

SEMEM4-43 - SQA Unit Code HWAW 04

Carrying out maintenance activities on fluid power equipment



Overview

This standard identifies the competences you need to lead maintenance activities by carrying out corrective maintenance activities on fluid power equipment, in accordance with approved procedures. As part of the team you will be required to maintain a range of fluid power equipment. This will involve dismantling, removing and replacing faulty items, at component and unit level, on such as pumps, valves, actuators, sensors, intensifiers, regulators, compressors, pipes and hoses, and other specific fluid power equipment. This will involve depressurising the system, and removing, replacing and repairing system components, as applicable. You will also be required to identify and implement a systematic approach to improving the equipment maintenance activities undertaken and ensure that the maintenance team have to appropriate skills, knowledge and understanding to maintain the equipment efficiently, effectively and safely.

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 or the tools and equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. 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 an in depth understanding of your work, and will provide an informed approach to applying maintenance procedures to fluid power equipment. You will understand the dismantling and reassembly methods and procedures used, and their application. You will know how the equipment functions and the purpose of the individual components, their function and associated defects, in adequate depth to provide a sound basis for carrying out the maintenance activity, correcting faults and ensuring that the repaired equipment functions to the required specification and remains compliant with all standards and regulations. In addition, you will have sufficient depth of knowledge of the various components, to ensure they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly of the equipment.

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.

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Performance criteria

You must be able to:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 produce and update relevant maintenance schedules and plans
- P3 lead maintenance activities within the limits of your personal authority
- P4 carry out the maintenance activities in the specified sequence and in an agreed timescale
- P5 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule
- P6 complete relevant maintenance documentation accurately
- P7 dispose of waste materials in accordance with safe working practices and approved procedures
- P8 identify and lead on making improvements to maintenance processes and procedures
- P9 update management information and systems to support the activities of the maintenance department

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Knowledge and understanding

You need to know and understand:

- K1 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
- K2 how to prioritise your own and your team's workload to ensure that targets are met
- K3 how to communicate effectively, listen, question, support and coach others to work towards the departmental targets
- K4 the importance of ensuring that teams have the required skills, knowledge and understanding in order to maintain equipment to the required standards
- K5 how to complete a skills audit of team members
- K6 how maintenance teams can access the appropriate training and development programmes once a need training need has been identified
- K7 the isolation and lock-off procedures or permit-to-work procedure that applies
- K8 the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others
- K9 hazards associated with carrying out mechanical maintenance activities (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and how to minimise these and reduce any risks
- K10 the importance of wearing protective clothing and other appropriate safety equipment during maintenance process
- K11 how to obtain and interpret drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process
- K12 the various fault finding techniques that can be used, and how they are applied (such as half-split, input/output, emergent problem sequence, six point technique, functional testing, unit substitution, injection and sampling techniques, and equipment self-diagnostics)
- K13 the procedure to be adopted to establish the background of the fault
- K14 how to evaluate the various types of information available for fault diagnosis
- K15 how to use the various aids and reports available for fault diagnosis
- K16 how to evaluate sensory information from sight, sound, smell, touch
- K17 how to use a range of fault diagnostic equipment to investigate the problem (such as measuring devices, pressure and flow testing devices)
- K18 the importance of checking that test equipment is within current calibration dates, and the procedure to get the test instruments correctly calibrated
- K19 how to use the test equipment, and how to connect it into the circuit at

