CODE: OHSCER242A

TITLE: Operate a turbine

DESCRIPTOR: This unit of competency covers the functions required to operate a turbine to meet industry minimum training and assessment standards for the purposes of certification. This unit has been developed in accordance with the licensing and assessment requirements of NOHSC:1006 [2001].

This scope of work for this level covers turbines with any or all of the following features—attached condensers, multi-wheeled, a multi-stage heat extraction process and a speed of greater than 3600 rpm. This unit involves starting, operating, monitoring, shutting down and storing boiler.

Element	Performance Criteria
1.0 Start steam turbine	
1.1 Select and use personal protective clothing and equipment	1.1.1 *Personal protective clothing* and *equipment* is selected for use, ensuring statutory requirements and work place procedures are followed. 1.1.2 Functions that require the use of *personal protective clothing* and *equipment* are reported to enable the function to be assessed using the hierarchy of prevention/control procedure.
1.2 Carry out pre-operational safety checks	1.2.1 Pre-operational safety *checks* of turbine are conducted in accordance with statutory requirements, manufacturer's recommendations and plant operating procedures. 1.2.2 Maintenance requirements are identified and reported in accordance with workplace procedures.
1.3 Maintain health and safety standards in the work area	1.3.1 *Hazards and potential hazards* in work area are identified in accordance with statutory requirements and work place procedures. 1.3.2 *Hazards* are reported in accordance with statutory requirements and work place procedures. 1.3.3 Prevention/control measures are selected in accordance with the hierarchy of control.
1.4 Start turbine	1.4.1 Turbine is *started* and brought up to speed and placed on line safely, in accordance with statutory requirements, manufacturer's recommendations and work place procedures. 1.4.2 *Maintenance* requirements are to be identified and reported in accordance with workplace requirements.

Element	Performance Criteria
2.0 Operate and monitor turbine	
2.1 Conduct take/hand over procedures for turbines	2.1.1 Operating status of turbine is diagnosed. 2.1.2 *Operating log* is maintained clearly and accurately, in accordance with statutory requirements and workplace procedures. 2.1.3 Information regarding turbine, its status and operation is *communicated* clearly in accordance with workplace procedures.
2.2 Monitor turbine operation	2.2.1 Turbine is *monitored* in accordance with statutory requirements manufacturer's recommendations and workplace procedures. 2.2.2 Engine room *chemicals* are stored and handled in accordance with statutory requirements, manufacturer's recommendations and workplace procedures.
2.3 Maintain health and safety standards during turbine operation	2.3.1 *Maintenance* requirements are identified and reported in accordance with work place procedures. 2.3.2 Turbine *emergency* is responded to in accordance with statutory requirements, manufacturer's recommendations and workplace procedures.
3.0 Shut down turbine	
3.1 Carry out turbine **operational** shutdown	3.1.1 Turbine is *shut down* in accordance with statutory requirements, manufacturer's recommendations and workplace procedures. including checks of:
3.2 Carry out turbine shut down for an **internal inspection**.	3.2.1 Turbine is *shut down* in accordance with statutory requirements, manufacturer's recommendations and workplace procedures. including checks of: 3.2.2 Turbine *valves and fittings* are removed for maintenance in accordance with statutory requirements, manufacturer's recommendations and workplace procedures.

RANGE STATEMENT

The assessment must determine that there is sufficient skill and knowledge for the operator to take the licence and operate in a new workplace. The assessment must be adjustable but prescriptive to ensure transferability.

What may be involved in routine *checks* of steam turbines?

Pre-operational

Pre-operational *checks* may include but not limited to:
- checking the steam supply and system
- operation and position of turbine valves
- safety devices
- over-speed shut-down
- pressure relieve devise
- speed governor
- exhaust system
- auxiliary equipment
- lubrication system
- evidence of structural weaknesses
  - paint separation
  - stressed welds
- evidence of damage
- leaks
- emergency devices and alarms
- log books.

Pre-start

Pre-start *checks* must be in accordance with manufacturer's recommendations, Australian Standards and guidelines.

