भारतीय मानक
IS 2664 : 2024
Indian Standard

शमन तेल — विशिष्टि

(तीसरा पुनरीक्षण)

Quenching Oil — Specification

(Third Revision)

ICS 75.100

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

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Lubricants and their Related Products Sectional Committee, PCD 25

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Lubricants and their Related Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Quenching is a type of metal heat treatment process, which involves the rapid cooling of a metal to adjust the mechanical properties of its original state. Quenching operation is generally carried out in a media, such as (a) water; (b) fatty oils, mineral oils and mixtures of fatty and mineral oils; and (c) molten lead and molten salt baths. The selection of quenching media depends upon the metal used, the hardness and other properties that the metallic article is desired to attain. The important characteristics of a quenching medium are: (a) the rate of transfer of heat from the metal to the medium, and (b) the ability of the medium to resist change in its properties due to frequent contact with the glowing metal.

This standard was first published in 1964 and subsequently revised in 1974 and 1980. In the second revision, the requirements for ash, pour point, flash point, viscosity, volatility and resistance to oxidation for the various grades of oils were modified. An additional requirement for viscosity index for compounded and additive type oils was added. In addition to the physico-chemical requirements, a performance test based on GM magnetic quenchometcr was also included.

This revision has been brought out to keep pace with the latest technological developments and international practices. In this revision, the following major changes have been incorporated:

a) Amendment 1 published in 1993 has been incorporated;

b) Additional requirement for viscosity index for mineral type quenching oils has been added, as the viscosity index of a quenching oil is directly related to its performance, affecting its behaviour over varying temperatures; and

c) A performance test based on a quenchometer with cooling curve analysis has been included. In addition to quenching time, this test offers cooling profiles which leads to better interpretation of cooling characteristics of the fluid.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

QUENCHING OIL — SPECIFICATION

(Third Revision)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for quenching oils.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TYPES

The material shall be of the following types:

a) Mineral type;
b) Compounded type; and
c) Additive type.

4 GRADES

The material of the mineral type shall be of the following viscosity grades:

a) Light;
b) Medium; and
c) Heavy.

5 REQUIREMENTS

5.1 Description

The material shall be made from refined petroleum oils with or without admixture of fatty oils and/or additives. It shall be a clean, homogeneous liquid, free from water, dirt and suspended matter.

5.2 The material shall comply with the requirements given in Table 1, when tested according to the methods prescribed under the annexes to this standard and parts of IS 1448. Reference to the relevant method of test is given in col (8) of the Table 1.

5.3 Performance Requirement

The material shall also pass the performance test on a quenchometer with cooling curve analysis as described in Annex D. The value for this test shall be as agreed to between the purchaser and the supplier.

6 PACKING AND MARKING

6.1 Packing

The material shall be packed in securely closed metal or any other suitable container as agreed to between the purchaser and the supplier.

6.2 Marking

The packaging containing the material shall be marked with the following information:

a) Name and type of material;

b) Manufacturer’s name, initials or trademark, if any;

c) Net mass of material;

d) Identification in code or otherwise to enable the lot of consignment or manufacture to be traced back from records; and

e) Any other statutory requirements.

6.2.1 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

7 SAMPLING

7.1 Representative samples of the material shall be drawn as prescribed in IS 1447 (Part 1).

7.2 All the requirements given in **5** shall be tested on the composite sample.

7.3 The lot shall be declared as conforming to the requirements of the specification if all the test results on the composite sample satisfy the relevant requirements.

Table 1 Requirement for Quenching Oil

(*Clause* 5.2)

