

Carrying out condition monitoring of plant and equipment

Overview

This standard identifies the competences you need to carry out condition monitoring of plant and equipment, in accordance with approved procedures. You will be required to select the appropriate monitoring equipment to use, based on the type of plant or equipment being monitored and the conditions you wish to check. You will be expected to check that the equipment is in a suitable condition to use (such as undamaged, correctly calibrated, appropriate range) and set up the equipment ready for use. You will then use this equipment to carry out diagnostic condition monitoring (fault diagnosis or prognosis) on a range of equipment such as mechanical, electrical, process controller, fluid power or integrated systems.

Your responsibilities will require you to comply with organisational policy and procedures for the condition monitoring activities undertaken, and to report any problems with the diagnostic equipment or monitoring activities 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 a good understanding of your work, and will provide an informed approach to applying condition monitoring techniques. You will understand the monitoring methods and procedures used, and their application, and will know about the various monitoring units, and peripheral components, in adequate depth to provide a sound basis for carrying out the monitoring activities safely and correctly.

You will understand the safety precautions required when carrying out the monitoring activities, especially those for isolating the equipment. You will also understand your responsibilities for safety, and the importance of taking the necessary safeguards to protect yourself and others in the workplace.

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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. correctly set up and check and calibrate the equipment required for the monitoring being carried out
3. carry out the monitoring activities with the minimum disruption to normal activities
4. record and review the outcomes on completion of the condition monitoring activities, and take appropriate actions
5. complete and store all relevant monitoring documentation in accordance with organisational requirements

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Knowledge and understanding

You need to know and understand:

1. the specific health and safety precautions to be applied during the monitoring procedure, and their effects on others
2. the health and safety requirements of the area in which the monitoring activity is to take place, and the responsibility these requirements place on you
3. hazards associated with carrying out monitoring activities on plant and equipment (such as electrical supplies, moving machinery, guarding removed, process controller interface, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how to minimise these and reduce any risks
4. the importance of wearing protective clothing and other appropriate safety equipment (PPE) during the monitoring activities
5. how to obtain and interpret drawings, charts, specifications, manufacturers' manuals, history/maintenance reports, symbols used on monitoring instrument documents, and other documents needed in the monitoring/maintenance process
6. the basic principles of how the plant or equipment to be monitored functions, its operating sequence, the working purpose of individual units/components and how they interact
7. the basic principles of condition monitoring, and how it helps prevent equipment failure
8. the different types of monitoring component or sensor (such as temperature, force, pressure, vibration, rotational, voltage, current), their fittings, and their application
9. the various monitoring systems, and the methods that can be employed to make test measurements for the purposes of machinery protection or predictive maintenance
10. methods of attaching monitoring components to different parts of the plant, equipment or system
11. the need to check that monitoring instruments are fit for purpose, undamaged, and have a suitable monitoring range and value
12. the importance of monitoring equipment calibration and authorisation procedures
13. the need to set up and operate condition monitoring equipment correctly
14. care and control procedures for condition monitoring equipment
15. the problems that can occur during the monitoring activity, and how they can be overcome
16. recording the results from conditioning monitoring, and the documentation to be used
17. control procedures for reporting the results from condition monitoring

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18. the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials
19. the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

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Scope/range

1. Carry out all of the following during the monitoring activities:
 1. plan and communicate the condition monitoring activities so as to minimise disruption to normal working
 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
 3. select the appropriate condition monitoring equipment for the intended purpose
 4. check the calibration of the monitoring equipment before use
 5. set up the monitoring equipment in accordance with the appropriate procedures
 6. check that the monitoring equipment is functioning correctly
 7. carry out the monitoring activities, using appropriate techniques and procedures
 8. apply safe working practices and procedures at all times

2. Use appropriate monitoring techniques to set up, check and calibrate equipment protection systems, or predictive maintenance system monitoring techniques, on two of the following types of equipment:
 1. engines (such as piston or turbine)
 2. rotating or reciprocating machinery (such as pumps, compressors)
 3. mechanical equipment (such as cyclic and rotational devices, gearboxes, drives and linkages)
 4. production machinery (such as machine tools, presses, transfer mechanisms)
 5. process equipment (such as furnaces, chemical baths)
 6. rotating electrical machinery (such as generators, motors)
 7. stationary electrical equipment (such as transformers, switchgear)
 8. stationary plant and equipment (such as air receivers, accumulators, tanks, piping)
 9. emergency standby or alarm/warning systems and equipment
 10. fluid power equipment (such as pipework, cylinders and actuators and pumps)
 11. process controller (such as program controller, input/output interfacing, wiring/cabling, monitoring sensors)
 12. electrical components (such as power supplies, switchgear and distribution panels, control systems)

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13. environmental systems (such as air conditioning, fume extraction)
3. Use two of the following condition monitoring methods:
 1. off-line/portable monitoring
 2. protection monitoring
 3. sampled monitoring
 4. human sensory monitoring (sight, sound, touch, smell)
 5. continuous monitoring
4. Use two of the following monitoring techniques:
 1. vibration analysis
 2. pressure analysis
 3. temperature analysis
 4. voltage/current analysis
 5. flow analysis
 6. radio telemetry analysis
 7. particle analysis
 8. thickness analysis
 9. crack detection analysis
 10. oil analysis
 11. leak detection analysis
 12. corrosion detection
 13. humidity analysis
 14. environmental pollutant analysis
 15. photo/optical equipment
 16. ther specific monitoring equipment
5. Use monitoring systems in one of the following monitoring conditions:
 1. equipment operating under the effects of weather, natural hazards, temperature or pressure
 2. equipment operating in environments with potential flammable or explosive conditions (such as dust, vapours, liquids or gases)
 3. equipment working in wet, dirty, dusty or corrosive conditions
 4. equipment operating in a benign or clean room environment
6. Carry out all of the following on completion of the condition monitoring activities:
 1. validation and evaluation of the condition monitoring systems

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- and procedures used
 - 2. suggested improvements to the process of condition monitoring
 - 3. draw valid conclusions, based on the information gained from the condition monitoring activities
 - 4. recommend actions to be taken in respect of the engineering plant and equipment being monitored
7. Complete and store all relevant monitoring documentation in accordance with organisational requirements, using one of the following:
- 1. job cards
 - 2. predictive maintenance log or report
 - 3. permit to work/formal risk assessment and/or sign on/off procedures
 - 4. organisational-specific documentation
 - 5. electronic reports

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