Australian Government

MEM23135A Evaluate moulding tools and processes

Release: 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

MEM23135A Evaluate moulding tools and processes

Modification History

Release 1 (MEM05v9).

Unit Descriptor

This unit of competency covers the evaluation of design features and functions of moulding tools and related processes. It includes injection moulds, blow, extrusion, compression, rotating, thermoforming and die casting moulds, and moulds for low volume components.

Application of the Unit

This unit applies to moulding tools which manufacture components for engineering or related applications. It is suitable for people working as tool designers and maintenance technicians or paraprofessionals and draftspersons, and those pursuing manufacturing engineering or related technical qualifications and careers.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM23004A	Apply technical mathematics

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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.

Elements and Performance Criteria

1	Determine scope of moulding tool evaluation	1.1	Identify moulding tools used and related moulded products for evaluation
		1.2	Confirm stakeholders to be consulted on evaluation
		1.3	Confirm that appropriate support, including technical and professional assistance, is available
		1.4	Identify relevant work health and safety (WHS) and regulatory requirements, standards, codes of practice, risk management and organisational procedures
2	Prepare for evaluation of moulding tools	2.1	Identify principles and techniques required to evaluate and optimise moulding tools and related manufacturing processes
		2.2	Select appropriate analysis techniques, software and software validation techniques
		2.3	Investigate sustainability implications of mould tooling and related manufacturing processes
3	Evaluate moulding tools and related manufacturing processes	3.1	Review design and construction features of functions of moulding tools and related manufacturing processes
		3.2	Assess moulding tools and related manufacturing processes for compliance with WHS and other regulatory and risk management requirements
		3.3	Assess moulding tools, products and processes for sustainability

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		3.4	Assess suitability of moulding tools for integration with quick changeover, preventative maintenance and other lean manufacturing-related techniques
		3.5	Review integration of moulding tools with production management and control software
		3.6	Apply systems thinking, continuous improvement, problem solving and decision making, and constraint and contingency management principles and techniques to evaluation
		3.7	Review tooling in relation to product manufacturability and process maintainability
4	Report results	4.1	Record results of evaluation
		4.2	Provide documentation, such as tool, product and process analysis, and computer-aided design (CAD) files

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Required Skills and Knowledge

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

Required skills

Required skills include:

- determining role and performance requirements of moulding tools in manufacturing processes
- reviewing moulding tool design and construction
- reviewing features and functions of moulding tool in relation to products produced with the tool and any limitations of moulding tools in the related manufacturing processes
- selecting and using appropriate analysis techniques and software for evaluation and optimisation of moulding tools and related manufacturing processes
- identifying WHS, regulatory and risk management compliance
- investigating sustainability implications of moulding tools and associated manufacturing processes
- assessing use of moulding tools for integration with:
  - lean manufacturing systems and techniques
  - manufacturing control software, such as system control and data acquisition (SCADA) software
- applying systems thinking, continuous improvement, and constraint and contingency management to evaluation of moulding tools
- reporting and documenting scoping, principles and techniques identification and evaluation of tooling and related manufacturing processes, tooling graphics and models

Required knowledge

Required knowledge includes:

- design parameters, construction features, functions and context of moulding tools in manufacturing operations
- sources of technical and professional assistance
- WHS and regulatory compliance requirements, and risk management practices for moulding tools and related manufacturing and maintenance processes
- sustainability and lean systems implications for mould tooling and related manufacturing processes
- range of moulding processes that use tooling, including:
  - injection moulding
  - blow moulding
  - extrusion moulding

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  - compression moulding
  - rotational moulding
  - thermoform (vacuum) moulding
  - die casting
  - low volume and manual moulding
- moulding tool design features, functions and manufacturing techniques
- CAD design software and techniques, including software for:
  - analysis
  - mould flows
  - heat dissipation
- injection moulds process, including:
  - design features, functions and limitations
  - properties of materials for injection moulded components
  - enhanced injection moulding tools and processes
- blow moulds, including continuous and intermittent parison extrusion moulding, injection and stretch blow moulds:
  - enhanced blow moulding tools and techniques
  - properties of blow moulding materials)
- extrusion moulds, including:
  - design features, functions and limitations
  - properties of extruded materials
- compression moulds, including compression injection moulds:
  - design features functions and limitations
  - properties of materials for compression moulding
- rotating moulds:
  - design features functions and limitations
  - properties of materials for rotating moulded components, including acetal copolymer (POM)
- thermoforming (vacuum) moulds:
  - design features, functions and limitations
  - properties of materials for thermoformed components including amorphous thermoplastics and semicrystalline materials, with clearly defined melting points
- low volume moulds (e.g. flexible, laid up and sprayed shell moulds)
- die casting moulds:
  - design features functions and limitations
  - properties of materials for hot chamber die cast components
  - properties of materials for cold chamber die cast components
- analysis techniques, software and software validation techniques
- systems thinking, continuous improvement, problem solving and decision making, and constraint and contingency management principles and techniques

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- reporting and documentation requirements

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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.

