

Overview

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This standard identifies the competences you need to carry out a complete overhaul of gearbox assemblies, in accordance with approved procedures. The gearbox assembly to be overhauled will have been removed from its operating environment, and the overhauling activities will take place in a maintenance environment or manufacturer's workshop.

In carrying out the overhauling operations, you will be required to follow laid-down procedures and to use specific dismantling and rebuilding techniques. The overhauling activities will involve removing all ancillary components and sub-assemblies, removing the gearbox drive shafts, lay shafts and gear train assemblies, removing bearings and seals, and stripping the gearbox housing of all its components. You will be required to inspect the components for damage and wear, and to make decisions on which components can be reused and which will need replacing.

You will then rebuild the gearbox assembly, which will involve fitting replacement or overhauled sub-assembly units and the replacement of all damaged, worn and 'lived' components. The overhauling activities will include making all necessary checks and adjustments to ensure that components are correctly replaced, positioned, aligned, adjusted, torque loaded, locked and fastened, the correct sealants are used and, where appropriate, the gear box is refilled with the correct grade of oil.

Your responsibilities will require you to comply with organisational policy and procedures for the overhaul of the gearbox assembly, and to report any problems with the overhauling activities, or with the tools and equipment used that you cannot personally resolve, or that are outside your permitted authority, to the relevant people. You must ensure that all tools, equipment and materials used in the overhauling activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. You will be expected to work with a minimum of supervision, taking 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 appropriate overhauling techniques and procedures to gearbox assemblies. You will understand the dismantling and reassembly methods and procedures used, and their application. You will know how the gearbox assembly functions, the purpose of the individual components and associated defects, in adequate depth to provide a sound basis for carrying out the overhauling activities to the required specification. In addition, you will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out the reassembly.

You will understand the safety precautions required when carrying out the overhauling activities associated with gearbox assemblies, especially those for lifting, handling and supporting the equipment being removed and replaced. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

Performance criteria

You must be able to:

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1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. follow the relevant overhauling schedules to carry out the required work
3. establish the components to be removed and, where appropriate, mark components to aid re-assembly
4. ensure that any stored energy or substances are released safely and correctly
5. carry out the overhaul to the agreed level, using the correct tools and techniques
6. ensure that all removed components are correctly identified and stored in the correct location
7. report any instances where the overhauling activities cannot be fully met, or where there are identified defects outside the planned overhauling schedule
8. complete the relevant documentation, in accordance with organisational requirements
9. dispose of unwanted components, waste materials and substances, in accordance with safe working practices and approved procedures
10. deal promptly and effectively with problems within your control and report those that cannot be solved

Knowledge and understanding

You need to know and understand:

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1. how to work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
2. the hazards associated with overhauling gearbox assemblies and how to minimise them and reduce any risks
3. the importance of wearing protective clothing (PPE) and other appropriate safety equipment during the overhaul
4. how to obtain and interpret drawings, specifications, manufacturers' manuals, history/maintenance reports, and other documents needed in the overhauling process
5. how to carry out currency/issue checks on the specifications you are working with
6. the quality control procedures to be followed during the overhauling operations
7. the procedure for obtaining replacement parts, materials and other consumables necessary for the overhaul
8. company policy on the repair/replacement of components during the overhauling process
9. terminology used in gearbox assemblies
10. the basic principles of how the gearbox assembly functions, its operating sequence, the working purpose of individual units/components and how they interact
11. the extent to which the equipment is to be dismantled for overhaul
12. the sequence to be adopted for the dismantling/reassembling of the gearbox assembly
13. the techniques used to dismantle the gearbox assembly, without damage to the components or surrounding structure (such as release of energy/pressures/force; making mechanical disconnections; proof-marking components to aid reassembly; removing assemblies having interference fits
14. the need to protect the system integrity by ensuring that exposed components are correctly covered/protected

15. how to lift and move large components and assemblies; the methods and equipment used to transport, handle and lift the components during the overhauling activities
16. the need to ensure that lifting and handling equipment is within its current certification dates
17. methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lived' and consumable items
18. the uses of measuring equipment
19. methods of reassembling the gearbox, using new or previously overhauled components
20. how to make adjustments to replaced components/assemblies to ensure that they function correctly
21. the various mechanical fasteners that are used, and their method of removal and replacement
22. the various types of electrical connector that are used, methods of unlocking, orientation indicators, and locating and locking in of the connections
23. the tools and equipment used in the overhauling activities, and how to check that they are in a safe/usable condition
24. the importance of ensuring that all tools are used correctly and within their permitted operating range
25. the importance of ensuring that all tools, equipment and components are accounted for and returned to their correct location on completion of the overhauling activities
26. the procedure for the safe disposal of waste materials
27. the need to complete the overhaul documentation and/or reports following the overhauling activity
28. the problems that can occur during the overhauling activity, and how they can be overcome
29. the extent of your own authority and to whom you should report if you have a problem that you cannot resolve