Pre-start checks may include but not limited to:
- Inspection of elevating work platform/fixed work platforms/ladders.
- Ensure written documents are completed.
- Establish exclusion zones with barricades if necessary
- Checks fixed guards/covers.
- Ensure relevant permits, authority to work are obtained.

Start up checks

May include but are not limited to:
- position and operation of valves and fittings
- operation of lubrication system
- operation of drainage system
- steam quality
- operation of auxiliary equipment
- freedom of rotation of turbine
- turbine warm up
- operation of steam traps and steam line purge systems
- warm up reticulation system
- reticulation line pressure.

Post-start

Post-start *checks* must be in accordance with manufacturer's recommendations, Australian Standards and guidelines.

Pre-start *checks* may include but not limited to:
- check hazards warning systems.
- operating, emergency controls and safety devices are located and identified and correctly tested in accordance with manufacturers' specifications.
- communication signals to be confirmed with appropriate personnel.
- defects and damage are reported according to site procedures.

What range of turbines may be operated?

Turbines may be operated with the following features:
- attached condensors
- multi-wheeled
- a multi-stage heat extraction process
- a speed of greater than 600 rpm.

Definition of a steam turbine engine as explained in the NOHSC:7019 Guideline:

All industrial equipment where steam acts on a turbine or rotor to cause a rotary motion.

This definition excludes steam turbines and expansion turbines with a power output of less than 500kW.

What *personal protective clothing* and *equipment* may be relevant to this standard?

The relevant personal protective equipment may include but not be limited to:
- thermally insulated gloves
- hard hat head protection
- ear protection (muffs or plugs)
- chemical resistant gloves and apron
- respiratory devices
- eye protection
- working protective gloves
- boots
- high visibility clothing where required.

What *hazards* may be encountered in the workplace?

Hazards that may be encountered in the workplace include but are not limited to:
- chemical hazards
- thermal hazards
- manual handling hazards
- machine guards
- illumination of work area
- rubbish and combustibles in area
- leakage of steam plant
- leakage of fuel
- obstructions in work area
- hot exposed steam pipe

- broken ladder hand rail
- excessive noise from machinery
- spillage of oil on the workplace floor
- odour of gas
- fumes from a liquid chemical spill
- low water condition.

What may be included in an *Operating Log*?

Information contained in the operating log must be in accordance with workplace requirements, statutory legislation and manufacturer's recommendations.

Records may include:
- time in use
- steam pressure
- chemical treatment
- test results
- maintenance requirements.

What *valves and fittings* may be associated with the turbine?

Valves and fittings may include but not be limited to:
- safety valves
- gauge glasses
- main steam stop valve
- turbine drain valve
- steam pressure gauge
- temparature guage
- lubrication system.

What information regarding the turbine is *communicated* in take/hand over?

Information may include but not be limited to:
- Previous load requirements
- maintenance issues
- operational incidences
- read operating log
- general inspection of boiler to detect any defects
- accept responsibility of boiler
- equipment malfunctions are noted
- equipment tested as required.

What may be included as turbine *chemicals*?

Chemicals may include but not be limited to:
- extinguishing agent's carbon dioxide
- water
- soda acid
- organic foam and dry powder
- oxygen scavenger
- feed water additives
- other chemicals.

What enterprise (workplace) requirements may apply to this standard?

The enterprise requirements that may apply include but are not limited to:
- Australian Standards
- State/Territory legislation
- manufacturer operating instructions
- local operating procedures
- environmental requirements
- noise standards.

What *maintenance* requirements may be encountered in the workplace?

Maintenance requirements that may be encountered in the workplace include but are not limited to:
- leaking steam pipe
- exposed electrical wiring
- defective lighting in the workplace
- leaking safety valve
- lubricating system
- blade inspection
- gland seals
- bearing and safety devices.

What occupational health and safety requirements may be relevant to this standard?

Safe systems and procedures for:
- Hazard Identification and Risk Control
- extreme temperatures (hot/cold)
- Material Safety Data Sheets(MSDS)
- maintenance and inspection of turbines
- turbines emergencies
- selection and use of personal protective clothing and equipment
- chemical hazards
- thermal hazards
- manual handling hazards
- machine guards
- illumination of work area
- rubbish and combustibles in work area
- obstructions in work area
- manual handling
- working in confined spaces (chemical/lubrication storage rooms)
- the protection of people in the workplace
- using lifting equipment and associated gear to manufacturers specification.

