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PETROCHEMICAL INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 75.100

E 34

NB/SH/T 0845-2010

Determination of viscosity shear stability of transmission

lubricants using the tapered roller bearing rig

传动润滑剂黏度剪切安定性的测定 圆锥滚子轴承试验机法

Issued on: January 09, 2011

Implemented on: May 01, 2011

Issued by: National Energy Administration

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Determination of viscosity shear stability of transmission lubricants using the tapered roller bearing rig

1 Scope

1.1 This standard specifies a test method, for evaluating the viscosity shear stability of transmission lubricants, using a tapered roller bearing rig.

1.2 This standard applies to all kinds of transmission lubricants.

1.3 This standard deals with certain hazardous materials, operations, equipment, BUT is not intended to make recommendations on all safety issues related thereto. Therefore, users shall establish appropriate safety and protective measures AND determine the applicability of relevant regulatory restrictions, before using this standard.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

GB/T 265 Petroleum products - Determination of kinematic viscosity and calculation of kinematic viscosity

JJF 1001 General terms in metrology and their definitions

JJF 1059 Evaluation and expression of uncertainty in measurement

3 Method overview

This method uses a tapered roller bearing rig, under the test conditions similar to the gearbox, to make the lubricant be subject to the action of mechanical shear stress, resulting in permanent viscosity loss; uses the drop rate of the kinematic viscosity of lubricant, to represent the viscosity shear stability of the lubricant.

4 Test equipment

4.1 Rig: Standard four-ball extreme pressure rig, with constant temperature control.

4.2 Test head: The test head is equipped with a tapered roller bearing. The schematic diagram of the tapered roller bearing and its adapter is as shown in Figure 1. The schematic diagram of the circulation of the heating or cooling liquid, in the heating or cooling body, is as shown in Figure 2.

4.3 Test piece: SKF32008XQ tapered roller bearing.

5 Reagents and materials

5.1 N-heptane: Analytically pure, which is used for cleaning test pieces.

5.2 The reference oils are as follows:

5.2.1 CEC RL181, which is also used as running-in oil.

5.2.2 CEC RL209.

5.2.3 CEC RL210.

Note: The detailed specifications and other information of the above reference oils can be found in the CEC Reference Oil Handbook CEC P-72-98. The latest reference oil data can also be obtained, by visiting the CEC website www.cectests.org. It shall follow the protocol PTC-16 to select the reference oil.

6 Preparations

6.1 Preparation of tapered roller bearings and their adapters

6.1.1 Running-in of tapered roller bearings

$$R_v = \frac{V_{\text{sol}} - V_{\text{col}}}{V_{\text{sol}}} \times 100 \dots\dots\dots (1)$$

Where:

V_{sol} - The kinematic viscosity of test lubricant (100 °C) before test, mm²/s;

V_{col} - The kinematic viscosity of test lubricant (100 °C) after test, mm²/s

Note: The smaller the relative viscosity loss value, the higher the viscosity stability.

10 Test report and test validity

10.1 Basic content of the test report

The basic contents of the test report shall mainly include:

- The name and address of the laboratory;
- The unique identification of the report and the unique identification of each page, as well as the total number of pages of the report;
- The name and address of the customer;
- The description and identification of the test items;
- The identification of the test procedure or description of the test method/procedure.

10.2 Operation data

- The operating conditions;
- The tapered roller bearings used;
- The lubricant used;
- The special events (e.g., interruptions).

10.3 Result representation

- Viscosity shear loss percentage of the test lubricant (%).

11 Reference oil calibrating machine

11.1 Reference oil calibrating machine

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