TRANSNET

freight rail

ICTM

(WHEELSET AND MATERIALS TECHNOLOGY)

MAGNETIC PARTICLE INSPECTION PROCEDURE OF GEAR WHEELS FOR GEAR ROOT CRACKS

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Transnet SOC Ltd and Relevant Third Parties

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LIST OF FIGURES

1.0 COMPONENTS

1.1 Electrical and diesel locomotive gear wheels.

2.0 SCOPE

2.1 This procedure covers the magnetic particle inspection procedure for root cracks in electrical and diesel locomotive gear wheels.

3.0 REFERENCES

3.1 ASTM E709-85: Standard practice for magnetic particle examination.
3.2 ASTM E269-88: Standard definitions for terms relating to magnetic particle inspection.
3.3 ISO 9712:1992: Non-destructive testing - Qualification and certification of personnel.
3.4 ASME V: Article 7: Magnetic Particle Inspection

4.0 PERSONNEL QUALIFICATIONS

4.1 All qualifications of personnel engaged in magnetic particle inspection to this procedure, shall be approved by SPOORNET. Qualifications exceeding the renewal period of that specific qualification scheme, will be considered invalid.

5.0 VISION REQUIREMENTS

5.1 The operators shall have documented evidence of satisfactory vision as stipulated in ISO 9712: 1992. The vision tests have to be performed annually by an oculist, optometrist or other medically recognised person.

6.0 EXTENT OF TESTING

6.1 100% inspection of all gear roots will be performed.
6.2 Pole placing shall be such that over lapping shall ensure 100% inspection of all gear roots.

7.0 TIME OF INSPECTION

7.1 Gears to be inspected after wheel sets have been removed.
7.2 The surface temperature shall not exceed 57°C.

8.0 SURFACE PREPARATION

8.1 The areas to be inspected must be clean and dry. The area shall be free from any dirt, scale, paint, oil, grease or any contaminant which may interfere with the test or the interpretation of indications.

9.0 MAGNETIC PARTICLE MATERIALS

9.1 Wet fluorescent magnetic particle suspension.

10.0 EQUIPMENT

10.1 Electromagnetic yoke (AC).
10.2 Burmah Castrol strips, Berthold spoon or ASME field indicators.
10.3 Ultraviolet lamp.
10.4 Calibrated light intensity meter.

11.0 MAGNETISING METHOD

11.1 The continuous field or current flow method shall be used for maximum flux density.

12.0 FIELD INDICATORS

12.1 Checking of the field direction and magnetic particle suspension using the Burmah Castrol strips, Bertholdt spoon or ASME field indicators shall be done prior to inspection.

13.0 PRE-CALIBRATION TESTS

13.1 A lifting test, at maximum pole spacing, shall be performed on a 4.5kg steel test block prior to testing.
13.2 The UV light intensity shall be checked with a calibrated light intensity meter prior to inspection as described in ASTM E709-85, paragraph 5.3.2 and must be a minimum of 800 $\mu W/cm^2$ at a distance of 381 mm.

14.0 SENSITIVITY

14.1 The yoke poles shall be placed on the circumference of the gear and not across more than three gear teeth (See Figure 1).

15.0 TEST METHOD

15.1 Position the yoke as shown in figure 1.
15.2 Apply current while spraying wet fluorescent suspension on the inspection area.
15.3 Inspect area with UV light.

16.0 ACCEPTANCE CRITERIA

16.1 All gears showing any cracks in any position on the gear teeth must be rejected.

17.0 MARKING

17.1 All gears should be marked in such a manner as to prevent the accidental re-use of the gear.

18.0 REPORTING

18.1 The following information of defective gears must be supplied to the Principal Engineer, att: Kingsley Sivhabu Materials Engineering, Koedoespoort.
18.1.1 Name of gear manufacturer
18.1.2 Date of manufacture
18.1.3 Date of reprofiling
18.1.4 Serial number of gear
18.1.5 Date of crack detection
18.1.6 Number and lengths of cracks
18.1.7 Position of cracks
18.1.8 Name of operator.

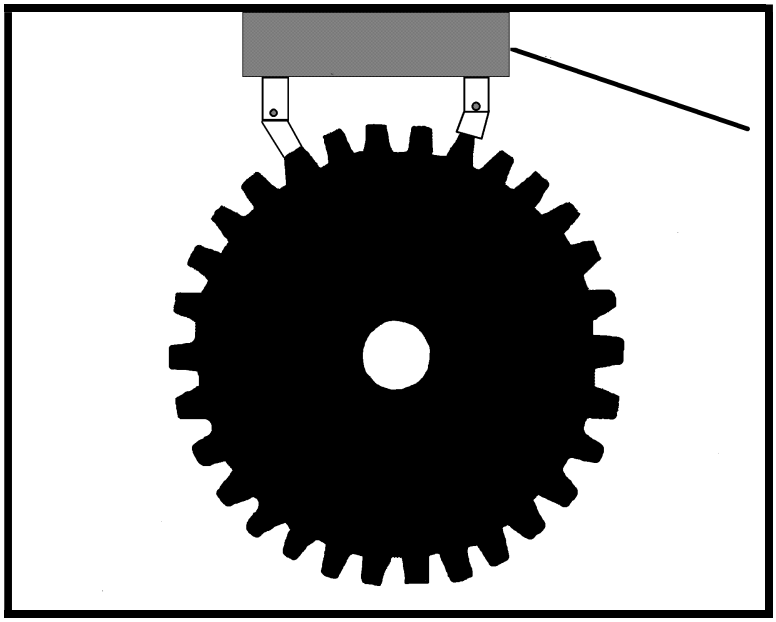

Figure 1: Relative position of magnetic yoke