SEMEM324

Maintaining mechanical equipment within an engineered system

Overview

This standard identifies the competences you need to carry out corrective maintenance on mechanical equipment within an engineered system, in accordance with approved procedures. You will be required to maintain a range of mechanical equipment, such as gearboxes, pumps, machine tools, conveyor systems, workholding arrangements, engines, processing plant and equipment, which are working in an integrated system involving two of the following interactive technologies: electrical, fluid power or process controller.

You will be expected to isolate and disconnect items and components of the interactive technologies in order to gain access to and remove the mechanical units and components that require replacing or repair. This will involve dismantling and reassembling a variety of different types of assemblies and sub-assemblies which, in some instances, will need to be dismantled to component level.

Your responsibilities will require you to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with the maintenance activities, tools or equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the work, and that all necessary job/task documentation is completed accurately and legibly. You will be expected to work with minimal supervision, taking personal responsibility for your own actions, and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to applying mechanical maintenance procedures within an engineered system. You will know about the integrated technology assemblies and sub-assemblies, and their properties, functions and associated defects, in adequate depth to provide a sound basis for carrying out the dismantling and reassembly process safely and effectively. You will also understand the maintenance methods and procedures used, and their application within the engineered system, in sufficient depth to be able to carry out the maintenance activities, correct faults, and ensure that the maintained equipment functions to specification and remains compliant with all standards and regulations. You will also know about the interaction of the other

associated integrated technologies and have sufficient knowledge to carry out the dismantling and reassembly safely and effectively.

You will understand the safety precautions required when carrying out the maintenance activities, especially those for isolating the equipment and taking the necessary safeguards to protect yourself and others in the workplace. You will be required to demonstrate safe working practices throughout.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety legislation and other relevant regulations, directives and guidelines
2. follow the relevant maintenance schedules to carry out the required work
3. carry out the maintenance activities within the limits of your personal authority
4. carry out the maintenance activities in the specified sequence and in an agreed timescale
5. report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
6. complete and store all relevant maintenance documentation in accordance with organisational requirements
7. dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition

Knowledge and understanding

You need to know and understand:

1. the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility these requirements place on you
2. the isolation and lock-off procedure or permit-to-work procedure that applies to the system
3. the specific health and safety precautions to be applied during the maintenance activity, and their effects on others
4. what constitutes a hazardous voltage and how to recognise victims of electric shock
5. how to reduce the risks of a phase to earth shock (such as insulated tools, rubber mating and isolating transformers)
6. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the maintenance activities
7. hazards associated with carrying out maintenance activities on an integrated system (such as handling fluids, stored pressure/force, electrical supplies, process controller interface, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks
8. how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports and other documents needed for the maintenance activities
9. the basic principles of how the system functions, its operation sequence, the working purpose of individual units/components, and how they interact
10. the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance
11. organisational policy on repair/replacement of components during the maintenance activities
12. the sequence to be adopted for dismantling and reassembling the equipment, to both sub-assembly and individual component level
13. methods of removing components that have interference fits (expansion, contraction or pressure)
14. the techniques used to dismantle/assemble integrated equipment (such as release of pressures/force, proof marking to aid assembly, plugging exposed

pipe/component openings, dealing with soldered joints, screwed, clamped and crimped connections)
15. methods of attaching identification marks/labels to removed components or cables, to assist with re-assembly
16. methods of checking that components are fit for purpose, and the need to replace `lifed' items (such as seals, gaskets and bearings)
17. how to make adjustments to components/assemblies, to ensure they function correctly
18. how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose
19. the importance of making `off-load' checks before proving the equipment with the electrical supply on
20. the generation of maintenance documentation and/or reports on completion of the maintenance activity
21. the equipment operating and control procedures to be applied during the maintenance activity
22. how to use lifting and handling equipment safely and correctly in the maintenance activity
23. the problems that can occur during the maintenance activity, and how they can be overcome
24.
the organisational procedure to be adopted for the safe disposal of waste of all types of material
25.
the extent of your authority and to whom you should report if you have a problem that you cannot resolve

Scope/range

1.

