the use of risk control measures as specified in the Performance Criteria and Range Statement
- Apply sustainable energy principles and practices as specified in the Performance Criteria and Range Statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in 6) Essential Knowledge and Associated Skills of this unit
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedure

- Demonstrated performance across a representative range of contexts from the prescribed items below:
  - The knowledge and application of relevant sections of occupational, health and safety legislation; statutory legislation; enterprise/site safety procedures; enterprise/site standard operating procedures and safe operating principles; enterprise/site emergency procedures
  - The knowledge of principles and techniques of operation of a gas turbine and associated plant and equipment
  - The knowledge of operational testing of plant
  - The knowledge of system components and the manner in which these components interact with other plant and equipment
  - The knowledge of the principles of fuel combustion and emission control
  - The knowledge of the principles of heat recovery steam generator and feedwater sampling and chemical treatment
  - The ability to prepare and plan work
  - The ability to prepare plant/equipment for operation
  - The ability to monitor and operate plant/equipment in accordance with enterprise/site standard operating procedures and safe operating principles
  - The ability to analyse plant faults
  - Dealing with an unplanned event by drawing on essential knowledge and skills to provide appropriate

solutions incorporated in the holistic assessment with the above listed items.

Context of and specific resources for assessment

8.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

Competency Standards should be assessed in the workplace or simulated workplace and under the normal range of workplace conditions.

Assessment of this unit will be supported with documentary evidence, by means of endorsement stating type and application of work.

In addition to the resources listed above in Context of assessment', evidence should show competency working in limited spaces with different types of plant and equipment as well as different structural/construction types and methods and in a variety of environments.

Method of assessment

8.4)

This unit shall be assessed by methods given in Volume 1, Part 3 "Assessment Guidelines".

Note:
Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

8.5)

There are no recommended concurrent assessments with this unit, however in some cases efficiencies may be gained in terms of learning and assessment effort being concurrently managed with allied competency standard units where listed.

UEPOPS336A Operate and monitor a gas turbine unit

UEPOPS333A Operate and monitor HRSG hot gas control

system

UEPOPS433A Start up a heat recovery steam generator unit\

Key competencies **8.6**)

Evidence that particular key competencies have been achieved within this unit is in the context of the following Performance Criteria of evidence. See Volume 2, Part 4 for an explanation of Key competencies and levels of this Training Package.

Key competencies	**Example of Application**	**Performance Level**
How are ideas and information communicated within this competency?	Refer to the following example of application: Explain ideas and actions, make suggestions for alternative actions and deal with contingencies and non-routine situations.	2
How can information be collected, analysed and organised?	Refer to the following example of application: Information with regard to operations, faults and maintenance may be observed and monitored for analysis and organised into records and reports.	2
How are activities planned and organised?	Refer to the following example of application: Planning the required activity, to include co-ordination and use of equipment, materials and tools to avoid backtracking and rework.	2
How is team work used within this competency?	Refer to the following example of application: Coordinate activities of the team and provide appropriate support to other team members in completion of work tasks to meet the team's goals.	2
How are mathematical ideas and techniques used?	Refer to the following example of application: Calculation of time to complete routine projects, operations, tasks, estimation of distances, levels, loads and material requirements.	2

How are problem solving skills applied?	Refer to the following example of application: Determine solutions which focus on long and short-term resolution of work task problems.	2
How is use of technology applied?	Refer to the following example of application: Access, communicate, measure and provide information to monitor operations and performance of plant and equipment.	2

Skills Enabling Employment

8.7)

Evidence that competency in this unit incorporates skills enabling employment is in the context of the following performance. See Volume 2, Part 5 for definitions and an explanation of skills enabling employment.

Skills for Employment		**Example of Application**
1	Developing and using skills within a real workplace	Refer to the following example of application: Completion of tasks within an acceptable timeframe and performance with some supervision.
2	Learning to learn in the workplace	Refer to the following example of application: Comprehension and application of theoretical knowledge to well-developed skills.
3	Reflecting on the outcome and process of work task	Refer to the following example of application: Focused on improvement in own and other team member's performance in the workplace.
4	Interacting and understanding of the context of the work task	Refer to the following example of application: Working understanding of the processes and systems which apply to the workplace.
5	Planning and organising the meaningful work task	Refer to the following example of application: Achieving work tasks in a timely manner and ensuring that the work team achieves its stated work goals.