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- the appropriate points
- K20 how to relate previous reports/records of similar fault conditions
- K21 how to evaluate the likely risk of running the equipment with the displayed fault, and the effects the fault could have on health and safety, and on the overall process or system
- K22 the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance activities
- K23 principles and theories associated with fluid power equipment (such as cascading and truth tables, logic/ladder diagrams)
- K24 the basic principles of operation of the equipment to be maintained
- K25 company policy on repair/replacement of components during maintenance process
- K26 how to construct and apply ladder logic, sequential charts/tables or functional diagrams
- K27 dry and lubricated systems, and their application
- K28 selection, types and characteristics of fluids for the system
- K29 the effects of pressure and flow on the performance of the system
- K30 the identification of different compressors (such as screw, piston, rotary, vane)
- K31 the identification of different hydraulic pumps and motors (such as piston, gear, vane)
- K32 how to determine pressure settings and their effect on the system
- K33 the different types of pipework, fittings and manifolds, and their application
- K34 the identification, application, function and operation of different types of valves, sensors, actuators, cylinders and pumps
- K35 the application and fitting of static and dynamic seals
- K36 recognition of contaminants and the problems they can create, and the effects and likely symptoms of contamination in the system
- K37 the techniques used to dismantle/assemble fluid power equipment (release of pressures/force, proof marking, extraction)
- K38 methods of checking that components are fit for purpose
- K39 how to make adjustments to components/assemblies to ensure that they function correctly
- K40 the identification and working purpose of individual components, and how they interact
- K41 how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose
- K42 the generation of maintenance documentation and/or reports following the maintenance activity
- K43 equipment operating and control procedures to be applied during the maintenance activity
- K44 how to use lifting and handling equipment safely and correctly in the maintenance activity
- K45 the problems associated with the maintenance activity, and how they

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- can be overcome
- K46 the procedure to be adopted for the safe disposal of waste of all types of materials
- K47 how to conduct a systematic plan, do, check, act (PDCA) approach to problem-solving and business improvement
- K48 how to evaluate improvement ideas in order to select those that are to be pursued
- K49 how improvements to the process are achieved by engaging the knowledge and experience of the people working on the process
- K50 how to create or update Standard Operating Procedures (SOP's) maintenance schedules and plans.
- K51 the techniques required to communicate information using visual control systems (such as, card systems, colour coding, floor footprints, graphs and charts, team boards, tool/equipment shadow boards)
- K52 the limit of your own authority and to whom you should report if you have a problem that you cannot resolve

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Additional Information

Scope/range related to performance criteria

- You must be able to:
1. Lead a maintenance team by carrying out all the following:
 - 1.1. communicate the maintenance activities to the team
 - 1.2. involve the team in planning how the maintenance activities will be undertaken
 - 1.3. allocate specific maintenance activities to each team member
 - 1.4. involve the team in identifying improvements that could be made to the maintenance process and/or procedures
 - 1.5. encourage the team and/or individuals to take the lead where appropriate
 2. Review and update maintenance procedures and plans to include three of the following:
 - 2.1. preventive maintenance (routine inspections, and adjustments)
 - 2.2. corrective maintenance (activities identified from preventative maintenance activities)
 - 2.3. predictive maintenance (analysis of the equipment's condition)
 - 2.4. reactive maintenance (unexpected equipment/component failure)
 - 2.5. maintenance prevention (equipment/component design and development)plus supporting documentation associated with two of the following
 - 2.6. equipment performance
 - 2.7. equipment downtime/failure
 - 2.8. overall equipment effectiveness (OEE)
 - 2.9. maintenance costs
 - 2.10. health and safety
 - 2.11. staff development and training
 - 2.12. maintenance procedures/instructions
 - 2.13. operator manuals/working instructions
 - 2.14. regulatory compliance
 3. Collect fault diagnosis evidence from three of the following sources:
 - 3.1. the person or operator who reported the fault
 - 3.2. sensory input (such as sight, sound, smell, touch)
 - 3.3. test instrument/rig measurements (such as pressure, flow, sequence)
 - 3.4. plant/machinery records
 - 3.5. monitoring equipment or gauges
 - 3.6. condition of the end product
 - 3.7. recording devices
 4. Use a range of fault diagnostic techniques, to include two of the following:
 - 4.1. half-split technique
 - 4.2. input/output
 - 4.3. emergent sequence

