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## Overview

This standard identifies the competences you need to carry out condition monitoring of engineering 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 monitoring equipment is in a suitable condition to use (such as undamaged, correctly calibrated, appropriate range), and to 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 are outside your permitted authority, to the relevant people. You will be expected take personal responsibility for your 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 the appropriate condition monitoring techniques to engineering plant and equipment. 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 involved with moving machinery/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, regulations, directives and other relevant guidelines
2. correctly set up and check-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 and take appropriate actions

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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 condition monitoring activities on engineering plant and equipment (such as electrical supplies, moving machinery, process controller interface, using damaged or badly maintained tools and equipment, not following laid-down procedures), and how they can be minimised
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. how the engineering plant or equipment to be monitored functions, the operation 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 importance of checking 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 importance of setting up and operating the condition monitoring equipment correctly
14. care and control procedures for condition monitoring equipment
15. 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

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- monitoring
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 whom you should report to if you have a problem that you cannot resolve

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## Scope/range

1. Carry out all of the following during the condition monitoring activities:
  1. plan 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
  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 machinery 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 treatment equipment)
  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 air receivers, pipework, valves, cylinders and actuators and pumps)
  11. instrumentation and control equipment (such as temperature, pressure, level, flow, weight, speed)
  12. process controller (such as program controller, robots, input/output interfacing, wiring/cabling, monitoring sensors)
  13. electrical equipment (such as power supplies, switchgear and distribution panels, control systems)
  14. electronic equipment (such as control units, visual display or indicating devices)

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15. environmental systems (such as air conditioning, heating and ventilation, 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
  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 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 the relevant paperwork from one of the following, and pass it to the appropriate people:
    1. job cards
    2. predictive maintenance log or report
    3. permit to work/formal risk assessment and/or sign on/off procedures

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4. company-specific documentation

SEMETS354

Carrying out condition monitoring of engineering plant and equipment



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