BRITISH STANDARD

BS 2000 :
Part 72 : 1993

Methods of test for

Petroleum and its products

Part 72. Determination of viscosity of cutback bitumen

(Identical with IP 72/86(92))

BSI STANDARDS

Foreword

This British Standard, having been prepared under the direction of the Petroleum Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 28 February 1993.

This British Standard supersedes BS 2000 : Part 72 : 1988, which is withdrawn.

BS 2000 comprises a series of test methods for petroleum and its products that are published by the Institute of Petroleum (IP) and have been accorded the status of a British Standard. Each method should be read in conjunction with the preliminary pages of 'IP Standard methods for analysis and testing of petroleum and related products' which gives details of the BSI/IP agreement for publication of the series, provides general information on safety precautions, sampling and other matters, and lists the methods published as Parts of BS 2000.

The numbering of the Parts of BS 2000 follows that of the corresponding methods published in 'IP Standard methods for analysis and testing of petroleum and related products'. Under the terms of the agreement between BSI and the Institute of Petroleum, the revised version of BS 2000 : Part 72 will be published by the IP (in 'Standard methods for analysis and testing of petroleum and related products' and as a separate publication). BS 2000 : Part 72 : 1993 is thus identical with IP 72/86, which was reapproved in 1992. Square brackets marked in the margin of this IP Standard indicate text that differs from the previous edition.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Committee reference PTC/13

IP 72/86 (1992) BS 2000: Part 72: 1993

Determination of viscosity of cutback bitumen

This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations.

1. SCOPE

1.1. This method provides a measure of the viscosity by determining the time of efflux of 50 ml of a cut-back bitumen, at 40°C, through a 10 mm orifice. The method is applicable to cut-back bitumens whose efflux times lie in the range 15 to 500 sec; it is suitable for cut-back bitumens complying with BS 3690.

NOTE 1: The apparatus and general procedure may be used for grades of cut-back bitumen that fall outside the range given in BS 3690, but the detailed procedure may require minor amendment. For example, cut-back bitumens more fluid than those complying with BS 3690 may require a lower test temperature (25°C), or both a lower test temperature and a viscometer cup with a smaller orifice (4 mm).

2. SUMMARY OF METHOD

2.1. The viscometer cup is filled with the warm sample and the cup is then transferred to a constant-temperature bath, maintained at 40°C for at least 1.5 h. The time of efflux of 50 ml through a 10 mm orifice is then determined.

3. APPARATUS

3.1. *Viscometer-cup* – The 10 mm viscometer cup and ball valve shall comply with the requirements of Figure 1.

NOTE 2: Figure 2 gives the dimensional differences for a 4 mm viscometer cup and ball valve.

3.1.1. The viscometer cup shall be provided with:

(*a*) a cork suitable for closing the 10 mm orifice with the ball valve in position;

(*b*) a cork suitable for closing the upper end of the cup without touching the test material when the cup is filled to just above the level peg on the ball-valve rod. This cork shall be provided with a central hole through which the IP 8C thermometer (see 3.4) can pass so that the thermometer bulb can be maintained at the geometric centre of the test material, and a groove in the side through which the metal rod of the ball valve can pass.

3.2. *Viscometer-cup holder* – This shall fulfil the following requirements:

(*a*) support one or more cups in a vertical position;

(*b*) provide a clearance of 280 ± 20 mm between the bottom of the orifice of the cup and the base on which the holder stands;

(*c*) provide a means of maintaining the test material in the cup at the test temperature during the period of efflux;

(*d*) provide a valve support to hold the ball valve 16 ± 1 mm vertically above the orifice of the cup during efflux of the test material.

NOTE 3: The above requirements are fulfilled, for a single-cup apparatus, by the Standard Tar Viscometer illustrated in Figures 3 and 4. In the case of the apparatus illustrated the temperature of the water bath is maintained by applying a small gas flame to the heating tube and stirring frequently.

3.3. *Constant-temperature bath* – A water bath, maintained at 40 ± 0.1°C, in which one or more of the filled viscometer cups can be immersed up to the rim of the cup.

NOTE 4: It will be necessary to provide a suitable support to maintain the cup(s) in an upright position.

3.4. *Thermometer* – complying with the requirements of Specification IP 8C.

The thermometer should be checked for accuracy.

3.5. *Receiver* – a 100 ml cylinder with graduations to capacities of 20 ml, 25 ml and 75 ml. The cylinder shall comply with the requirements of BS 604.

