PROMPR22
Carrying out fault diagnosis on mechanical equipment

Overview

This standard identifies the competences you need to carry out efficient and effective fault diagnosis on mechanical equipment, in accordance with approved procedures. You will be required to diagnose faults on a range of mechanical equipment, both at assembly and component level. This will include equipment such as machine tools, gearboxes, processing plant, engines, pumps, process control valves, compressors, transfer equipment, lifting and handling equipment, mechanical structures and other company-specific equipment. You will be expected to use a variety of fault diagnosis methods and techniques, and to utilise a number of diagnostic aids and equipment. From the evidence gained, you will be expected to identify the fault and its probable cause, and to suggest action to remedy the problem.

Your responsibilities will require you to comply with organisational policy and procedures for the fault diagnostic activities undertaken, and to report any problems with these 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 full 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 fault diagnosis procedures on mechanical equipment. You will understand the various fault diagnosis methods and techniques used, and their application. You will also know how to apply and interpret information obtained from diagnostic aids and equipment, in adequate depth to provide a sound basis for carrying out the activities and for identifying faults or conditions that are outside the required specification.

You will understand the safety precautions required when carrying out the maintenance 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:

P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines

P2 review and use all relevant information on the symptoms and problems associated with the products or assets

P3 investigate and establish the most likely causes of the faults

P4 select, use and apply diagnostic techniques, tools and aids to locate faults

P5 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved

P6 determine the implications of the fault for other work and for safety considerations

P7 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault

P8 record details on the extent and location of the faults in an appropriate format

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Knowledge and understanding

You need to know and understand:

K1 the health and safety requirements of the area in which you are carrying out the fault diagnosis activities, and the responsibility these requirements place on you

K2 the specific safety precautions to be taken when carrying out fault diagnosis of the specific piece of equipment

K3 the isolation and lock-off procedure or permit-to-work procedure that applies

K4 the importance of wearing protective clothing and other appropriate safety equipment during the fault diagnosis activities

K5 hazards associated with carrying out fault diagnosis on mechanical equipment (such as moving machinery, handling oils and greases, stored pressure/force, misuse of tools, using practices or procedures that do not follow laid-down procedures), and how to minimise these and reduce any risks

K6 where to obtain, and how to interpret drawings, specifications, manufacturers' manuals and other documents needed in the fault diagnosis process

K7 the procedure to be adopted to establish the background of the fault

K8 how to evaluate various types of information available for fault diagnosis (such as operator reports, monitoring equipment, sensory information, machinery history records and condition of end product)

K9 the various fault finding techniques that can be used, and how they are applied (such as half-split, input/out put, emergent problem sequence, six point technique, function testing, unit substitution, injection and sampling techniques, and equipment self diagnostics)

K10 how to use a range of fault diagnostic equipment to investigate the problem (such as measuring devices, torque and run-out devices)

K11 how to use various items of test equipment, and how to calibrate it and check that it is free from damage and defects

K12 how to evaluate sensory information (sight, sound, smell, touch)

K13 the procedure(s) to be followed for investigating the faults, and how to deal with intermittent faults

K14 how to analyse and evaluate possible characteristics and causes of specific faults/problems

K15 how to relate previous reports/records of similar fault conditions

K16 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

K17 how to prepare and produce a risk analysis report (where appropriate)

K18 how to prepare a report and take follow-up action which satisfies the company policy on concluding fault diagnosis

K19 the extent of your own authority and to whom you should report if you have problems that you cannot resolve

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Additional Information

Scope/range

The numbers of scope items specified (below) indicate the minimum requirements for this occupational standard. You must:

1 Carry out all of the following during the fault diagnostic activity:

1.1 plan the fault diagnosis prior to beginning the work
1.2 obtain and use the correct issue of company and/or manufacturer's 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 fault diagnostic activities using approved procedures
1.7 identify the fault and determine appropriate corrective action
1.8 dispose of waste items in a safe and environmentally acceptable manner, and leave work area in a safe condition

2 Carry out fault diagnosis on three of the following types of equipment:

2.1 gearboxes
2.2 machine tools
2.3 lifting and handling equipment
2.4 processing plant
2.5 engines
2.6 pumps process control valves
2.7 compressors
2.8 workholding devices
2.9 transfer equipment
2.10 mechanical structures
2.11 company-specific equipment

3 Collect evidence regarding the fault from four of the following sources:

3.1 person or operator who reported the fault
3.2 monitoring equipment or gauges
3.3 recording devices
3.4 sensory input (such as sight, sound, smell, touch)
3.5 plant/machinery records
3.6 condition of end product

4 Use a range of fault diagnostic techniques, to include two of the following:

4.1 half-split technique
4.2 emergent sequence
4.3 input/output
4.4 six point technique
4.5 equipment self diagnostics
4.6 unit substitution
4.7 function/performance testing
4.8 injection and sampling

5 Use a variety of diagnostic aids and equipment, to include two of the following:

5.1 manufacturer's manual
5.2 algorithms
5.3 probability charts/reports
5.4 equipment self diagnostics
5.5 physical layout diagrams
5.6 flow chart
5.7 fault analysis charts (such as fault trees)
5.8 trouble shooting guides

6 Apply two of the following monitoring or testing procedures to help in the fault diagnosis:

6.1 alignment checks
6.2 force/pressure checks (such as spring pressure, hydraulic or pneumatic pressures)
6.3 leakage
6.4 vibration
6.5 thermal checks (such as bearings, friction surfaces)
6.6 movement checks (such as travel, clearance, levers and links)

7 Use two of the following types of test equipment to aid fault diagnosis:

7.1 measuring instruments/devices
7.2 dial test indicators
7.3 torque measuring devices
7.4 other specific test equipment
7.5 thermal indicators
7.6 audio test devices

7.7 self-diagnostic equipment

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 Provide a record of the outcome of fault diagnosis, using one of the following:

9.1 step-by-step analytical report
9.2 preventative maintenance log/report
9.3 corrective action report
9.4 company-specific reporting procedure

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