



Australian Government

Department of Education, Employment and Workplace Relations

PMAOPS221B Operate and monitor prime movers

Revision Number: 1

PMAOPS221B Operate and monitor prime movers

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit covers the operation of a prime mover and its ancillary equipment is used to drive a high pressure pump or compressor. The prime mover may be a large high voltage/current electrical motor, a turbine or a diesel engine. It is a complex, independent item of equipment with a specialised start up and shut down procedure. It may have its own control panel and inbuilt vibration monitoring equipment.
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Application of the Unit

Application of the unit	Often the operation of a prime mover will require a 'ticket' (special licence) to operate and local requirements need to be checked. This unit includes starting up/shutting down and monitoring the performance of the equipment and a full understanding of HSE 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 prime mover • monitor, shut down and start up prime mover and ancillary equipment using relevant procedures. This unit does not apply to close coupled motors which are operated as part of the equipment, eg for pump motors see <i>PMAOPS201B Operate fluid flow equipment</i>. 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 for work.	1.1. Identify work requirements 1.2. Identify and control hazards 1.3. Coordinate with appropriate personnel
2. Prepare equipment for operation.	2.1. Check operation and function of prime movers by applying principles of operation and procedures 2.2. Check the operational area to ensure that any potential hazards which may affect the operation of the equipment are removed 2.3. Conduct required safety checks and pre-starts to determine or verify the operational condition of the equipment.
3. Start up prime movers.	3.1. Commission and bring on line prime mover protection devices and ancillary equipment as required by start-up 3.2. Start up prime mover according to procedures.
4. Monitor and assess prime mover systems.	4.1. Monitor fuel, energy systems and flows as required for prime mover use 4.2. Ensure adequate supplies of clean air at the stated rate or temperature are delivered to the prime mover to allow for successful operation to be achieved 4.3. 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 4.4. Monitor and adjust cooling systems to allow for the most efficient operating temperature to be maintained throughout all operating conditions 4.5. Monitor governing systems to allow correct operational speeds of equipment to be maintained and regulated. 4.6. Take appropriate action as a result of monitoring observations.
5. Monitor operational maintenance requirements.	5.1. Conduct routine inspections and checks to ensure normal or stated prime mover operation is maintained 5.2. Identify equipment faults through observation of the operational equipment and periodic sampling and testing 5.3. Take appropriate action on items found 5.4. Record operational data to provide a historical record of the operating condition of equipment.
6. Isolate and de-isolate plant.	6.1. Isolate plant 6.2. Make safe for required work

ELEMENT	PERFORMANCE CRITERIA
	6.3. Check plant is ready to be returned to service 6.4. Prepare plant for return to service.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

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

Required knowledge

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

- all items on a schematic of the prime mover and the function of each
- prime mover operating parameters and capacities
- prime mover operating principles, including fuel injection, lubrication, cooling, ignition, induction and exhaust power supply
- equipment operation, including flows, pressures temperatures and speeds
- equipment terminology
- sampling and testing techniques
- process drawings, eg PID, PFS
- cause and effect
- safety systems and procedures
- job hazard analysis.
- physics and chemistry relevant to the prime mover
- process parameters and limits, eg temperature, pressure, flow
- 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
- correct methods of starting, stopping, operating and controlling flow
- corrective action appropriate to the problem cause
- function and troubleshooting of major internal components and their problems.

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 requires an application of the knowledge contained in the use of the prime movers 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 prime mover, incidents on similar prime movers 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 production/processing system. For your plant this may include (select relevant items): • diesel, gas and petrol reciprocating engines • turbine engines • electric motors • governing systems • power supply • safety and shutdown systems • cooling systems.
Problems	Typical problems for your plant may include: • variation in power/fuel supply • vibration • overheating • fouling of turbine/engine/exchangers • lubrication quality • ancillary equipment failures. • prime mover failure or malfunction • electrical failure or malfunction • mechanical failure/malfunction • equipment design deficiencies • quality measurement inaccuracy, eg analyzer, manual sampling deficiencies • fuel quality.
Appropriate action	Appropriate action includes: • determining problems needing action • determining possible fault causes • rectifying problem using appropriate solution within area of responsibility

RANGE STATEMENT	
	• following through items initiated until final resolution has occurred • reporting problems outside area of responsibility to designated person.
Procedures	Procedures may be written, verbal, computer-based or in some other form. They include: • all work instructions • standard operating procedures • formulas/recipes • batch sheets • temporary instructions • any similar instructions provided for the smooth running of the plant. 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.
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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