Australian Government

Department of Education, Employment and Workplace Relations

PMAOPS222B Operate and monitor pumping systems and equipment

Revision Number: 1

PMAOPS222B Operate and monitor pumping systems and equipment

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	In a typical scenario a prime mover is used to drive a complete pumping system including pumps and ancillary equipment (eg, vibration monitors, lubrication pumps and equipment, gear boxes and barring gear). The pumps covered by this unit typically are used for hydrocarbon transmission lines.

Application of the Unit

Application of the unit	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 pump • monitor, shut down and start up pump and ancillary equipment using relevant procedures. This unit only applies to pumping systems and equipment which are driven by prime movers and does not include systems with close coupled motors (see *PMAOPS201B Operate fluid flow equipment*). This unit includes starting up/shutting down the system and monitoring the performance of the equipment including responding to the requirements of emergency situations 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.

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. 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 pump and driver 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 pre-start-up checks on the driver and pump to ensure that all nominated operational valves are correctly sequenced before commencing pumping operations, and that all safety requirements are met.
3. Start up/shut down pump.	3.1. Commission pump protection devices and ancillary equipment in accordance with procedures. 3.2. Start up prime mover to procedures 3.3. Bring pump on line 3.4. Shut down pump as required 3.5. Perform emergency shut down when required.
4. Monitor and assess pumping systems and equipment.	4.1. Verify the operational condition of all flanges, gaskets and seals to ensure that the operational integrity of these components is maintained within stated operational tolerances and to avoid any environmental damage 4.2. Monitor pumping installations/equipment to determine if the correct pump pressures, temperatures and flows conform to their required application 4.3. Monitor and regularly check pumping systems/ equipment performance and all components to identify any signs of excessive wear and diminution of performance 4.4. Check operational valves and valve assemblies for possible leakages 4.5. Monitor and identify variations in the operating conditions of the pumping systems/equipment through the interpretation of amperage operating data and equipment 4.6. Periodically check and clean filter systems to remove any potential blockages or impurities entering the pumping system/equipment and causing it to cavitate or malfunction during operation 4.7. Inspect and sample lubrication oil to check that operating levels are correct and to determine if any contamination has taken place which may affect the operational capacity of the

ELEMENT	PERFORMANCE CRITERIA
	pumping system/equipment. 4.8. Take appropriate action resulting from checks and monitoring.
5. Identify maintenance requirements.	5.1. Conduct routine inspections and checks to ensure normal or stated pump operation is maintained 5.2. Identify equipment faults through observation of the operational equipment and periodic sampling and testing 5.3. Take appropriate action 5.4. Record operational data as required by procedures.
6. Isolate and de-isolate plant.	6.1. Isolate plant 6.2. Make safe for required work 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
Competence includes the ability to and be able to distinguish between causes of problems/alarms/fault indications such as: • instrument failure malfunction • electrical failure malfunction • mechanical failure malfunction • equipment design deficiencies • product parameters (temperature, viscosity, purity) • fouling or contamination, eg filters, exchangers, seal system, lubrication • cavitation • overheating (bearings, casing etc) • overload.
Required knowledge
The knowledge referred to in the Evidence Guide for this unit includes: • all items on a schematic of the pump system and the function of each • pumping system/equipment operating parameters • sampling and testing techniques • equipment terminology • plant or field layout or geography • safety systems and procedures • fault finding and troubleshooting techniques • job hazard analysis. • principles of operation of pump, ancillaries and components • physics and chemistry relevant to the pump, ancillaries and the materials processed • process parameters and limits, eg temperature, pressure, flow, pH • duty of care obligations • hierarchy of control • communication protocols, eg radio, phone, computer, paper, permissions/authorities • relevant alarms and actions • plant process idiosyncrasies • correct methods of starting, stopping, operating and controlling process • corrective action appropriate to the problem cause • function and troubleshooting of major components and their problems • types and causes of problems within operator's scope of skill level and responsibility.

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 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 pumps and their 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 pump, incidents on similar pumps 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 an operating pump system 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 if 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 pumping system. For your plant this may include (select relevant items): • beam pumps • electrical submersible pumps • jet pumps • centrifugal pumps • positive displacement pumps, eg reciprocating pumps • various drivers (diesel engine, electric motor, steam turbine etc) • instrumentation • filters.
Typical problems	Typical problems for your plant may include: • variation in feed • vibration • control of level, temperature, pressure and flow • blockages • overheating • overloading.
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	*PMAOPS221B*	*Operate and monitor prime movers*