Australian Government

MEM234007 Design fluid power systems

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MEM234007A Design fluid power systems.

Application

This unit of competency defines the skills and knowledge required to design fluid power systems, including pneumatic multi-actuator control systems, hydraulic systems, including hydrostatic transmissions, proportional and servo valve control, and programmable logic controllers (PLC). It includes work health and safety (WHS), regulatory requirements, automation safety and systematic design processes and design considerations including those related to dynamic loads and optimised control system response and stability.

It is suitable for fluid power system and automation designers and maintenance personnel across all forms of manufacturing and engineering, and for those pursuing engineering or related qualifications and careers.

Individuals completing this work either already have or are developing skills and experience in fluid power systems and hydrodynamics, mathematics, computer techniques, basic electrical and controllers.

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 design brief for fluid power systems	1.1 Confirm the design brief and operational requirements with the client 1.2 Establish technical, commercial and environmental parameters of the brief or contract 1.3 Determine stakeholders to be consulted in design process 1.4 Consider regulatory, sustainability or environmental issues relevant

Elements	**Performance Criteria**
Elements describe the essential *outcomes.*	*Performance criteria describe the performance needed to demonstrate achievement of the element.*
	to the briefs 1.5 Provide preliminary advice to client on the feasibility for realising the fluid power system design
2. Prepare concept proposal	2.1 Analyse and establish worksite requirements for fluid power system realisation in conjunction with the client 2.2 Undertake initial design investigations for fluid power system capacity and responsiveness 2.3 Carry out required modelling, simulation and calculations, using appropriate software and test equipment to determine fluid power system, function, behaviour and safety 2.4 Generate possible solutions that respond to the design brief 2.5 Check feasibility and validate solutions against design criteria ensuring conformity to WHS requirements and relevant standards 2.6 Determine social and sustainability implications of solutions 2.7 Review concept proposals with client to identify preferred solution
3. Design fluid power system	3.1 Develop selected fluid power design to meet specifications, including dimensioning, sizing and positioning of system components 3.2 Evaluate sequence and mode control methods for multi-actuator circuit, stand alone and network designs for implementation 3.3 Determine options for design of compressed air supply for a multi-application facility, if applicable 3.4 Ensure that design solution is optimised with respect to the system specifications 3.5 Develop fluid power design documentation, including drawings, circuit diagrams, specifications, operating instructions and any appropriate manuals and training materials 3.6 Check that the final design meets all required specifications and operational capabilities 3.7 Consult with client and stakeholders to obtain sign-off on 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.	
Parameters of the brief or contract include:	• design of new equipment or fault analysis, rectification or modification to an existing design • design cost and system capital cost • maintainability, product life cycle cost • durability, function, performance and aesthetics • energy and environmental sustainability and social issues • equipment availability and worksite restrictions • other special features and limits in the design brief.
Sustainability includes:	• resources and energy • social and economic • life cycle design of product raw material, solids and hazardous waste, and production by-products • contamination of land, air and stormwater pollutants, and discharge to sewerage • climate change.
Appropriate software includes:	• computer-aided design (CAD) • circuit design and analysis • animation • simulation • modelling • performance analysis.
Validation techniques include:	• comparison of traditional solutions for simple design problems with software solutions to the same design problems • review of previously implemented designs which were completed using the software • use of failure mode and effects analysis (FMEA).
Design criteria includes:	• essential criteria including WHS and environmental criteria which are pass and fail criteria for design option selection • desirable criteria including simplicity of design, which can be rated or scored to aid selection of design amongst options.

WHS requirements include:	• WHS acts, regulations and relevant standards • industry codes of practice • risk assessments • registration requirements • safe work practices • state and territory regulatory requirements.
Standards include:	• AS/NZS 4024.1 Safety of machinery • AS/NZS ISO 31000 Risk management – Principles and guidelines • NOHSC:1010 National Standard for Plant • NOHSC:1014 National Standard for the Control of Major Hazard Facilities • AS 61508.1 Functional safety of electrical/electronic/programmable electronic safety-related systems – General requirements.
Sequence and mode control methods for multi-actuator circuit includes:	• sequential operations with or without conditional jumps • optimisation techniques • functions including timing, counting, stop start, cycle selection and boundary conditions • pneumatic and electrical relay cascade control • pneumatic and electrical relay step-sequenced control • PLC control • microcontrollers for special purpose machines.
Stand alone and network control includes:	• compressor control and application control • fluid powered machine control including proportional-integral-derivative (PID) parameter control from remote host controller • communications bus systems and serial systems • distributed control systems (DCS) • supervisory control and data acquisition (SCADA) • computer-integrated manufacture (CIM) options.
Trends and techniques in fluid power system design include:	• fluid power design • reverse engineering • sustainability issues and implications • materials and components • assembly, fabrication and construction techniques • lean and other quality techniques • latest relevant modelling, simulation and validation techniques and other software.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234007A Design fluid power systems.

Links

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