Carry out all of the following during the maintenance activity as applicable to the equipment being maintained:

1.1 plan and communicate the maintenance activities to cause minimal disruption to normal working
1.2 obtain and use the correct issue of organisational and/or manufacturers' drawings and maintenance documentation
1.3 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
1.4 ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids)
1.5 provide and maintain safe access and working arrangements for the maintenance area
1.6 carry out the maintenance activities using appropriate techniques and procedures
1.7 reconnect and return the system to service on completion of the maintenance activities
1.8 record the results of the maintenance activity and report any defects found
1.9 dispose of waste materials in accordance with safe working practices and approved procedures and leave the work area in a safe condition

2.

Use appropriate dismantling and re-assembly techniques to deal with seven of the following components:

fluid power components

1. releasing stored pressure
2. chocking/supporting cylinders/rams/components
3. disconnecting/removing hoses and pipes
4. removing and replacing units/components (such as pumps, valves, actuators)

electrical components

5. check isolation of the power
6. removing/replacing minor electrical components (such as relays, sensing devices, limit switches)
7. disconnecting and reconnecting wires/cables
8. removing and replacing major electrical components (such as motors, switch/control gear)

9. removing and replacing wiring enclosures (such as conduit, trunking and traywork)

process controller components:

10. de-activating program controller
11. resetting program controller
12. disconnecting/reconnecting wires/cables
13. re-loading programs
14. make minor program amendments
15. removing and replacing program logic peripherals
16. removing and replacing input/output interfacing

1.

Carry out maintenance activities on three of the following types of mechanical equipment:

- 1.1 gearboxes
- 1.2 processing plant
- 1.3 mechanical structures
- 1.4 engines
- 1.5 machine tools
- 1.6 pumps
- 1.7 conveyors/elevators
- 1.8 lifting and handling equipment
- 1.9 compressors
- 1.10 workholding arrangements
- 1.11 transfer equipment
- 1.12 process control valves
- 1.13 pipes/pipework
- 1.14 robots
- 1.15 other specific equipment

2.

Carry out all of the following maintenance techniques, as applicable to the equipment being maintained:

- 2.1 draining and removing fluids / release of gas pressure and safe isolation
- 2.2 proofmarking/labelling of components
- 2.3 dismantling equipment to unit/sub-assembly level
- 2.4 dismantling units to component level
- 2.5 replacing damaged/defective components
- 2.6 replacing all `lifed' items (such as seals, bearings, gaskets)
- 2.7 checking components for serviceability
- 2.8 tightening fastenings to the required torque
- 2.9 setting, aligning and adjusting replaced components
- 2.10 replenishing oils and greases
- 2.11 making `off-load' checks before powering up

2.12 functionally testing the complete system

3.

Replace/refit a range of mechanical components, to include seven of the following:

3.1 shafts
3.2 valves and seats
3.3 cams and followers
3.4 pulleys and belts
3.5 couplings
3.6 brakes
3.7 springs
3.8 slides
3.9 gears
3.10 bearing and seals
3.11 chains and sprockets
3.12 levers and links
3.13 clutches
3.14 fitting keys
3.15 locking and retaining devices (such as circlips, pins)
3.16 robots
3.17 flanges/gaskets
3.18 pipes/pipework

4.

Ensure that the maintenance activities comply with one of the following:

4.1 organisational guidelines and codes of practice
4.2 equipment manufacturer's operation range
4.3 BS, ISO and/or BSEN standards

5.

Complete and store all relevant maintenance documentation in accordance with organisational requirements, using one of the following:

5.1 job cards
5.2 permits to work/formal risk assessment and/or sign on/off procedures
5.3 maintenance log or report
5.4 organisational-specific documentation
5.5 electronic reports

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