



Australian Government

PMAOPS405 Operate complex control systems

Release: 1

PMAOPS405 Operate complex control systems

Modification History

Release 1. Supersedes and is equivalent to PMAOPS405A Operate complex control systems

Application

This unit of competency covers the skills and knowledge required to operate a complex control panel. The panel will control entire plant areas and multiple products/process streams and will use a large number of control loops and a broad range of control algorithms; and will probably include advanced process control (APC) as one of its operations. Its operation will require managing multiple complex tasks.

This unit of competency includes all such items of equipment and unit operations which form part of the control system, including as appropriate to the facility:

- process control systems (e.g. distributed control systems (DCS), and supervisory control and data acquisition (SCADA))
- use of multiple control systems
- interacting control loops/cascade control
- personal computers
- printers
- fire and gas detection/protection systems
- emergency shutdown (ESD) systems
- communications systems.

This unit of competency applies to senior technicians or those in similar roles who are required to apply in-depth knowledge of process and plant in order to operate, monitor and optimise an entire plant area consisting of several plant units/systems, solve process problems and liaise with other plant areas.

This control system would typically be an advanced control system and may include operation of simpler control systems as part of its operation. The panel will typically be located off plant in a control room.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Operations

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

1	Use operator interface	1.1	Use keyboards, track ball and monitor and/or stand-alone controllers to access control system/panel
		1.2	Monitor the process using the operator interfaces
		1.3	Select appropriate controller modes
		1.4	Access historical data and information
		1.5	Acknowledge messages and alarms
		1.6	Access advanced control features as appropriate
2	Access control information	2.1	Obtain relevant data and information from the control system by applying systems knowledge
		2.2	Identify the status of individual pieces of equipment from the control panel and use information to identify potential faults
		2.3	Minimise fluctuations and variations in process through the interpretation of existing trends and control schematics
		2.4	Determine the overall operating effectiveness of the plant area related to the required targets for the area
		2.5	Record process variations/irregularities to procedures
3	Control process variations and monitor operations	3.1	Monitor process using all information available in the control room
		3.2	Use historical data to assist the identification of problems
		3.3	Process available information to identify potential faults
		3.4	Undertake required set point/output changes to meet

- plant area and process requirements
- 3.5 Adjust production in response to test results and control panel information
 - 3.6 Monitor key process and environmental variables and take action to achieve required outcomes
 - 3.7 Adjust controller settings in accordance with procedures
 - 3.8 Use advanced control features as appropriate
 - 3.9 Turn controller features on and off to meet process and control needs
 - 3.10 Optimise operation of entire plant area in accordance with guidelines
 - 3.11 Undertake calibration operations in accordance with procedures.
 - 3.12 Coordinate with stakeholders external to the plant area in accordance with procedures
 - 3.13 Record adjustments and variations to specifications/schedules
 - 3.14 Communicate to appropriate personnel as required
- 4 **Facilitate planned and unplanned process start-ups and shutdowns**
 - 4.1 Select and apply procedures to planned start-up and shutdown processes.
 - 4.2 Select and apply procedures to unplanned shutdown processes
 - 4.3 Implement all required emergency responses
 - 4.4 Communicate necessary information to all personnel affected by events
 - 4.5 Log all required information
 - 5 **Respond to alarms or out-of-specifications**
 - 5.1 Identify system(s) affected by the alarm or condition
 - 5.2 Interpret alarms and prioritise actions to be taken

	on conditions	5.3	Respond to the alarm or incident by following procedures
		5.4	Deal with any out-of-specification material in accordance with procedures
		5.5	Communicate the problem/solution to appropriate personnel
		5.6	Record the information as required
		5.7	Provide details of the alarm and action taken to the next shift at changeover
		5.8	Follow up on the incident to see that appropriate action has been taken
6	Control hazards	6.1	Identify hazards/changes in hazards in the production/processing work area
		6.2	Assess the risks arising from those hazards
		6.3	Implement measures to control risks in line with procedures and duty of care
		6.4	Communicate hazards and hazard controls to affected personnel
7	Resolve other problems within scope of responsibility	7.1	Identify possible problems in equipment, control systems or process
		7.2	Determine problems needing action
		7.3	Determine possible fault causes
		7.4	Rectify problem using appropriate solution within area of responsibility
		7.5	Follow initiated items through until final resolution has occurred
		7.6	Report problems outside area of responsibility to designated person

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Regulatory framework

The latest version of all legislation, regulations, industry codes of practice and Australian/international standards, or the version specified by the local regulatory authority, must be used, and include one or more of the following:

- legislative requirements, including work health and safety (WHS)
- industry codes of practice and guidelines
- environmental regulations and guidelines
- Australian and other standards
- licence and certification requirements

All operations to which this unit applies are subject to stringent health, safety and environment (HSE) requirements, which may be imposed through state/territory 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.

Hazards

Hazards include one or more of the following:

- electricity
- gases and liquids under pressure
- equipment failures
- noise, rotational equipment or vibration
- plant services (steam, condensate and cooling water)
- working at heights, in restricted or confined spaces, or in environments subjected to heat, dusts or vapours
- flammability and explosivity
- hazardous products and materials
- unauthorised personnel
- sharp edges, protrusions or obstructions
- slippery surfaces, spills or leaks

- extreme weather
- other hazards that might arise

Procedures All operations must be performed in accordance with relevant procedures.