What permits may be relevant to this standard?

Consider any permits required to carry out job activity are obtained from the relevant authorised personnel for example confined spaces, chemical or dangerous goods storage, hot work permits.

What work area may be relevant to this standard?

The work area may include but not be limited to:
- factories
- ships
- hospitals
- laundries
- chemical plants
- power stations
- rail.

Who are downstream users?

Downstream users may include but not be limited to:
- production
- maintenance workers
- supervisors
- other turbine operators.

How might the turbine be operated in a safe, controlled and correct manner?

The turbine is operated with consideration to the manufacturer's instructions and specifications, Australian Standards, State/Territory legislation, workplace procedures.

What checks may be included in *monitoring* the turbine?

Monitoring a turbine may include but not be limited to:
- checks of steam reticulation line pressure
- usage of and supply of steam
- quality of steam
- operation of control/safety devices.

What may be involved in responding to turbine *emergency*?

Reponses to turbine emergency may include but not be limited to:
- identification of emergency
- selection and application of appropriate firefighting equipment
- notification of downstream users
- operation of turbine only when safe to do so
- isolate steam turbine/boiler where necessary.

What types of *equipment* may be associated with turbines?

The types of equipment associated with turbines include but is not limited to:
- gas monitoring equipment
- fire fighting equipment
- personal protective equipment
- first aid equipment (basic)
- manual handling equipment
- oil filtration equipment
- work platform
- other lifting gear.

What checks may be included in the operational *shutdown* of a turbine?
Operational shutdown of a turbine may include but not be limited to:
- cooling down process
- boiler pressure/vacuum
- steam isolation
- lubrication system
- isolation of cooling water.

What checks may be included in the *shutdown* of a boiler for an internal inspection?

Shutdown of a turbine for internal inspection may include but not be limited to:
- checks of bearings and seal blades
- opening of turbine housing for internal inspection
- gearbox
- coupling.

What checks may be involved in procedures regarding entry into *confined spaces*?

Entry into confined spaces may include but not be limited to:
- checks of opening size
- available room to manoeuvre in confined space
- lighting voltage
- air quality in confined space
- air supply
- need to enter
- permits.

What are the key considerations when coordinating operations?

The turbine is operated with consideration to:
- communication with other operators
- hand-over procedures
- maintenance of log-books
- effect on the equipment of end-users.

What self management skills may be associated with boilers?

Self management skills includes but is not limited to:
- performance management including time management
- planning
- scheduling of operations
- training of personnel.

What records may need to be kept or updated?

Records may include but not limited to:
- log books
- maintenance records
- records of faults and potential faults
- repairs carried out according to manufacturers specification and operating procedures
- workplace record keeping requirements
- details of any daily or periodic maintenance work
- details of yearly programmed or any additional maintenance work.

EVIDENCE GUIDE

The evidence guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competency for this unit. This is an integral part of the assessment of competency and should be read in conjunction with the performance criteria, the range statement and the assessment guidelines.

Competence in this standard requires evidence of the ability to utilise the components and controls of a steam turbine to carry out operations without damage to the steam turbine, property or injury to people. It requires the ability to conduct pre-start and shut-down procedures to ensure mechanical reliability, communicate and cooperate with other personnel such as downstream users and maintain operating records.

What **critical aspects** of evidence are required to demonstrate competency in this unit?

- Location, interpretation and application of relevant information, standards and specifications.
- Compliance with the site safety plan and occupational health and safety legislation/regulations/codes of practice/advisory standards applicable to workplace operations.
- Compliance with organisational policies and procedures including quality requirements.
- Safe and effective operational use of tools, turbine and equipment.
- Communication and working effectively and safely with others.

What **specific knowledge** is needed to achieve the performance criteria?