3.6. *Timing device* – this shall be suitable for the determination of an efflux time in the range 15 to 500 sec. The device shall be capable of measuring times to an accuracy of ± 0.2 sec.

NOTE 5: It is important to ensure that the accuracy of the timing device is maintained.

4. PREPARATION OF SAMPLE

4.1. *Water in the sample* – If the sample has been contaminated with water, reject the sample as unsuitable for testing by this method.

4.2. *Loss of volatiles* – Take great care during sample preparation, and any subsequent handling, to minimise the loss of volatile constituents of the test material.

4.3. *Temperature of the sample.*

4.3.1. *Sample received at a temperature above 60°C* – Allow the sample to cool to about 60°C and then stir the sample to ensure, as far as possible, the thorough re-blending of any separated diluent.

4.3.2. *Sample received cold* – Place the sample container in an oven maintained at 60 ± 5°C. Ensure that the sample container is not in direct contact with a heated surface of the oven, and that loss of the volatile constituents of the sample is kept to a minimum. Leave the sample in the oven for the time indicated in the following Table:

Volume of the sample, ml	Period of heating, h
750 ± 250	$2 \pm \frac{1}{2}$
1500 ± 500	$2\frac{1}{2} \pm \frac{1}{2}$
2500 ± 500	$3 \pm \frac{1}{2}$

For larger samples it will be necessary to use judgement regarding the sample preparation and the time required for the temperature of the sample to reach 60°C. After the heating period, stir the sample to ensure, as far as possible, the thorough re-blending of any separated diluent.

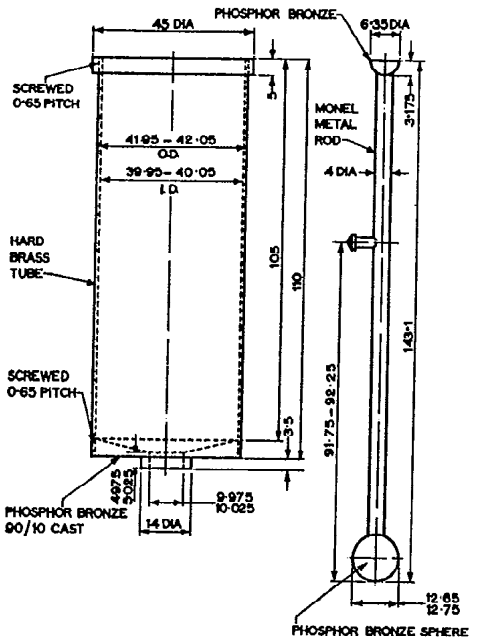

Fig. 1. 10 mm cup and ball valve.

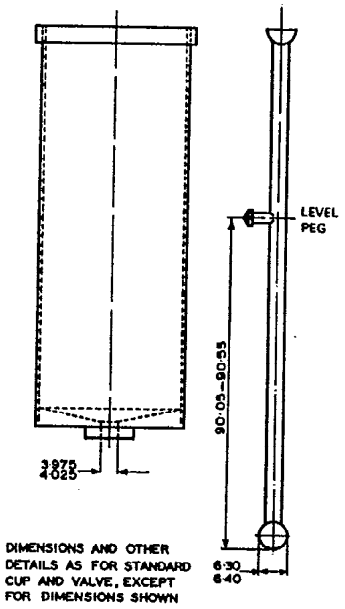

Fig. 2. 4 mm cup and ball valve.

