T-shore Education

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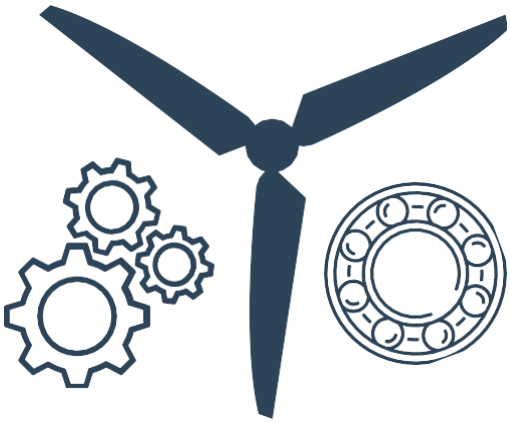
Learning Scenario Manual

Module:
Gearbox and Bearing Maintenance
Learning scenario:
Gearbox inspection



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Note This is a fictive generic equipment checklist intended for training purposes and therefore may vary from the equipment checklist provided by a company. It is important that a technician always read and fill checklist carefully prior to any task.

Table of Content

1 List of equipment

Table 1. List of equipment

Tool name	Model / Version	Quantity
Inspection report	V01	1
Gloves	ANSI cut resistant level A1	1
Gloves	Nitrile	2
Safety shoes	-	1
Safety goggles	-	1
Safety helmet	-	1
Suitable working clothing	-	1
Mechanical tools set (manual torque wrench, screwdriver etc.)	-	1
Borescope	Any functional and calibrated	1 for 2 participants
Oil sample container	-	1
Gearbox filter	Correct for specific gearbox type and model	1 for 2 participants
Paper towels	-	-

2 Instruction

2.1 Inspection preparation

Step 1: Documentation

- Fill out *Table 1. Documentation overview* and *Table 2. Report overview* in **Gearbox Inspection report**

Step 2: Safety procedures

- Verify that the gearbox is safely shut down and properly cooled to allow safe access.
- Fill out *Table 3. Safety procedures* in **Gearbox Inspection report**

2.2 Exercise 1 - Exterior Gearbox inspection

Step 1: Visual inspection of bolts & housing

- Inspect bolts and housing

Note Look for discolorations, loose bolts, or other loose parts. Pay attention to visible mechanical damage, corrosion. If any irregularities are found, fix them if possible (e.g., tightening loose bolts).

- Record all observations accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report**

Step 2: Inspection of oil penetration into bushings and gaskets

- Inspect for oil leaks

Note Look closely for oil penetration in bushings and gaskets. Identify areas where leakage might have occurred. Reflect on potential causes of the leakage, such as improper sealing or wear and tear.

- Record all observations accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report**

Step 3: Visual inspection of sensors for gears and bearings

- Inspect sensors

Note identify type of sensors. Examine the sensors for any damage or irregularities. Ensure sensors are properly positioned and securely fastened.

- Record all observations (for each sensor) accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report**

2.3 Exercise 2 - Interior Gearbox inspection

Step 1: Hatch opening and initial inspection

- Carefully open the gearbox hatch

Note Use the appropriate tools to remove the hatch bolts or securing mechanisms. Safely set aside the hatch and bolts to prevent damage or loss.

- Perform preliminary inspection

Note Look for immediate signs of oil leakage, contamination, corrosion or wear & tear.

Step 2: Borescope inspection of gears

- Position the borescope to inspect gears that may not be visible directly through the opened hatch.

Note Look for signs of wear, surface damage, cracks, pitting, or misalignment on gear teeth. Inspect each gear component type - high speed gear wheel, Intermediate speed gear wheel, low speed gear wheel, sun pinion, planet gear wheel 1,2,3 , ring gear.

- Capture images

Note The images should represent the phenomenon or technical condition as accurately as possible. They must be informative and of high quality, capturing information in a clear and straightforward manner, leaving no room for alternative interpretations. Create as many images as needed.

- Record all observations accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report**

Step 3: Borescope inspection of bearings

- Position the borescope to inspect bearings that may not be visible directly through the opened hatch.

Note Look for signs of wear, overheating, contamination, insufficient lubrication, surface damage. Inspect each bearing type - Planet gear 1,2,3 bearings.

- Capture images

Note The images should represent the phenomenon or technical condition as accurately as possible. They must be informative and of high quality, capturing information in a clear and straightforward manner, leaving no room for alternative interpretations. Create as many images as needed.

- Record all observations accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report**. Attach images to **Gearbox Inspection report** and add them to *Table 5. List of attachments*

Step 4: Borescope inspection of internal housing

- Position the borescope to inspect housing areas that may not be visible directly through the opened hatch.

Note Look for signs of corrosion, debris or structural damage

- Capture images

Note The images should represent the phenomenon or technical condition as accurately as possible. They must be informative and of high quality, capturing information in a clear and straightforward manner, leaving no room for alternative interpretations. Create as many images as needed.

- Record all observations accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report**. Attach images to **Gearbox Inspection report** and add them to *Table 5. List of attachments*

Step 5: Hatch closing (if Exercise 3 applicable – skip step 5)

- Carefully close the hatch and tighten bolts according to the manufacturer's specifications.

Note Use the appropriate tools to and torque configuration to secure hatch and bolts according to manufacturer's specifications. Use the right torque value according to bolts specifications. Ensure a proper seal to prevent oil leaks or contamination.

2.4 Exercise 3 - Lubrication system inspection

Step 1: Check the oil level

- Inspect with dipstick or visual level in reservoir

Note Compare the observed level to the recommended range. If recommended level no available notice that in report.

- Verify with sensor (if applicable)

Note Check if the oil level sensor reading matches the manual measurement.

- Record all observations accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report**

Step 2: Take oil sample

- Prepare for sampling

Note Use clean, approved equipment for oil sampling and label the container clearly (e.g., gearbox ID, date, time). Wear plastic gloves, secure basket and use paper towels if needed.

- Take the sample

Note To ensure proper sampling: First, drain a small amount of oil into a bucket. Then, without closing the valve, take the sample to container and drain some more oil into the bucket. Finally, close the valve. The initial draining of oil into the bucket is intended to flush the valve and oil line. The initial sample may contain contaminants from the valve, which is why it is recommended to collect the middle sample. Similarly, a sample taken while closing the valve may also contain contaminants for the same reason.

- Secure the sample

Note Secure the sample in a clean, sealed container. Do not expose to UV radiation and heat/cold.

- Visual inspection

Note Observe the oil for discoloration, particles, or contamination. Describe the condition of the lubricant (e.g., "clear and clean," "cloudy," or "contaminated").

- Record all observations accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report.**

Step 3: Inspect oil filter and replace (if applicable)

- Inspect oil filter for clogging, damage, or wear & tear.

Note Check for clogging, damage, or wear & tear.

- Remove the old filter

Note Safely detach the used oil filter, ensuring no contamination enters the system. Wear plastic gloves and use paper towels if needed.

- Install the new filter

Note Fit the replacement filter securely, following the manufacturer's instructions. Wear plastic gloves and use paper towels if needed.

- Dispose of old filter

Note Dispose of the old filter according to environmental regulations. Wear plastic gloves and use paper towels if needed.

- Record all observations accurately in the inspection checklist – *Table 4. List of inspection points* in **Gearbox Inspection report**

Step 4: Hatch closing

- Carefully close the hatch and tighten bolts according to the manufacturer's specifications.

Note Use the appropriate tools to and torque configuration to secure hatch and bolts according to manufacturer's specifications. Use the right torque value according to bolts specifications. Ensure a proper seal to prevent oil leaks or contamination.

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