6	Performing the work task in non-routine or contingent situations	Refer to the following example of application: Seek advice and apply solutions to problems relevant to the workplace environment.

Range Statement

RANGE STATEMENT

7) This relates to the competency standard unit as a whole, providing the range of contexts and conditions to which the Performance Criteria apply. It allows for different work environments and situations that will affect performance.

Plant and equipment may include: gas turbines; gas turbine emission control equipment; gas turbine exhaust gas control dampers; heat recovery steam generators and auxiliary plant; heat recovery steam generator supplementary duct firing equipment; fuel and fuel delivery systems; fuel management systems; flame detection equipment; steam temperature control equipment; AC and DC electrical distribution systems; electrical switchgear; electric motors; electric motor driven pumps and fans; diesel engine driven auxiliary plant; station water distribution systems; hydraulic power oil systems; compressed air systems; distributed control systems; supervisory, protection, alarm and control equipment.

Safety standards may include relevant sections of Occupational Health and Safety legislation, enterprise safety rules, relevant State and federal legislation, national standards for plant and Australian standards.

Information and documentation sources may include verbal or written communications; enterprise safety rules documentation; enterprise operating instructions; computer-based and computer accessed documentation; enterprise/site standing and operating instructions; enterprise log books; manufacturer's operation and maintenance manuals; and equipment and alarm manuals.

Technical and operational indicators may include stimuli (auditory, olfactory, tactile, visual), local indicators and recorders, computers and alarms (visible and/or audible).

Communications may be by direct personal interaction or by means of telephone, verbal or text-based telephone messaging, two way radio, pager, computer (electronic mail) and/or operating logs (written or verbal).

Appropriate personnel for consultation, giving or receiving direction may include: supervisor/team leader or equivalent, power plant operations personnel or equivalent, technical and engineering officers or equivalent, maintenance staff, other operating staff or equivalent, system controller/network controller, field operator, restricted H.V. operators, independent generators and customers and contractor staff.

Operating environment may be remote from the plant and equipment being operated, (in cases where operation is assisted by remote indication of operating parameters and plant status), during inclement or otherwise harsh weather conditions, in hot/wet/noisy/dusty/elevated/confined or enclosed areas or during night periods.

Plant operations (systems requirements) may include:

Returns to service with the heat recovery steam generator in a cold, warm or hot

RANGE STATEMENT

condition; compressor on-load or off load blade washing; operational testing.

Operational tests may include:

Loss of a major auxiliary control response checks; stand-by plant "cut-in" tests; dampers/valves operating checks and pre and post start tests.

Faults and abnormal operating conditions may include:

Failure of starting device; excessively high exhaust temperature, excessive blade path temperature spread, excessively high wheel space temperature, excessively high compartment temperatures, excessively high shaft or bearing vibration, excessively high speed (or frequency, when synchronised); reduction in flow or failure of fuel supply; uneven fuel distribution to combustors; loss of a major auxiliary; loss of electrical supply to switchboards, drive motors or valve actuators; automatic control loop(s) malfunctions; high temperatures on/in: motor and/or pump bearings, lubricating oil or motor windings; heat exchange element tube leaks; excessively high heating/cooling rates; high differential pressures on fuel/oil/air filters and strainers; failed field devices; failed/malfunctioning actuators/dampers/valves.

Generic terms are used throughout this Training Package for vocational standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms are given in Volume 2, Part 1.

Unit Sector(s)

Not Applicable

Literacy and numeracy skills

Literacy and numeracy skills **2.2**)

Participants are best equipped to achieve this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 Literacy and Numeracy

Reading	4	Writing	4	Numeracy	4

Competency Field

Competency Field **4)**

Operations