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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 12581-2006

**Standard test method for oxidation characteristics of inhibited
mineral oils**

加抑制剂矿物油氧化特性测定法

(English Translation)

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1 Scope

1.1

This Standard specifies the evaluation of the oxidation stability of inhibited steam turbine oils in the presence of oxygen, water, and copper and iron metals at an elevated temperature. This test method is limited to a maximum testing time of

10000h. This test method is also used for testing other oils, such as hydraulic oils and circulating oils having a specific gravity less than that of water and containing rust and oxidation inhibitors.

1.2

This Standard adopts SI units.

1.3

This Standard is involved in some materials, operations and equipment with hazard, but does not purport to address all of the safety concerns. Therefore, it is the responsibility of the user of this Standard to establish appropriate safety and protective measures and determine the applicability of management system prior to use.

2 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For dated reference, subsequent amendments (excluding corrigendum) or revisions of these publications do not apply. However, all parties who enter into an agreement according to this Standard are encouraged to study whether the latest edition of these documents is applicable. For undated references, the latest edition of the normative document is applicable to this Standard.

GB/T 514 "Liquid in Glass Thermometers for Petroleum Products-Specification"

GB/T 699 "Quality Carbon Structural Steels"

GB/T 4756 "Petroleum Liquids-Manual Sampling" (GB/T 4756-1998, eqv ISO)3170:1988)

GB/T 4945-2002 "Standard Test Method for Acid and Base Number of Petroleum Products and Lubricants by-Colour-indicator Titration"

GB/T 5231 "Wrought Copper and Copper Alloys Chemical Composition Limits and Forms of Wrought Products"

GB/T 6682 "Water for Analytical Laboratory Use-Specification and Test Methods" (GB/T 6682-1992, neq ISO 3696:1987)

GB/T 7304 "Petroleum Products and Lubricants-Determination of Neutralization Number-Potentiometric Titration Method"

GB/T 17039 "Standard Practice for Utilization of Test Data to Determine Conformance with Specifications"

SH/T 0163 "Standard Test Method for Acid Number of Petroleum Products by Semi-micro Color Indicator Titration"

SH/T 0565 "Standard Test Method for Determination of the Sludging Tendencies of Inhibited Mineral Oils"

3 Summary of Test Method

The sample is contacted with oxygen in the presence of water and an iron-copper catalyst at 95°C. The test continues until the measured acid number of the sample is

2.0mgKOH/g or above. The number of test hours required for the sample to reach

2.0mgKOH/g is the "oxidation lifetime".

4 Significance and Use

This test method is widely used for specification purposes and is considered of value in estimating the oxidation stability of lubricants, especially those that are prone to water contamination. It should be recognized, however, that correlation between results of this method and the oxidation stability of a lubricant in field service may vary markedly with field service conditions and with various lubricants. The precision statement for this method was determined on steam turbine oils.

Note: In the course of testing a lubricant by this method, other signs of deterioration, such as sludge formation or catalyst coil corrosion, may appear that are not reflected in the calculated oxidation lifetime. The application of alternative criteria for evaluation of lubricants using this test apparatus is under study. Test Method SH/T 0565 is now available for sludge tendency measurement.

5 Apparatus

5.1

Oxidation Cell, of borosilicate glass, as shown in Figure 1, consisting of a test tube, condenser, and oxygen delivery tube. The test tube has a calibration line at

300mL (maximum error 1mL) at 20°C.

heating liquid itself to a depth of 355 ± 10 mm.

Note: Metal heating baths meeting the test method requirements may also be used. It is not known what types of heating baths were used in developing the precision statement.

5.2.1

Studies have suggested that direct sunlight or artificial light may adversely influence the results of this test. To minimize effects of light exposure on the sample, light shall be excluded from the sample by one or more of the following ways:

5.2.1.1

Use of heating baths that are constructed of metal, or combinations of metals and other opaque materials, that prevent light from entering the test tube from the sides is preferred. If a viewing window is included in the design, this viewing window shall be fitted with an opaque cover and be kept closed when no observation is being made.

5.2.1.2

If glass heating baths are used, the bath shall be wrapped with aluminum foil or other opaque material.

5.2.1.3

Bright light entering the test tube from directly overhead can be eliminated by use of an opaque shield.

5.3

Flowmeter, with a capacity of at least 3L/h, and an accuracy of 0.1L/h.

5.4 Heating Bath Thermometer-oxidation characteristic No. 2 thermometer having a

range from 72 to 126°C, and conforming to the requirements for thermometer GB-58 as prescribed in GB/T 514. Alternatively, temperature measuring devices of equal or better accuracy may be used.

5.5 Oxidation Cell Thermometer, oxidation characteristic No. 1 thermometer having

a range from 80 to 100°C, graduated in 0.1°C, total length-250mm, stem diameter-6.0 to 7.0mm, calibrated for 76-mm immersion, and conforming to the requirements for thermometer GB-57 as prescribed in GB/T 514. Alternatively, temperature measuring devices of equal or better accuracy may be used.

5.6 Thermometer Bracket, for holding the oxidation cell thermometer, of 1Cr18Ni9Ti

stainless steel, having the dimensions shown in Figure 2. The thermometer is held in the bracket by two fluoroelastomer O-rings of approximately 5mm inside diameter.

Alternatively, thin stainless steel wire may be used.

length and 15.9 to 16.5mm inside diameter. The turns of wire are evenly spaced, and two consecutive turns of the same wire are 3.96 to 4.22mm apart, center to center. The mandrel shown in Figure 3 is designed to produce such a coil. Using this mandrel, the iron wire is wound on a thread of 14.98-mm diameter, while the copper wire is wound on a thread of 15.9-mm diameter. The smaller diameter is to allow for springback of the iron wire after winding, so as to give 15.9-mm consistent inside diameter. Use of a very soft annealed steel wire may allow use of identical thread diameters for the two wires. Any arrangement that leads to the coil configuration described above is satisfactory.

8.3 Catalyst storage

The catalyst coil may be stored in a dry, inert atmosphere prior to use. A suitable procedure for catalyst storage is given in Appendix B. Before use it should be inspected to ensure that no corrosion products or contaminating materials are present.

For overnight storage (less than 24h) the coil may be stored in n-Heptane.

N-Heptane used for catalyst storage must be free of traces of water and corrosive materials. Redistilled n-Heptane conforming to 6.6 and stored in a tightly sealed bottle is