Overview of assessment	A person who demonstrates competency in this unit must be able to evaluate moulding tools and processes for safety, economy and fitness for purpose.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently: • determine parameters and context of moulding tools in manufacturing processes • review design and construction features, functions, applications and limitations of moulding tools • identify principles, design, analysis techniques and software required to evaluate and optimise moulding tools and related manufacturing processes • evaluate WHS, regulatory and risk management compliance • report and document results.
Context of and specific resources for assessment	• This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, then a simulated working environment must be used where the range of conditions reflects realistic workplace situations. • The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. • Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. • Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.
Method of assessment	• Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package. • Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge. • Assessment methods must be by direct observation of

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	tasks and include questioning on underpinning knowledge to ensure correct interpretation and application. • Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. • Assessment may be in conjunction with assessment of other units of competency where required.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

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.

Features and functions of moulding tools	Features and functions of moulding tools include: • materials used in their construction • method of manufacture (e.g. welding and machining) • dimensions and tolerances • method of installation and any capacity for operator adjustment during use • method of adjustment for production changeover • the degree of training of operators required before use of the moulding tool • any limitations on the use of the moulding tool • cost of manufacture
Injection moulded components	Injection moulded components include: • all thermoplastics • some thermosets and elastomers • metal powders, such as low alloy and stainless steels, soft magnetic and controlled expansion alloys

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Enhanced injection moulding tools and processes	Enhanced injection moulding tools and processes may include: • multi-component and hard-soft injection moulding • microcellular foamed materials • powder injection moulding (PIM) • metal injection moulding (MIM) • gas or water assisted injection
Enhanced blow moulding tools and techniques	Enhanced injection moulding tools and processes may include: • multi-component and hard-soft injection moulding • microcellular foamed materials • powder injection moulding (PIM) • metal injection moulding (MIM) • gas or water assisted injection
WHS, regulatory requirements and enterprise procedures	WHS, regulatory requirements and enterprise procedures may include: • WHS Acts and regulations • relevant standards • codes of practice from Australian and overseas engineering and technical associations and societies • risk assessments • registration requirements • safe work practices • state and territory regulatory requirements
Standards and codes	Standards and codes refer to all relevant Australian and international standards and codes applicable to a particular moulding tool and process task

Appropriate technical and professional assistance	Appropriate technical and professional assistance may include:
	• technical support and advice relating to elements which have intrinsic dangers, such as:
	  • high pressure
	  • energised fluid vessels
	  • high temperatures and heat energy capacity
	  • wiring with high current control voltages above extra low voltage
	• professional support for technologies, such as:
	  • specialist electric motor drives and controllers
	  • specialist materials, plastics, metal alloys and nano materials
	  • special processes, foundry, alloy welding, heat treatment, sealing and fastening

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Sustainability	Sustainability is used to mean the entire sustainable performance of the organisation/plant, including: • meeting all regulatory requirements • conforming to all industry covenants, protocols and best practice guides • minimising ecological and environmental footprint of process, plant and product • maximising economic benefit of process plant and product to the organisation and the community minimising the negative WHS impact on employees, community and customer
Systems thinking	Systems thinking refers to the conduct of engineering work in a manner that demonstrates knowledge of how the interaction of different technical systems on equipment, machinery or structures, as well as the skills and techniques of personnel, combine to perform or support engineering-related operations, processes or projects. It embraces determining or establishing how the function of each technical system or component, as well as the skills and techniques of personnel, effects or potentially may effect, outcomes. Systems should be interpreted broadly within the context of the organisation and depending on the project or operation can include equipment, related facilities, material, software, internal services and personnel, and other organisations in the value chain
Continuous improvement implementation	Continuous improvement implementation may relate to plant, products, processes, systems or services, including design, development, implementation or manufacture, commissioning, operation or delivery and maintenance. Improvement processes may include techniques, such as: • balanced scorecard • current and future state mapping • measuring performance against benchmarks • process improvement, problem solving and decision making • data management, generation, recording, analysing, storing and use of software • training for improvement systems participation • technical training
Constraints and contingencies	Constraints and contingencies may be: • financial • organisational, procedural or cultural • physical constraints, such as limits to resources, limits to site

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	access or logistical limitations
Lean principles	Lean principles affecting tooling and related processes include: • tooling and processing costs • capacity and responsiveness to product demand • quality of product • reliability of tooling, process and supply • waste minimisation which includes ease of tool change

Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.

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