



Australian Government

MEM29010 Plan and implement preventative maintenance procedures in an Industry 4.0 manufacturing workplace

Release: 1

MEM29010 Plan and implement preventative maintenance procedures in an Industry 4.0 manufacturing workplace

Modification History

Release 1. New unit.

Application

This unit defines the skills and knowledge required to use Industry 4.0 systems and processes to effectively plan for the implementation of preventative maintenance tasks in a manufacturing, engineering or related workplace.

This includes reviewing data generated from Industry 4.0 systems and processes to plan preventative maintenance tasks, including integration with an already established workplace preventative maintenance strategy, identifying appropriate measures to establish the operational conditions for implementing the tasks, and coordinating the preventative maintenance tasks to ensure they are consistent with the enterprise's overall Industry 4.0 strategy.

The unit requires an understanding of data collection systems and processes associated with preventative maintenance strategies and how these strategies can contribute to and receive support from broader Industry 4.0 systems in a workplace.

This unit of competency applies to a person planning, supervising, or coordinating regular preventative maintenance tasks as part of maintaining equipment and systems availability, including systems and equipment associated with Industry 4.0 related activities such as equipment related data collection, data analysis, and local, remote and cloud-based networking. The unit does not require direct performance of the preventative maintenance tasks, nor does it include engineering analyses associated with preventative maintenance such as failure mode and effects analysis (FMEA) and mean time between failure (MTBF).

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

Pre-requisite Unit

Nil

Competency Field

Applied technologies

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. Identify and review relationship of workplace preventative maintenance strategy to enterprise Industry 4.0 strategy	1.1 Identify Industry 4.0 systems and processes in use within the workplace 1.2 Identify level of local, remote and cloud-based networking within the plant 1.3 Identify and review workplace preventative maintenance strategy for links to Industry 4.0 systems and processes in use within the workplace
2. Identify and schedule preventative maintenance requirements	2.1 Identify equipment and components requiring preventative maintenance from workplace maintenance strategy, equipment and other workplace records, manufacturer's documentation, and discussions with relevant personnel 2.2. Review data from Industry 4.0 systems and processes including digital twin information where available for preventative maintenance requirements 2.3 Prioritise preventative maintenance requirements 2.4 Review operational and Industry 4.0 systems requirements and schedule preventative maintenance for least disruption to operations
3. Plan preventative maintenance tasks	3.1 Identify preventative maintenance task requirements from appropriate workplace records, Industry 4.0 generated data, manufacturer's documentation, and discussions with relevant personnel 3.2 Identify and apply workplace health and safety (WHS) requirements for the preventative maintenance tasks 3.3 Confirm scheduling of preventative maintenance tasks with appropriate personnel 3.4 Plan preventative maintenance tasks, including isolation and reconnection requirements, required equipment and materials, and risk management procedures
4. Supervise the implementation of preventative maintenance tasks	4.1 Brief personnel performing preventative maintenance on task plan and WHS procedures to be followed 4.2 Monitor conduct of preventative maintenance task by maintenance and other required personnel 4.3 Analyse non-conformances against the preventative maintenance plan and implement procedures for appropriate remedial actions
5. Ensure equipment and operations are restored to Industry 4.0 workplace requirements	5.1 Monitor completion of preventative maintenance tasks, including test runs of machinery and associated equipment 5.2 Supervise any required re-establishment of data connections and networking

Elements	Performance Criteria
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	5.3 Restore work site and equipment to work-ready state 5.4 Document completion of preventative maintenance task according to workplace procedures

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.

- Industry 4.0 systems include one or more of the following:
- industrial internet of things (IIoT) devices
 - collaborative robots
 - networked and cloud connected traditional robots and other industrial automation
 - networked and cloud connected supervisory control and data acquisition systems (SCADA)
 - networked and cloud connected enterprise resource planning (ERP) systems
 - networked and cloud connected CAD and CAM systems
 - digital twins
 - augmented and virtual reality systems
 - networked and cloud connected CNC and additive manufacturing machines
 - networked and cloud connected data storage and processing facilities
 - networked and cloud connected edge devices
 - other networked and cloud connected digital devices and systems relevant to the workplace

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.