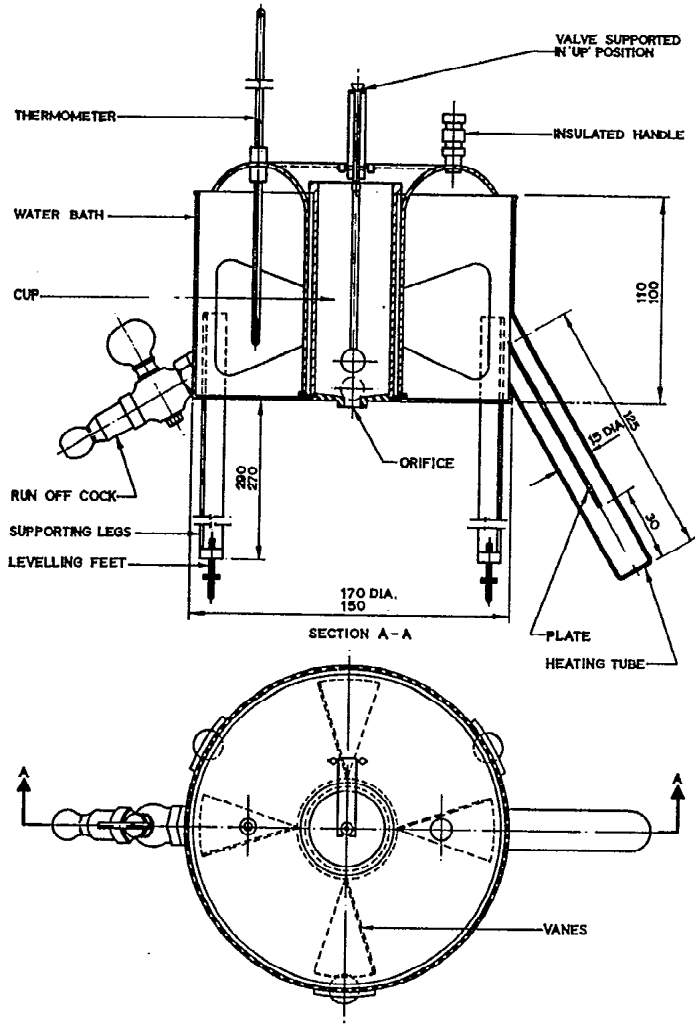

Fig. 3. Elevation and plan of assembled viscometer.

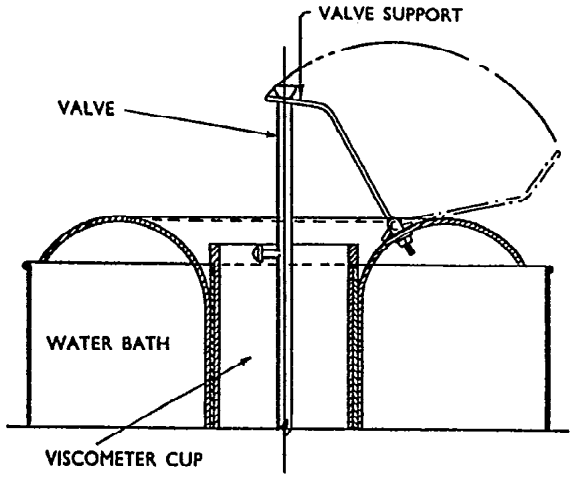

Fig. 4. Section showing arrangement of valve support.

5. PROCEDURE

5.1. *Filling the cup with the prepared sample* – Ensure that the viscometer-cup is clean and free from solvent or other cleaning agent.

NOTE 6: Exercise great care when cleaning the cup to prevent any damage to the orifice.

With the orifice closed with the cork and ball valve, fill the cup to just above the level peg. Insert the large cork to close the top of the cup.

5.2. *Conditioning the test material* – Suspend or otherwise support the filled cup, up to its rim, in the water of the constant-temperature bath for 1.75 ± 0.25 h. Maintain the bath at 40 ± 0.1°C. After 1.5 h check that the test material is at the test temperature.

5.3. *Preparation of the receiver* – Pour 20 ml of the light mineral oil into the receiver.

5.4. *Preparation of the viscometer-cup holder* – Towards the end of the conditioning period, prepare the viscometer-cup holder so that the test material will be maintained at the test temperature throughout the time of efflux of the sample.

5.5. *Transfer of the viscometer-cup* – After the 1.75 ± 0.25 h conditioning period, transfer the viscometer cup to the holder. Remove the bottom cork, and then the top cork while at the same time removing any excess sample above the centre line of the level peg using the thermometer.

5.6. *Timing the efflux period* – With the receiver in position under the orifice of the cup, lift the ball valve and suspend it on the valve support. When the oil in the receiver reaches the 25 ml mark start the timing device and stop it when the oil reaches the 75 ml mark. Record the time of efflux to the nearest sec.

6. REPORT

6.1. Report the time of efflux as the viscosity, IP 72.

NOTE 7: If a temperature other than 40°C and/or a 4 mm orifice viscometer is used, these must be reported.

7. PRECISION

7.1. Results of duplicate tests should not differ by more than the following amounts:

Viscosity, sec	Repeatability	Reproducibility
Below 20	sec	2 sec
20–40	2 sec	10% of the mean
Above 40	5% of the mean	10% of the mean