



Australian Government

PMAOPS364A Operate an electrochemical process

Release 1

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Modification History

Release 1 – New unit

Unit Descriptor

This unit of competency covers the skills and knowledge needed to operate an electrochemical process in the metalliferous industry. This includes electrowinning, electrorefining or other electrolysis process for the extraction of metal from other ore materials.

Application of the Unit

This unit applies to a plant technician who has the responsibility for the operation of an electrochemical process in an industrial scale metalliferous processing facility, for the production of metals. This includes other electrolytic processes, such as electrorefining, electrowinning and other electrolytic cells. It is not intended to apply to processes where the electricity is just a heating mechanism.

This unit applies to an individual working alone or as part of a team or group and working in liaison with other shift team members and the control room operator, as appropriate.

This unit requires a detailed knowledge of the electrochemical process, including the handling and stripping of electrodes, and handling of the solutions. It also covers dealing with the associated hazards, such as very high electric currents, high temperatures and/or corrosive or hazardous solutions. The plant technician would be expected to conduct start-ups, shutdowns and isolation of cells, and contribute to the periodic shutdown and start-up of cells for major maintenance or refurbishment.

This unit does NOT require the operation of a central control panel.

This unit has been written with electrochemical processes for the extraction of metals from their ores, such as electrowinning of copper, zinc, nickel and other metals, where the metal is extracted from an ore solution and electrorefining of copper from blister copper, lead, nickel, silver and other metals, where the metal is purified by electroplating pure metal from an intermediate product. However, it should also be applicable to other metals or ores with appropriate contextualisation. Although aluminium is produced by an electrolytic process, this is covered by other competencies and is not included here.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

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

1	Prepare for work	1.1	Identify work requirements
		1.2	Identify and control hazards
		1.3	Coordinate with appropriate personnel
		1.4	Check for recent work undertaken on plant
		1.5	Note any outstanding/incomplete work
		1.6	Check operational status of the cells against requirements
		1.7	Complete any required shift handover checks
2	Operate electrochemical process	2.1	Identify the type of electrochemical equipment, cells and ancillary equipment
		2.2	Adjust solution volume, feed quality, temperatures, electrical current, voltage and production rate, as required

- 2.3 Pull and strip plates/electrodes as required and to procedures
 - 2.4 Complete routine checks, logs and paperwork, taking appropriate action on unexpected readings and trends
- 3 Recognise problems and take appropriate action
 - 3.1 Monitor plant frequently and critically throughout shift using measured/indicated data and senses (e.g. sight and hearing), as appropriate
 - 3.2 Recognise developing situations which may require action
 - 3.3 Adjust feeds, temperatures, electrical current and voltage, as appropriate, to meet product requirements
 - 3.4 Take other appropriate actions on problems, as required
 - 3.5 Identify upstream and downstream impacts of any adjustment made or variation in conditions
- 4 Make plant safe for work and prepare for return to duty
 - 4.1 Take part in the preparations for maintenance or upgrade work on the electrochemical or ancillary equipment
 - 4.2 Shut down plant as required
 - 4.3 Make equipment and area safe for required work
 - 4.4 Check plant is ready to be returned to service
 - 4.5 Prepare plant for return to service
 - 4.6 Start up plant as required

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- recognising conditions which will lead to out of specification operation
- implementing enterprise procedures within time constraints and in a manner relevant to the correct use of the equipment
- identifying hazards and safe operating procedures for handling high temperatures and hazardous materials and solutions
- conveying information relevant to the operation clearly and effectively
- maintaining appropriate levels of quality assurance
- reading and numeracy to interpret workplace documents and technical information
- applying mathematics to the level of understanding and determination of raw material feed rates and composition

Required knowledge

Required knowledge, to the breadth and depth required for the operation of the electrochemical process, includes:

- principles of operation of electrochemical process and ancillary equipment
- knowledge of metallurgy, to the extent of determining effects of varying conditions in the cells or process, raw materials feed rates, quality, composition and proportions on finished product composition
- process parameters and limits (e.g. temperature, flow and electrical parameters, where applicable)
- duty of care obligations
- hierarchy of control
- communication protocols (e.g. radio, phone, computer, paper and permissions/authorities)
- typical issues causing problems and the resolution of those problems
- routine problems, faults and their symptoms and the corrective action to be taken
- relevant alarms and actions
- plant process idiosyncrasies
- all items on a schematic of the plant item and the function/principles of operation, and problem solving of each
- physics and chemistry relevant to each process unit and the processes used

- relevant environmental and heritage requirements
- mathematical formulae and their application to determining feed rates and materials properties

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria required skills and knowledge range statement and the Assessment Guidelines for the Training Package.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Critical aspects for assessment and evidence are:

- early warning signs of equipment/processes needing attention or with potential problems are recognised
- the range of possible causes can be identified and analyzed 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.

Context of and specific resources for assessment

Assessment of this competence will occur over a range of situations which will include typical disruptions to normal, smooth operation. This will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability. Where safety, lack of opportunity or significant cost is an issue an industry-based simulation may be employed to assist the process.

Guidance information for assessment

Assessment processes and techniques must be appropriate to the language, competency and safety requirements of the site and consistent with workplace systems or procedures.

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. 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) may also be included.

Procedures

Procedures may be written, verbal, computer-based or

in some other form. They may include, but are not limited to:

- all work instructions
- standard operating procedures
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant
- good operating practice as may be defined by industry codes of practice

Procedures would be expected to comply with any relevant government regulations.

Logs and reports

Logs and reports may include:

- paper or electronic-based logs and reports
- verbal/radio reports
- reporting items found which require action

Appropriate action

Appropriate action includes, but is not limited to:

- determining problems needing action
- accessing and applying relevant technical and plant data
- applying appropriate problem solving techniques to determine possible fault causes
- rectifying problem using appropriate solution within area of responsibility
- following through items initiated until final resolution has occurred
- reporting problems outside area of responsibility/ability to designated person

Typical problems

Typical problems may include, but are not limited to:

- variations in feed material
- control of temperature
- control of feed rates and composition of feeds
- control of impurities, waste material and irregularities

Health, safety and environment (HSE)

All operations to which this unit applies are subject to stringent HSE 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.

Work requirements

Work requirements may come from briefings, handovers and work orders and may include:

- compliance documentation
- product specifications
- nature and scope of tasks
- achievement targets
- operational conditions
- lighting conditions
- plant or equipment defects
- hazards and potential hazards
- coordination requirements or issues

Unit Sector(s)

Competency field Operational/technical

Unit sector

Custom Content Section

Not applicable.