Sl No.	Characteristic	Requirement					Method of Test
		Mineral type			Compounded Type	Additive Type	
		Light	Medium	Heavy			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	Acidity, inorganic, mg of KOH per g of the oil	Nil	Nil	Nil	Nil	Nil	IS 1448 (Part 2)
ii)	Acidity, organic, mg of KOH per g of the oil, *Max*	0.1	0.1	0.1	1.3	0.6	IS 1448 (Part 2)
iii)	Ash, percent by mass, *Max*	0.01	0.01	0.01	0.05	-	IS 1448 (Part 4/Sec 1)
iv)	Pour point, ºC, *Max*	0	0	3	3	0	IS 1448 (Part 10/Sec 2)
v)	Flash point, cleveland (open) cup, ºC, *Min*	160	175	200	175	175	IS 1448 (Part 69)
vi)	Kinematic viscosity at 40 ºC, cSt	11.5 to 17.5	20.5 to 36	36 to 73	19.5 to 34	19.5 to 34	IS 1448 (Part 25/Sec 1)
vii)	Viscosity index, *Min*	90	90	90	90	90	IS 1448 (Part 56)
viii)	Saponification value, *Max*	0.5	0.5	0.5	5 to 15	-	IS 1448 (Part 55/Sec 1)
ix)	Volatility (loss on heating at 150 ºC for two h), percent by mass, *Max*	8	4	3	4	4	Annex B
x)	Resistance to oxidation:						IS 1448 (Part 65)
	a) Kinematic viscosity of the oxidized oil at 40 ˚C, mm^2/s	Not more than 1.70 of the original oil at the same temperature			-	-	IS 1448 (Part 25/Sec 1)
	b) Carbon residue (conradson) of the oxidized oil, percent by mass, *Max*	2	2	2	-	-	IS 1448 (Part 122)
	c) Insolubles in the oxidized oil, percent by mass, *Max*	0.5	0.5	0.5	-	-	Annex C
	d) Acidity of the oxidized oil, organic (mg KOH/g of the oil), *Max*	1	1	1	-	-	IS 1448 (Part 2)
xi)	Copper strip corrosion test at 100 ºC for 3 h	Not worse than No. 1					IS 1448 (Part 15)

ANNEX A

(*Clause 2*)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 1447 (Part 1) : 2021	Methods of sampling of petroleum and its products: Part 1 Manual sampling (*second revision*)
IS 1448	Methods of test for petroleum and its products:
(Part 2) : 2007/ ISO 6619 : 1998	Petroleum products and lubricants — Neutralization number — Potentiometric titration method (*second revision*)
(Part 4/Sec 1) : 2021	Determination of ash (*fourth revision*)
(Part 10/Sec 2) : 2021/ISO 3016 : 2019	Petroleum and related products from natural or synthetic sources, Section 2 Determination of pour point (*third revision*)
(Part 12) : 2013/ ISO 2049 : 1996	Determination of colour (ASTM Scale) (*second revision*)
(Part 15) : 2004/ ISO 2160 : 1998	Petroleum products — Corrosiveness to copper — Copper strip test (*third revision*)
(Part 16) : 2014/ ISO 3675 : 1998	Crude petroleum and liquid petroleum products — Laboratory determination of density — Hydrometer method (*fourth revision*)
(Part 18) : 2020	Distillation of petroleum products (*third revision*)
(Part 19) : 2015/ ISO 5275 : 2003	Detection of thiols and other sulphur species — Doctor test (*second revision*)
(Part 25/Sec 1) : 2018/ISO 3004 : 1994	Transparent and opaque liquids, Section 1 Determination of kinematic viscosity and calculation of dynamic viscosity (*second revision*)
(Part 29) : 2021/ ISO 6246 : 2017	Petroleum products — Gum content of fuels — Jet evaporation method (*fourth revision*)
(Part 43) : 2018	Bromine number by colour indicator method (*third revision*)
(Part 55/Sec 1) : 2004	Determination of saponification value of petroleum products (*first revision*)
(Part 56) : 2013/ ISO 2909 : 2002	Calculation of viscosity index from kinematic viscosity (*third revision*)
(Part 65) : 2018	Oxidation test for lubricating oils (*third revision*)
(Part 69) : 2019/ ISO 2592 : 2017	Determination of flash and fire points — Cleveland open cup Method (*second revision*)
(Part 122) : 2013/ ISO 6615 : 1993	Determination of carbon residue — Conradson method (*first revision*)

ANNEX B

[*Table* 1, *Sl No.* (ix)]

TEST FOR VOLATILITY

B-1 PROCEDURE

Weigh 20 g ± 1 g of the material in a glass petri dish of approximately 9 cm diameter and keep the dish in a ventilated oven maintained at 150 ºC ± 2 ºC for two hours. Cool the dish with its contents in a desiccator to room temperature and then weigh accurately. Calculate the loss in mass as a percentage on the mass of the material taken for the test.

