



Australian Government

MEM23113A Evaluate hydrodynamic systems and system components

Release 1

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Modification History

Release 1 - New unit. Replaces MEM23081A, but not equivalent.

Unit Descriptor

This unit of competency covers the evaluation of fluid systems and system components. It includes hydrodynamic fundamentals, including properties of fluids and system component materials, evaluation of system component performance related to flow rates, pressures, forces and power of containment, transport and use of fluids, work health and safety (WHS) compliance requirements and risk management procedures.

Application of the Unit

This unit applies to evaluation of fluid systems and components used in hydrodynamic systems. It is suitable for people working as technicians in these industries or system designers, draftspersons and maintainers, and those pursuing careers and qualifications in engineering or related disciplines.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM23004A	Apply technical mathematics
MEM23006A	Apply fluid and thermodynamics principles in engineering

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	Establish scope of hydrodynamic system	1.1	Determine fluid systems and system components to be evaluated
		1.2	Identify stakeholders to be consulted on evaluation tasks
		1.3	Confirm that appropriate support, including technical and professional assistance, is available
		1.4	Determine WHS and regulatory requirements, risk management and organisational procedures
		1.5	Investigate sustainability implications of hydrodynamic applications
2	Apply principles and techniques required for evaluation of hydrodynamic system and components	2.1	Review features and functions of hydrodynamic system and components
		2.2	Determine hydrodynamic principles and techniques required to evaluate system and select and optimise components
		2.3	Determine appropriate analysis techniques, software and software validation techniques
3	Evaluate hydrodynamic system and components	3.1	Assess components and system compatibility with fluid properties
		3.2	Assess suitability of pumps and pump performance in hydrodynamic system
		3.3	Assess forces on bends and section changes in piping

- systems and confirm they are within specification
 - 3.4 Assess hydrodynamic performance of components, such as fittings, valves and hoses
 - 3.5 Assess open channel systems and optimise for required flow rates
 - 3.6 Evaluate collar and cylindrical bearings subject to boundary, transitional and hydrodynamic lubrication
- 4 Report results
- 4.1 Record outcomes of evaluation
 - 4.2 Provide documentation, such as calculations, component and system layouts, and functional diagrams

Required Skills and Knowledge

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

Required skills

Required skills include:

- determining parameters and context of tasks
- identifying WHS and regulatory requirements
- identifying risk management and organisational procedures
- reviewing sustainability implications, features and functions of hydrodynamic systems and components
- identifying hydrodynamic principles and techniques, analysis techniques, software and software validation techniques
- ensuring compatibility of units in calculations
- evaluating components and system compatibility with fluid properties, pumps, turbines, piping forces, hydrodynamic performance of components, open channel systems, collar and cylindrical bearing lubrication
- selecting equipment and instruments for use in evaluation considering properties and compatibility
- reporting and documenting results of scoping, principles and techniques identification, evaluation of applications, calculations, component and system layouts, and functional diagrams

Required knowledge

Required knowledge includes:

- WHS and regulatory requirements, codes of practice, standards, risk management and registration requirements
- availability of professional and technical assistance for engineering specialisations
- current options and trends in performance analysis software, including underpinning program techniques and software validation techniques
- properties of fluids:
 - fluid types
 - relevant units of measurement
 - chemical properties
- sustainability issues:
 - hydrodynamic energy, generation and consumption
 - environmental effects of manufacturing and use
- fluid statics

- fluid dynamics, including:
 - flow
 - velocity
 - viscosity
 - pressure
 - fluid power
 - hydrodynamic forces
- hydrodynamic system components
- head loss in pipes and fittings
- pumping systems, including components and methods for determining efficiency
- forces developed by flowing fluids
- open channel flow
- oiled bearings

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 hydrodynamic systems, including evaluation of system performance, selection of components and calculation of fluid force.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> • determine parameters and context of evaluation task • determine WHS, regulatory requirements, risk management and organisational procedures • identify features, functions and components of a range of hydrodynamic systems • investigate and review sustainability implications, features and functions of hydrodynamic systems and components • apply correct hydrodynamic principles and techniques for particular hydrodynamic systems • evaluate components and systems to determine safety, efficiency and fitness for purpose • report and document results.
Context of and specific resources for assessment	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package. • Assessment methods must confirm consistency and

	<p>accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge.</p> <ul style="list-style-type: none"> • Assessment methods must be by direct observation of 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.

Hydrodynamic systems	<p>Hydrodynamic systems include:</p> <ul style="list-style-type: none"> • fluid vessels (e.g. static dams, tanks and pools, and vessel in dynamic applications) • pumping systems (e.g. industrial wash, fire prevention and irrigation) • turbines for hydro-electric power generation • components, such as fluid containers, ducts, pipes, valves, pumps, turbines and fluid measuring devices • open channels for liquid transfer
Sustainability	<p>Sustainability is used to mean the entire sustainable performance of the organisation/plant, including:</p> <ul style="list-style-type: none"> • meeting all regulatory requirements • conforming to all industry covenants, protocols and best

	<p>practice guides</p> <ul style="list-style-type: none"> • 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
Appropriate licensed technical and professional assistance	<p>Appropriate technical and professional assistance may include:</p> <ul style="list-style-type: none"> • technical support and advice relating to elements which have intrinsic dangers, such as: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • specialist electric motor drives and controllers • specialist materials, plastics, metal alloys and nano materials • special processes, foundry, alloy welding, heat treatment, sealing and fastening
WHS, regulatory requirements and enterprise procedures	<p>WHS, regulatory requirements and enterprise procedures may include:</p> <ul style="list-style-type: none"> • 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 applying to electrical work
Standards and codes	<p>Standards and codes refers to all relevant Australian and international standards and codes applicable to a particular hydrodynamic system task</p>

Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.