Procedures are written, verbal, visual, computer-based or in some other form, include one or more of the following:

- emergency procedures
- work instructions
- standard operating procedures (SOPs)
- safe work method statements (SWMS)
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant

Routine problems Routine problems are predictable problems with known solutions and include one or more of the following:

- operating without advanced control features
- loss of power/utilities
- analysing failure modes
- variation/loss of feed
- unstable control of pressure, temperature level and flows
- control equipment failure
- process plant trips
- change in atmospheric conditions (rain, temperature, wind and lightning)
- emergency situations
- control function problems

Non-routine problems Non-routine problems are unexpected problems, or variations of previous problems and must be resolved by applying operational knowledge to develop new solutions, either individually or in collaboration with relevant experts, to:

- determine problems needing action
- determine possible fault causes
- develop solutions to problems which do not have a known solution
- follow through items initiated until final resolution has occurred
- report problems outside area of responsibility to designated person

Operational knowledge includes one or more of the following:

- procedures
- training
- technical information, such as journals and engineering specifications
- remembered experience
- relevant knowledge obtained from appropriate people

Alarms or abnormal conditions

Alarms or other abnormal conditions include the following:

- emergency, including emergency shutdown (ESD)
- partial or complete controller failure

Unit Mapping Information

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Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=9fc2cf53-e570-4e9f-ad6a-b228ffdb6875>

Assessment Requirements for PMAOPS405 Operate complex control systems

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria, and include the ability to:

- interpret and respond to panel messages and alarms
- obtain and interpret data from the control system to minimise variation and maximise performance
- identify early warning signs of equipment/processes needing attention or with potential problems
- select and apply procedures for planned and unplanned start-up/shutdown
- identify hazards and risks and apply risk control procedures
- communicate and negotiate effectively with all stakeholders
- isolate the causes of problems and distinguish between causes of problems/alarm/fault indications, including:
 - instrument failure/malfunction
 - electrical failure/malfunction
 - mechanical failure/malfunction
 - equipment design deficiencies
 - product parameters (temperature, flows, pressure and levels)
 - process control system malfunction
 - power/utility failures
 - software problems
 - multitasking.

Knowledge Evidence

Evidence must be provided that demonstrates knowledge of:

- advanced control features
- interactions between control loops
- interactions between plant units within the entire plant
- the architecture and location of the process/production equipment
- specific plant process operations
- interactions between plant items/processes
- product specifications and tolerances, systems operating parameters and system integrity limits

- process control philosophies and strategies
- emergency shutdown (ESD) procedures
- relevant science of the process (e.g. physics, chemistry and biochemistry) to the level of identifying and manipulating factors controlling process rate and product properties, and identifying and resolving potential problems
- basic science of upstream and downstream processes
- interactions between plant area and other value stream members
- impact of external factors (e.g. variations in weather and feed)
- complex process drawings (e.g. piping and instrumentation diagram (P&ID), process flow diagram (PFD), and cause and effect
- basis of control for the plant
- instrumentation and control systems, including feed forward, feed-back and open control
- instrumentation and control system components (e.g. relevant primary sensing devices, final control elements and transducers/transmitters)
- control loops (including proportional integral derivative (PID) control, set points, controlled variable and indicated variable)
- interaction between multiple control loops (including cascade control)
- impacts of changing controller settings and the limits within which changes can be made
- effective communication techniques
- organisation procedures
- uninterrupt power supply (UPS) and its applications and use
- duty of care obligations
- hierarchy of control
- hazards that may arise in the job/work environment, and:
 - their possible causes
 - potential consequences
 - appropriate risk controls.

Assessment Conditions

- The unit should be assessed holistically and the judgement of competence based on a holistic assessment of the evidence.
- The collection of performance evidence:
 - should occur over a range of situations which include typical disruptions to normal, smooth operations
 - will typically include a supervisor/third-party report focusing on consistent performance and problem recognition and solving. A supervisor/third-party report must be prepared by someone who has a direct, relevant, current relationship with the person being assessed and who is in a position to form a judgement on workplace performance relevant to the unit of competency
 - must include the use of industrial type complex control system, controlling a real or simulated process requiring demonstration of operation and responding to problems
 - may use industry-based simulation for all of the unit particularly where safety, lack of opportunity or significant cost is an issue.

- Assessment should occur in operational workplace situations. Where this is not possible, or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment reflecting realistic operational workplace conditions. This must cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Assessment in a simulated environment should use evidence collected from one or more of:
 - walk-throughs
 - pilot plant operation
 - demonstration of skills
 - industry-based case studies/scenarios
 - ‘what ifs’.
- Knowledge evidence may be collected concurrently with performance evidence (provided a record is kept) or through an independent process, such as workbooks, written assessments or interviews (provided a record is kept).
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications associated with this unit.
- The regulatory framework will be reflected in workplace policies and procedures and is not required to be independently assessed.
- Foundation skills are integral to competent performance of the unit and should not be assessed separately.
- Assessors must satisfy the assessor competency requirements that are in place at the time of the assessment as set by the VET regulator.
- In addition, the assessor or anyone acting in subject matter expert role in assessment must demonstrate both technical competency and currency. If the assessor cannot demonstrate technical competency and currency they must assess with a subject matter expert who does meet these requirements.
- Technical competence can be demonstrated through one or more of:
 - relevant VET or other qualification/Statement of Attainment
 - appropriate workplace experience undertaking the type of work being assessed under routine and non-routine conditions
 - appropriate workplace experience supervising/evaluating the type of work being assessed under routine and non-routine conditions
- Currency can be demonstrated through one or more of:
 - being currently employed undertaking the type of work being assessed
 - being employed by the organisation undertaking the type of work being assessed and having maintained currency in accordance with that organisation’s policies and procedures

- having consulted/had contact with an organisation undertaking the type of work being assessed within the last twelve months, the consultation/contact being related to assessment
- conducting on-the-job training/assessments of the type of work being assessed
- being an active member of a relevant professional body and participating in activities relevant to the assessment of this type of work.

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