ANNEX C

[*Table* 1, *Sl No.* (x) (c)]

DETERMINATION OF INSOLUBLES IN THE OXIDIZED OIL

C-1 REAGENT

Petroleum hydrocarbon solvent — conforming to the following requirements:

Sl No.	Characteristic	Requirements	Methods of test
(1)	(2)	(3)	(4)
i)	Density at 15 ºC, kg/m^3	0.679 8 to 0.689 8	IS 1448 (Part 16)
ii)	Distillation test:		IS 1448 (Part 18)
	a) Initial boiling point, ºC, *Min*	55	
	b) Distillation between 60 ºC, and 80 ºC, percent by volume, *Min*	90	
	c) Final boiling point, ºC, *Max*	90	
iii)	Doctor test	Negative	IS 1448 (Part 19)
iv)	Colour	Waterwhite (1.0)	IS 1448 (Part 12)
v)	Residue on evaporation, mg/100 ml, *Max*	2	IS 1448 (Part 29)
vi)	Bromine number, *Max*	1	IS 1448 (Part 43)

C- 2 PROCEDURE

Oxidize the oil as prescribed in IS 1448 (Part 65). Weigh about 10 g of the well stirred oxidized oil accurate to the nearest 0.1 g, in a 250 ml conical flask, add 100 ml of petroleum hydrocarbon solvent and after thorough mixing allow it to stand in the dark for 16 h to 24 h. Decant the clear liquid in the conical flask through an accurately weighed whatman filter paper (No. 40) or equivalent, which was previously dried at 95 ºC to 100 ºC. Care should be taken to prevent the sludge from coming to the filter paper at this stage. Wash the insoluble in the flask twice by decantation, using 75 ml of petroleum hydrocarbon solvent in each operation. Wash the insolubles on the filter paper using more petroleum hydrocarbon solvent and finally wash it on the filter paper until it is free from oil. Transfer the filter paper with the insoluble to an oven maintained at 5 ºC to 100 ºC and dry it to constant mass.

Express the mass of insolubles as a percentage of the mass of the oxidized oil taken for the test.

ANNEX D

(*Clause* 5.3)

TEST FOR DETERMINATION OF COOLING CHARACTERISTICS BY COOLING CURVE ANALYSIS

D-1 APPARATUS

D-1.1 Nickel probe assembly made of nickel alloy 600 of diameter 12.5 mm ± 0.01 mm and a length of 60 mm ± 0.25 mm, with a 1.45 mm to 1.65 mm sheathed K-Type thermocouple in the centre, with a computer based data acquisition system capable of providing cooling curve analyses.

D-1.2 Electric furnace capable of maintaining a temperature of 850 °C over the length of the probe.

D-1.3 Sample container of diameter and height able to provide 50 ml of tested fluid above and below the transferred probe during the quenching process.

D-2 PROCEDURE

Heat the nickel probe assembly in the furnace till it maintains 850 °C for at least 2 min. Fill the sample container with the quenching oil sample. Transfer the heated probe into the centre of the oil sample, activating the data acquisition software to record the cooling characteristics.

D-3 REPORT

D-3.1 From the temperature-time graph, report the time at 600 °C, 400 °C and 200 °C, to the nearest 0.1 s.

D-3.2 From the cooling rate – temperature graph, report maximum cooling rate, in °C/s, temperature where the maximum cooling rate occurs, in °C, and cooling rate at 300 °C, in °C/s.

D-3.3 Report the cooling curves and the cooling rate curves.

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Lubricants and their Related Products, PCD 25

Organization	*Representative(s)*
In Personal Capacity (*Flat - 1002, Raheja Heights, D - Wing, off Gen A K Vaidya Marg, Dindoshi, Malad East Mumbai - 400097*)	DR Y. P. RAO **(*Chairperson*)**
Afton Chemicals Private Limited, Mumbai	SHRI ANAND KUMAR
Ashok Leyland Limited, Chennai	SHRI MAHESH P. SHRI D. BALAKRISHNAN (*Alternate*)
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Indian Oil Corporation Limited - Refineries and Pipelines Division, New Delhi	SHRI ASHWANI SHARMA SHRI R. K. CHUGH (*Alternate*)
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Organization	*Representative(s)*
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Member Secretary
SHRIMATI KREETI DAS
SCIENTIST 'C'/DEPUTY DIRECTOR
(PETROLEUM, COAL AND RELATED PRODUCTS), BIS

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices: *Telephones*

Central : 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002 { 2323 7617

Eastern : 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091 { 2367 0012 2320 9474

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019 { 265 9930

Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113 { 2254 1442 2254 1216

Western : 5th Floor/MTNL CETTM, Technology Street, Hiranandani Gardens, Powai Mumbai 400076 { 25700030 25702715

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