- Preventative maintenance tasks include tasks for one or more of the following purposes:
- maintaining equipment and components to specifications and optimal performance
 - maintaining manufacturing processes to specification:
 - extending equipment life
 - maintaining data collection, data processing or networking capability of equipment
 - reduction of waste and rejects

Unit Mapping Information

No equivalent unit

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM29010 Plan and implement preventative maintenance procedures in an Industry 4.0 manufacturing workplace

Modification History

Release 1. New unit.

Performance Evidence

There must be evidence the candidate has demonstrated the ability to:

- identify Industry 4.0 related systems used in at least two workplaces or work locations
- identify data relevant to preventative maintenance on at least two occasions from at least one Industry 4.0 related system
- review procedures, products and processes for possible causes of deviations from patterns of normal use for at least two workplace systems or major equipment items
- establish a plan for at least two preventative maintenance tasks. The plans are to include:
 - work order/authority to conduct maintenance
 - description of equipment or component to undergo maintenance including:
 - purpose
 - operational characteristics
 - available resources such as drawings, manufacturer's documentation, previous maintenance records
- WHS requirements and procedures
- equipment shut down and isolation procedures
- data collection and connectivity status before, during, and after maintenance
- assessment of equipment failure characteristics including availability of fail-safe mode
- link failure characteristics to maintenance systems
- identification of production windows
- creation of a work schedule
- required physical and human resources including:
 - tools, equipment and spares
 - task team members
- identification of critical equipment and components
- plant performance and history
- availability of spares
- procedures to test success of maintenance including test run of equipment
- information to be recorded during and after completion of maintenance.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- types of maintenance including:
 - preventative versus breakdown or corrective maintenance
 - predictive versus preventative maintenance
- maintenance terminology
- the role of data in supporting analyses related to preventative and predictive maintenance including:
 - failure mode and effects analysis (FMEA)
 - mean time between failures (MTBF)
 - overall equipment efficiency (OEE)
- basic condition monitoring principles, processes and resources including information from:
 - on board operating and fault reporting data transmission by equipment
 - external condition monitoring through:
 - vision systems or vibration monitoring
 - other types of condition monitoring sensors
 - diagnostic reports obtained from supervisory control and data acquisition system (SCADA) or other enterprise or equipment software
 - product or process quality analyses
 - non-destructive testing techniques and reports
 - inspection by maintenance employees and other experts
- dependency of predictive and preventative maintenance analytics on data collection and processing strategies within the workplace
- advantages of preventative and predictive maintenance in an Industry 4.0 workplace environment including:
 - maintenance of production through reduced downtime due to unplanned stoppages
 - increased equipment efficiency and reliability
 - maintenance of connectivity and data flow from sensors, processors and other equipment
- maintenance roles within a typical manufacturing or engineering workplace including:
 - operator maintenance
 - role of maintenance tradespersons including contractors
 - technical and professional engineering employees
- strategies for maintaining or improving data collection for preventative and predictive maintenance purposes including:
 - review of available software and its capabilities in regard to maintenance
 - review of sensors, run sheets, maintenance reports and other data collection strategies
 - vision systems
 - remote visual inspection and other inspection techniques

- non-destructive testing techniques relevant to maintenance including:
 - thermography
 - vibration analysis
 - oil analysis
- preventative maintenance task plan content including:
 - work order/authority to conduct maintenance
 - description of equipment or component to undergo maintenance including:
 - purpose
 - operational characteristics
 - available resources such as drawings, manufacturer's documentation, previous maintenance records
 - maintenance task scheduling window
 - WHS requirements
 - equipment shut down and isolation procedures
 - data collection and connectivity status before, during and after maintenance
 - implementation procedures
 - potential failure characteristics including fail-safe mode availability
 - required tools, equipment and spares
 - information to be recorded during and after completion of maintenance
 - equipment spares.
 -

Assessment Conditions

- Assessors must:
 - have vocational competency in planning and implementing preventative maintenance procedures in an Industry 4.0 manufacturing workplace at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Where possible, assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- There must be access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
-

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>