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- 4.4. injection and sampling
- 4.5. unit substitution
- 4.6. six point technique
- 4.7. functional/performance testing
- 4.8. equipment self-diagnostics
5. Use a variety of diagnostic aids and equipment, to include two of the following:
 - 5.1. manufacturer's manual
 - 5.2. physical layout diagrams
 - 5.3. algorithms
 - 5.4. flow charts
 - 5.5. probability charts/reports
 - 5.6. fault analysis charts (such as fault trees)
 - 5.7. equipment self-diagnostics
 - 5.8. troubleshooting guides
 - 5.9. sequence charts
 - 5.10. function diagrams
6. Use all of the following diagnostic procedures:
 - 6.1. inspection (for leaks, loose fittings, breakages, wear/deterioration, damage to pipes/hoses, alignment)
 - 6.2. operation (such as manual operation, timing, sequencing)
 - 6.3. measurement (such as pressure, flow, timing, sequence, movement)
7. Use two of the following types of test equipment to aid fault diagnosis:
 - 7.1. measuring devices/meters
 - 7.2. flow indicators
 - 7.3. pressure indicators
 - 7.4. thermal indicators
 - 7.5. test rigs
 - 7.6. self-diagnostic equipment
 - 7.7. contamination monitoring and analysing devices
8. Find faults that have resulted in two of the following breakdown categories:
 - 8.1. intermittent problem
 - 8.2. partial failure/out-of-specification output
 - 8.3. complete breakdowns
9. Carry out all of the following during the maintenance activity:
 - 9.1. obtain and use the correct issue of company and/or manufacturer's drawings and maintenance documentation
 - 9.2. 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
 - 9.3. ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids)
 - 9.4. provide and maintain safe access and working arrangements for the maintenance area
 - 9.5. carry out the maintenance activities using appropriate techniques and procedures
 - 9.6. re-connect and return the system to service on completion of activities

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- 9.7. dispose of waste items in a safe and environmentally acceptable manner and leave the work area in a safe condition
10. Carry out maintenance activities on two of the following types of fluid power equipment:
 - 10.1. pneumatic
 - 10.2. hydraulic
 - 10.3. vacuum
11. Carry out all of the following maintenance activities, as applicable to the equipment being maintained:
 - 11.1. chocking/supporting actuators/rams/component
 - 11.2. releasing stored pressure
 - 11.3. draining, removing and replacing oil/fluids (as applicable)
 - 11.4. replacing damaged/defective components
 - 11.5. removing and replacing units/components (such as pumps, valves, actuators)
 - 11.6. disconnecting/removing hoses, pipes and tubing
 - 11.7. replacing all 'lived' items (such as seals, filters, gaskets, hoses)
 - 11.8. proof marking/labelling of removed components
 - 11.9. checking components for serviceability
 - 11.10. tightening fastenings to the required torque
 - 11.11. setting, aligning and adjusting replaced components
 - 11.12. making 'off-load' checks before re-pressurising the system
 - 11.13. functional/performance testing of the maintained system
 - 11.14. priming and bleeding the system (where applicable)
12. Carry out maintenance activities to component level on all of the following fluid power components:
 - 12.1. pumps
 - 12.2. valves
 - 12.3. cylinders
 - 12.4. actuators
13. Replace/refit a range of fluid power components, to include ten of the following:
 - 13.1. pumps
 - 13.2. motors
 - 13.3. compressors
 - 13.4. sensors
 - 13.5. pistons
 - 13.6. bearings
 - 13.7. receivers
 - 13.8. lubricators/filters
 - 13.9. spools
 - 13.10. reservoirs
 - 13.11. gaskets and seals
 - 13.12. regulators
 - 13.13. valves
 - 13.14. accumulators
 - 13.15. pipework, hoses/tubing

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- 13.16. valve solenoid
- 13.17. actuators/cylinders
- 13.18. pressure intensifiers
- 13.19. switches
- 13.20. other specific components
- 14. Identify and implement improvements in the services provided by the maintenance team to include two of the following:
 - 14.1. equipment downtime during maintenance
 - 14.2. equipment performance monitoring systems
 - 14.3. overall equipment effectiveness (OEE)
 - 14.4. maintenance procedures
 - 14.5. operator instructions
 - 14.6. visual management systems/documentation
 - 14.7. resource planning
 - 14.8. costs
 - 14.9. staff development and training
 - 14.10. health and safety
 - 14.11. procurement
 - 14.12. other (to be specified)
- 15. Maintain equipment which complies with three of the following:
 - 15.1. organisational guidelines and procedures
 - 15.2. equipment manufacturer's operating specification/range
 - 15.3. British, European or International standards or directives
 - 15.4. recognised compliance agency/body standards or directives
 - 15.5. health, safety and environmental requirements
 - 15.6. customer standards and requirements
- 16. Complete the relevant maintenance documentation to include one from the following:
 - 16.1. job cards
 - 16.2. permit to work/formal risk assessment and/or sign-on/off procedures
 - 16.3. maintenance log or report
 - 16.4. company-specific recording system

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