



Australian Government

Department of Education, Employment and Workplace Relations

MSATCM512A Apply metallurgy principles and practice to optimise furnace operation

Release: 1

MSATCM512A Apply metallurgy principles and practice to optimise furnace operation

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor	This unit covers applying metallurgical principles and practices to optimise furnace operation.
------------------------	---

Application of the Unit

Application of the unit	This unit requires application of metallurgical principles and practices to optimise furnace operation. This may be undertaken as a member of a new furnace design and development team or as part of a team optimising the operation of an existing furnace.
--------------------------------	---

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Pre-requisite Units		

Employability Skills Information

Employability Skills	This unit contains employability skills.
-----------------------------	--

Elements and Performance Criteria Pre-Content

Not applicable.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Select metallurgical principles and practices relevant to furnace operation	1.1. The relevant metallurgical techniques and principles and associated software and hardware technologies are selected for particular furnace design or furnace optimising situation 1.2. For existing furnaces, production records are analysed to identify opportunities for optimising furnace operation
2. Apply the relevant metallurgical principles and practices to achieve optimum furnace operation	2.1. The scientific principles are applied in a consistent and appropriate manner to obtain the best furnace operation solution taking into account metallurgical and commercial requirements 2.2. Appropriate calculations and coherent units are used in metallurgy and engineering calculations. 2.3. The techniques and associated technologies, software and hardware are applied in a consistent and appropriate manner to obtain required solutions. 2.4. Metallurgical assessments are made of metal and or alloys to ensure furnace installation or optimisation is achieving desired outcomes.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills:

- Select appropriate metallurgy principles to suit specific furnace applications
- Select appropriate techniques and associated technologies, software and hardware to optimise furnace operation to suit specific applications
- Apply and manipulate appropriate formulas for applications involving engineering and metallurgy calculations
- Apply appropriate calculations to metallurgy situations
- Refer solutions to the original aim of the metallurgy application.
- Report results in appropriate units, using appropriate significant figures.
- State limitations of solutions, due to assumptions, scientific principles and techniques used
- Present solutions referring to the original aim of the application.

Required knowledge:

Competency includes sufficient knowledge of:

- Metallurgy principles (as given in the range statement)
- Limitations of selected basic scientific principles
- Basic metallurgical techniques and related software and hardware technologies,
- The limitations of basic techniques and associated software and hardware technologies

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	A person who demonstrates competency in this unit must be able to apply metallurgy principles and practice to optimise furnace operation. Critical aspects for assessment and evidence are required to demonstrate competency in this unit.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	It is essential that competence is demonstrated in the ability to: • identify and predict the reaction of metals, alloys, non metallic elements, compounds and mixtures to heat; • identify the capacity and heating range of different types of furnaces; • identify refractories appropriate for furnace and application
Relationship to other units	This unit may be assessed concurrently with other relevant units.
Assessment method and context	Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the elements, performance criteria, skills and knowledge. A holistic approach should be taken to the assessment. Assessors should gather sufficient, fair, valid, reliable, authentic and current evidence from a range of sources. Sources of evidence may include direct observation, reports from supervisors, peers and colleagues, project work, samples, organisation records and questioning. Assessment should not require language, literacy or numeracy skills beyond those required for the unit. The assessee will have access to all techniques, procedures, information, resources and aids which would normally be available in the workplace. The method of assessment should be discussed and agreed with the assessee prior to the commencement of assessment.
Resource implications	This section should be read in conjunction with the range of variables for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required.

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. 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.

Codes of practice/standards	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used.
Sources of information	• Reference texts • Manufacturer's catalogues and industrial magazines • Websites • Use of phone, email and fax information gathering
Furnace operation includes	• Classification of fuels • Carbonisation of coal • Properties of coke • Gaseous Fuels • Electrical energy • Heat balances • Controlled atmospheres • Temperature measurement • Combustion calculations • Refractories • Types of furnances and typical construction • Typical burners and their use in furnaces • Exhaust gas analysis for oil and gas fired furnaces
Metallurgical techniques and principles	Includes applying metallurgical techniques and principles for: • the prediction and analysis of the properties and metals and alloys undergoing: • Smelting • Refining • Casting • Heat treating or forging in a furnace to produce commercial metal products or to develop new alloys and processes • Calculation of furnace capacity, temperature range and refractory specification to achieve melting • Development of heat treatment or forging solutions for specified metals and alloys

RANGE STATEMENT

	Commercial production forecasts
--	---

Unit Sector(s)

Unit Sector	Metallurgy
-------------	------------

Competency field

Competency Field	
------------------	--

Co-requisite units

Co-requisite Units		