Australian Government

MEM234012 Design integrated maintenance management systems

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MEM234012A Design integrated maintenance management systems.

Application

This unit of competency defines the skills and knowledge required to systematically design integrated maintenance processes for existing or new plant to complement engineering and business objectives through the maximisation of plant utilisation. It includes consideration of quality aspects, design for reliability and maintainability, and the generation of system data which is analysed and used to aid continuous improvement processes. Design activities can also include reverse engineering and design rectification or modifications of an existing design.

The unit is suitable for maintenance personnel and system designers across all areas of manufacturing and engineering who are involved in engineering, manufacturing and related asset maintenance systems, and for those pursuing engineering or related qualifications and careers.

Individuals completing this work either already have or are developing skills and experience in maintenance system evaluation, mathematics, mechanical, electrical, fluid and thermal, production methods and processes, materials handling, automated systems, repair techniques, work health and safety (WHS) and risk management.

Where the emphasis is on competitive manufacturing-related skills, such as lean manufacturing, reliability centred maintenance (RCM), proactive or total productive maintenance (TPM), and the engineering support is provided by other personnel, then the unit MSS405081 Develop a proactive maintenance strategy should be considered.

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

Pre-requisite Unit

Nil

Competency Field

Engineering science

Elements and Performance Criteria

Elements	Performance Criteria

Elements describe the essential *outcomes.*	*Performance criteria describe the performance needed to demonstrate achievement of the element.*
1. Interpret client brief or contract requirements	1.1 Determine required features of the integrated maintenance management system 1.2 Interpret parameters of the brief or contract 1.3 Determine stakeholders to be consulted in design process 1.4 Research current maintenance systems and management techniques relevant to brief or contract, including lean systems maintenance, systems thinking, continuous improvement, and constraint and contingency management 1.5 Assess WHS regulatory, sustainability or environmental issues relevant to contract or brief 1.6 Identify and seek required appropriate technical and professional assistance 1.7 Provide initial advice on feasibility based on specified or anticipated operations, including expectations for equipment availability and budget for maintenance
2. Prepare concept proposal	2.1 Establish integrated maintenance management system options for plant and plant support services 2.2 Establish facilities and service maintenance response system options 2.3 Categorise maintainable assets 2.4 Establish data collection, storage, analysis and system feedback requirements 2.5 Establish personnel participation and development requirements 2.6 Carry out required modelling and calculations using appropriate software and validation techniques 2.7 Generate solutions in response to the design brief, ensuring conformity with WHS requirements 2.8 Determine social and sustainability implications of solutions 2.9 Review concept proposals with client to identify most appropriate solution
3. Design and handover integrated maintenance management system	3.1 Develop integrated maintenance management system design in line with selected solution 3.2 Provide documentation, diagrams, specifications and instructions 3.3 Consult with client and stakeholders on features and operation of final design 3.4 Obtain sign-off on design in accordance with procedures

Elements	Performance Criteria
Elements describe the essential *outcomes.*	*Performance criteria describe the performance needed to demonstrate achievement of the element.*
	3.5 Monitor implementation with stakeholders and make any necessary adjustments to design

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.	

Integrated maintenance management systems include:	• management, financial, engineering and other practices for cost-effective maintenance of assets including plant, equipment and facilities
	• design for reliability and maintainability, manufacture, installation, commissioning and eventual write-off and replacement of the assets
	• data collection and analysis to assess the reliability, life cycle costs and productivity of the assets against the design criteria
	• maintenance of service or product output (quantities) and its quality within cost parameters
	• consideration of:
	  • maintenance priority
	  • maintenance activity audit
	  • monitoring and testing
	  • maintenance system data
	  • facilities and service maintenance response systems
	  • maintainability.

Parameters of the brief include:	• design of new equipment or fault analysis, rectification or modification to an existing design • determination of the degree of innovation and creativity expected by the client • design process limits and budgets

	• product cost limits and budgets • performance specifications • equipment availability, capacities and restrictions • specified administrative, communication and approval procedures • other special features and limits in the design brief.
Maintenance systems include:	• break-down maintenance • preventive maintenance • predictive maintenance (on-condition) • precision maintenance • proactive maintenance • RCM • TPM.
Lean systems maintenance includes:	• maximising machine and process uptime • minimising waste and costs • maintaining quality, delivery and customer service • continuous improvement • are set to complement engineering business objectives.
Processes covered under lean systems maintenance include:	• process improvement • problem-solving and decision-making • route cause analysis (RCA), failure mode and effects analysis (FMEA) or design review based on failure mode (DRBFM) • application of theory of constraints (TOC).

Continuous improvement relates to changes or modifications to:	• plant
	• products
	• processes
	• systems or services, including:
	  • design
	  • development
	  • implementation
	  • manufacture
	  • commissioning
	  • operation
	  • delivery
	  • maintenance.

Constraints and contingencies include:	• breakdowns • loss of services • sudden increases or decreases in production • regulatory change • lack of spare parts • delays in supply • shortage of skilled workers

	• limits to site access or logistical limitations • financial, regulatory or internal procedures constraints.
WHS, regulatory requirements and enterprise procedures include:	• WHS acts, regulations and relevant standards • industry codes of practice • risk assessments • registration requirements • safe work practices • state and territory regulatory requirements applying to electrical work.

Appropriate technical and professional assistance includes:	• technical support and advice relating to elements which have intrinsic dangers including:
	  • 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 including:
	  • specialist electric motor drives and controllers
	  • specialist materials, plastics, metal alloys and nano materials
	  • special processes, foundry, alloy welding, heat treatment, sealing and fastening.

Sustainability includes:	• 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.

Data collection, storage and analysis includes:	• manual methods or maintenance management software
	• management of asset data, maintenance inventory, and maintaining essential documentation including safety data sheets (SDS), work permits and databases
	• planning, data recording and analysis
	• generation of documents including work orders, inventory reorders, and reports for process improvement or design feedback
	• software options including:
	  • computer maintenance management (CMM)
	  • computer-aided process planning (CAPP)
	  • supervisory control and data acquisition (SCADA) and/or distributed control systems (DCS)

	• automated storage and retrieval systems (ASRS) • enterprise resource planning (ERP) • quality assurance (QA) and quality control (QC) systems software.

Personnel participation and development requirements include:	• the determination of labour requirements and functions
	• autonomous and supervised maintenance-related activities including monitoring, adjustment, lubrication, disassembly, repair or replacement of parts, balancing and assembly
	• installation, alignment and recommissioning in accordance with standard procedures
	• participation in process improvement, including measuring performance against benchmarks including life cycle costs, time between failures (TBF), and overall equipment effectiveness (OEE), as appropriate to individual job functions in design or operations
	• data management, generation, recording, analysing, storing and use of software
	• required training, including:
	  • training for systems participation
	  • technical training.

Appropriate software and validation techniques include:	• performance analysis and/or modelling requiring understanding of underpinning program techniques and algorithms, the use of finite element analysis and numerical methods within object-oriented modelling techniques • comparison of traditional solutions for simple design problems with software solutions to the same design problems • review of previously implemented design challenges which were completed using the software.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234012A Design integrated maintenance management systems.

Links

Companion Volume Implementation Guides are available on VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2