Scope/range related to performance criteria

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1. Carry out all of the following during the overhaul of the gearbox assembly:
 - 1.1 obtain and use the appropriate documentation for the overhauling activities
 - 1.2 adhere to procedures or systems in place for risk assessment, personal protective equipment and other relevant safety regulations and procedures to realise a safe system of work
 - 1.3 provide and maintain safe access and working arrangements for the work area
 - 1.4 ensure that the gearbox unit is suitably supported, and that appropriate lifting and handling equipment is available
 - 1.5 carry out the overhauling activities, following good practice/approved procedures
 - 1.6 ensure that components and surrounding structures are maintained free from damage and foreign objects
 - 1.7 return all tools and equipment to the correct location on completion of the activities
 - 1.8 leave the work area in a clean and safe condition on completion of the activities
2. Overhaul two of the following types of gearbox:
 - 2.1 crash mesh/sliding mesh
 - 2.2 constant mesh
 - 2.3 synchromesh
 - 2.4 planetary
 - 2.5 variable speed
 - 2.6 speed reduction/increase
 - 2.7 differential
 - 2.8 compound
3. Overhaul gearboxes operating on two of the following types of gear drive:
 - 3.1 spur gear
 - 3.2 worm and worm wheel
 - 3.3 harmonic drive
 - 3.4 helical gear
 - 3.5 bevel
 - 3.6 combined drive (such as bevel and helical)
 - 3.7 crossed helical
 - 3.8 spiroid (spiral bevel)
 - 3.9 rack and pinion
 - 3.10 hypoid
 - 3.11 other specific type

Overhauling gearbox assemblies

4. Carry out all of the following activities on the equipment being overhauled:
 - 4.1 cleaning parts prior to dismantling
 - 4.2 pre-disassembly checks and tests
 - 4.3 releasing stored energy (where applicable)
 - 4.4 draining/removing any remaining fluids
 - 4.5 applying protection to openings to prevent entry of contaminating debris
 - 4.6 proof-marking/labelling of components to aid reassembly
 - 4.7 dismantling equipment to unit/sub-assembly level
 - 4.8 dismantling units to component level
 - 4.9 removing and replacing components having interference fits (such as by expansion, contraction, pressure)
 - 4.10 checking components for wear and serviceability (such as visual, measurement, use of probes/scopes)
 - 4.11 replacing all damaged or defective sub- assemblies and components
 - 4.12 balancing components (where applicable)
 - 4.13 replacing all 'lived' and consumable items (such as seals, bearings, gaskets)
 - 4.14 'blue bedding' components (where applicable)
 - 4.15 setting and adjusting replaced components
 - 4.16 reassembling the gearbox unit
 - 4.17 making mechanical connections
 - 4.18 applying correct lubrication during assembly
 - 4.19 applying gaskets and sealant/adhesives
 - 4.20 tightening fastenings to the required torque
 - 4.21 securing components using mechanical fasteners and threaded devices (such as nuts, bolts, circlips, pins)
 - 4.22 applying locking and retaining devices (such as circlips, pins, wire locking, lock nuts, stiff nuts, swage nuts)
5. Replace/refit a range of gearbox assembly components, to include eight of the following:
 - 5.1 gear housings
 - 5.2 oil pumps
 - 5.3 bearings
 - 5.4 shims and packing
 - 5.5 drive shafts
 - 5.6 levers and linkages
 - 5.7 lay shafts
 - 5.8 selector mechanisms
 - 5.9 locks and stops
 - 5.10 locking devices
 - 5.11 gears/gear/trains/gear sub-assemblies
 - 5.12 wire thread inserts
 - 5.13 static seals/gaskets
 - 5.14 pipes and unions
 - 5.15 dynamic seals
 - 5.16 mechanical controls (such as plungers, springs, rollers)
 - 5.17 sensors (such as oil level, temperature)

Overhauling gearbox assemblies

- 5.18 electrical controls (such as solenoids, motors, switches)
- 5.19 oil filters
- 5.20 level indicators
- 5.21 other specific components
- 6. Carry out checks and tests on the overhauled gear box, to include all of the following:
 - 6.1 visual inspection for completeness of all operations
 - 6.2 visual inspection for freedom from damage or foreign objects
 - 6.3 applying protection to openings to prevent entry of contaminating debris
 - 6.4 carrying out any 'special-to-type' checks (such as bearing end float, gear backlash)
- 7. Overhaul gearbox assemblies, in compliance with one of the following:
 - 7.1 BS, ISO or BSEN standards and procedures
 - 7.2 customer standards and requirements
 - 7.3 company standards and procedures
 - 7.4 gearbox manufacturer's requirements

Overhauling gearbox assemblies

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