- Components, controls and features of turbines and their functions.
- Operating principles and operating methods.
- Legislative requirements with regard to licensing.
- Processes and procedures relevant to working with a steam turbine.
- Principles of the safe removal of obstacles and hazards from the workplace.
- The hierarchy of hazard control measures with elimination of substitution, isolation and engineering control measures being selected before safe work practices and personal protective equipment.
- Workplace communication procedures.
- Current state/territory occupational health and safety legislation, standards, codes of practices and advisory standards,
- Obtain licences and permits
- Demonstrate safe and environmentally responsible workplace practices.
- Electrical/steam/boiler hazards.

What **specific skills** are needed to achieve the performance criteria?

- Readily familiarise self with local conditions.
- Perform routine safety, basic service and maintenance procedures.
- Demonstrate emergency operating procedures.
- Read and interpret operators' manuals, manufacturers' specifications, work and maintenance plans and material safety data sheets.
- Communicate faults, malfunctions and workplace hazards, reports and maintain operational records.
- Comprehend and apply task instructions.
- Manual lifting
- Working with other turbine operators and personnel in a team environment.
- Able to listen and understand job requirement.
- Understand written documents.
- Understand tables and figures for job procedures.
- Understand interrelationship among workplace processes and procedures.in the English language.
- Understand and interpret signals and instructions in the English language.

What **methods of** assessment should apply?

- Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge.
- Assessment must include as a minimum the achievement of competence to the standard established in the NOHSC assessment instrument. Additional requirements may need to be achieved to comply with the AQTF including key competencies.
- Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge.
- Assessment must be applied in a real work environment or replicated industrial workplace.

In what **context** should the assessment occur?

- The application of competency is to be assessed in the workplace or replicated industrial workplace.
- Assessment is to occur using standard and authorised work practices including safety equipment and environmental constraints.
- Assessment of essential underpinning knowledge, other than the confirmatory questions, will usually be conducted in an off-site context.
- Assessment is to comply with relevant regulatory requirements including specific Australian Standards.

What are the **specific resource requirements** for this unit?

- Workplace location or replicated work facility in accordance with the OHS instrument relating to the OHS jurisidiction.
- Tools and equipment appropriate to turbines
- Specifications and work instructions
- Occupational Health and Safety Certification Training and Assessment Delivery Guide
- Occupational health and safety assessment instruments
- Occupational health and safety authority learner guide
- Occupational health and safety authority trainer guide.

What key competencies should be applied to this unit of competency?

There are a number of processes that are learnt throughout work and life which are required in all jobs. They are fundamental processes and generally transferable to other work functions. Some of these are covered by the **key competencies**, although others may be added. The questions below highlight how these processes are applied in this competency standard. Following each question a number in brackets indicates the level to which they key competency needs to be demonstrated where:

0 = not required
1 = perform the process
2 = perform and administer the process
3 = perform, administer and design the process

1. How can **communication of ideas and information** be applied?	Information and ideas with regard to steam turbines should be discussed with supervisors and co-workers. **Level 1**
2. How can **information be collected, analysed, and organised**?	Information with regard to performance, faults and maintenance may be observed and monitored for analysis and organised by records, maintenance logs, logbooks and reports. **Level 1**
3. How can **activities be planned and organised**?	Activities involving planning the work and hazard identification may be planned or coordinated around work schedules, or sequenced as required. Planning required in working with operators and operators of associated equipment. **Level 1**
4. How can **team work** be applied?	Team work may be applied in communication methods and procedures to work cooperatively with other team members. **Level 1**
5. How can the use of **mathematical ideas and techniques** be applied?	Mathematics may be applied in the basic calculation of volume, mass and density of water used in an out of steam turbine engines. **Level 1**
6. How can **problem solving skills** be applied?	Contingencies for changed or difficult operating conditions or to control hazards and maintenance problems. **Level 1**
7. How can the use of **technology** be applied?	To access, communicate, measure and record information with regard to maintenance, usage and performance of steam turbine engine job requirements. **Level 1**

Are there any other competency standards that could be assessed with this one?

This competency standard could be assessed on its own or in combination with the other units of competency relevant to the job function.

There is essential information about assessing this competency standard for the consistent performance and where and how it may be assessed in the Assessment Guideline developed by the National Occupational Health and Safety Commission. All users of this competency standard must have access to this guideline.