LANLEO31

Service and overhaul engines on land-based equipment

Overview

This standard covers the service and overhaul of engines on land-based equipment. It includes spark ignition and compression ignition engines and their configurations. It includes the identification and function of components, removal and replacement of engine assemblies and components and the dismantling, repairing and reassembly methods and techniques.

The standard covers engine systems and performance including the systems used to deliver the fuel (including carburetters and injection systems), and air supplies (inlet manifolds or pressure-charged intake systems), as well as air required in an engine combustion process, and the types, construction and function of the components.

It also includes the techniques used to diagnose and rectify mechanical engine faults and the process used to verify measurements.

When working with machinery or equipment you should be trained and hold current certification, where required, in accordance with the relevant legislation.

When working on high voltage (hazardous voltage/HaV) electric vehicles, de-energising must be done by a person who has been trained in accordance with the manufacturer's procedures.

This standard is for those who work in land-based engineering using their initiative in a customer-facing role. It may include mentoring a junior colleague to assist in aspects of service and overhaul.

Performance criteria

You must be able to:

1. be aware of hazards and assess the risks associated with the activity and the location where it is to be carried out
2. be aware of the potential environmental impact associated with the activity and the ways in which this can be controlled
3. select and wear suitable clothing and personal protective equipment (PPE)
4. select, prepare, use, maintain and store the tools and equipment required to carry out the activity in accordance with the relevant legal requirements, manufacturer's instructions and company practices
5. check that the land-based equipment requiring service and overhaul is safe, prepared and isolated from power sources, where required
6. take the necessary precautions to prevent the escape of chemicals, gases and other substances and minimise dangers from contamination and hazards, where required
7. use a variety of methods to collect diagnostic information to identify defects and faults
8. carry out tests to determine the cause of different engine problems
9. determine the requirements for service and overhaul
10. identify and establish the availability of replacement components required for the activity
11. inspect the condition of engines and components on land-based equipment during service and overhaul and investigate failed or worn parts
12. remove and replace worn and damaged components in accordance with instructions and specifications
13. where applicable, dismantle, repair and reinstate engine system components in line with the manufacturer’s specifications and standards
14. identify and rectify engine system faults
15. determine the appropriate firing order for multi-cylinder engines
16. test and set static and dynamic injection and ignition timing
17. adjust engine performance within specified operating limits
18. use suitable measuring equipment to verify compliance of engine components
19. use suitable testing methods to assess the performance of the reassembled system on completion of the work and confirm that it performs to the operating specifications prior to returning the equipment to the customer

20. recycle or sustainably dispose of the different types of waste, including hazardous and non-hazardous, caused by the activity, in accordance with the relevant legal and environmental requirements and company policies
21. complete records as required by the relevant legislation, warranty requirements and company procedures

Knowledge and understanding

You need to know and understand:

1. how to identify hazards and assess risks when preparing to service and overhaul land-based equipment
2. the type of clothing and personal protective equipment (PPE) suitable for the activity
3. the tools and equipment required to carry out the activity and how to select, prepare, use, maintain and store these safely and correctly, in accordance with the manufacturer's instructions and company practices
4. the relevant legal requirements for the preparation and use of work equipment
5. how land-based equipment should be prepared for service and overhaul
6. the dangers created by stored energy and how to respond to these during the preparation stage
7. the hazardous chemicals, gases and other substances that may be present and how they should be dealt with
8. the types of fuel sources available, how to recognise them and how this affects the servicing and overhaul of engines
9. the different methods that can be used for the assessment of defects and faults with engines on land-based equipment and for the identification of the root cause
10. the typical defects and faults that occur with engines on land-based equipment and how they can be rectified
11. the causes of excessive engine wear
12. the factors that determine whether it is worthwhile carrying out the service and overhaul, such as cost, estimated working life, or urgent need for the equipment
13. the components required for the service and overhaul and the company procedures for obtaining replacements
14. the types, construction and operating principles of engines and components
15. exhaust emissions, regulations and methods of control, including filters and fluids
16. how to remove and replace an engine and/or components on land-based equipment during service and overhaul
17. how to dismantle, repair and reinstate engines and/or components in line with the manufacturer’s specifications and standards
18. the equipment, methods and techniques for taking engine specific measurements

19. the effects of making enhancements to fuel and ignition systems
20. the procedure for verifying engine performance
21. the procedure for verifying correct engine timing for both static and dynamic timing
22. the methods of testing engines on completion of the activity to confirm that they perform to the operating specifications prior to returning the equipment to the customer
23. how to recycle or sustainably dispose of the different types of waste, including hazardous and non-hazardous, caused by the activity, in accordance with the relevant legal and environmental requirements and company policies
24. the potential impact that the activity could have on the environment and the ways in which this can be controlled
25. the information that needs to be recorded, the company procedure for maintaining records and the requirements of data protection legislation

Glossary

Compliance of engine components e.g.

- piston-ring gapping
- cylinder, liner, taper, ovality and protrusion
- crankshaft journal ovality and end-float
- piston/head clearances
- valve, guide, seat, train, operating system
- cylinder head/block distortion
- compression
- fuel and oil consumption

Engines and components e.g.

- spark ignition and compression ignition engines and their configurations
- air cooled and water cooled
- wet and dry liners, monoblock
- naturally aspirated and pressure charged (to include turbo compounding and supercharging)
- balancers and vibration suppression
- carburetters
- spark plugs
- injection pumps
- fuel-delivery pumps
- injectors
- governors
- cold-start aids
- air-filtration systems
- exhaust systems

- emission-control systems

Engine problems e.g.

- engine performance
- misfire
- backfire
- engine oil pressure
- overheating
- seizure
- abnormal noise
- non-starting
- excessive crank case breathing
- oil consumption
- fuel delivery and system pressures
- air intake charge pressures
- abnormal fuel usage,
- injection, camshaft and ignition timing
- emissions, e.g. blue, white or black smoke
- engine performance not in accordance with manufacturers' specifications
- weak and rich fuel mixtures
- restricted intake and exhaust air flow
- verifying governor operation

Filters and fluids:

- Diesel Oxidation Catalyst (DOC)
- Diesel Particulate Filter (DPF)
- Selective Catalytic Reduction (SCR)

- Diesel Exhaust Fluid (DEF)

Fuel sources e.g.

- petrol
- diesel
- hybrid
- LPG
- methane
- hydrogen

Hazardous chemicals and substances could include:

- fuels
- oils
- fluids
- gases
- dust
- compressed air

Instructions and specifications:

- drawings/plans
- schedules
- method statements
- Standard Operating Procedures (SOPs)
- manufacturer's instructions
- customer requirements
- verbal instructions

Methods of diagnosis:

- visual inspections

- functional and operational tests
- diagnostic equipment
- remote electronic control and monitoring systems
- reviewing technical data

Stored energy:

- springs
- belt tension
- hydraulic pressure
- electrical discharge
- accumulator discharge

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