



Test method T510

Viscosity of C.A.M. and H.B.C. bitumen emulsion-redwood no. 2

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Revision Summary

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		Reformatted and Revision Summary Added / Scope altered	D.Dash	Sep 1999
Ed 2/ Rev 0	All	Reformatted RMS template	J Friedrich	November 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T510 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T510

Viscosity of C.A.M. and H.B.C. bitumen emulsion-redwood no. 2

1. Scope

This test method sets out the procedure for determining the viscosity of Cationic Aggregate Mixing (C.A.M.) bitumen emulsion (coldmix grade) and high bitumen content (H.B.C.) emulsion as a time of flow in seconds by the Redwood No. 2 viscometer. The method is derived from Institute of Petroleum, Standard Designation IP 70/62.

2. Apparatus

- (a) A container of about 1 litre capacity, with a lid or cover.
- (b) A viscometer comprising a single cup assembly in which one Redwood No. 2 cup to the IP 70/62 or BS 434 Appendix G design, is set in water bath which is thermostatically controlled to maintain the temperature within the cup at $25.0 \pm 0.1^\circ\text{C}$, or 60°C or $85^\circ\text{C} \pm 0.5^\circ\text{C}$. For thermostating to 25°C a temperature conditioned room is satisfactory.
- (c) Kohlrausch receiver flasks as described in IP 70/62, $50 \text{ mL} \pm 0.06 \text{ mL}$.
- (d) A timing device, such as stopwatch, graduated in divisions of 0.2 second and accurate to within 0.07 percent when tested over a period of 5 minutes.
- (e) A thermometer conforming to ASTM 90C or equivalent, or an ASTM 12C/IP64C if measurements are to be done at 25° , 60° and 85°C .
- (f) 150 mm stainless steel spatula, having a squared end.

3. Preparation of Apparatus

- (a) Clean the viscometer cup with a suitable solvent and thoroughly remove the solvent.
- (b) Allow the thermostatically controlled water bath to begin heating in sufficient time for the required temperature to be reached and to become steady before filling the cup.

4. Preparation of Sample

Stir the sample thoroughly with the spatula, and pour off into a container a portion sufficient to fill the cup (approx. 150 mL). See Techniques (c) if skin, lumps and foreign matter suspected.

5. Procedure

- (a) Precondition sample in container to reach 25°C by immersion of container in hot or cold water as necessary with stirring. For HBC emulsion the test may also be run at 60° or 85°C .
- (b) Place the ball valve in the orifice of the cup and pour in the sample until it is slightly above the level indicating peg in the side of the cup. Place the lid and thermometer in position.
- (c) Maintain the temperature of the heating bath at $25.0^\circ \pm 0.1^\circ\text{C}$ (or 60° or $85^\circ \pm 0.5^\circ\text{C}$). Adjust the level of the liquid in the cup by allowing some of it to flow out until the level peg is just exposed. Replace the cup cover in position and swing the thermometer towards the closed end of the cover slot.
- (d) Place the clean, dry receiver flask centrally below the jet, with the top of the neck a few millimetres from the bottom of the jet. Do not insulate the flask in any way.
- (e) Lift the ball valve and simultaneously start the time recorder. Suspend the valve from the clip supporting the cup thermometer by means of the hook in the wire stem. Stop the recorder at the instant the sample reaches the graduation mark of the flask and note the final reading of the cup thermometer.

- (f) Reject any determination if the temperature of the sample in the cup varies by more than 0.1°C. (or 0.5°C in the case of tests performed at 60° or 85°C).

6. Calibration

Select a lubricating oil or a fluid of known Newtonian characteristics up to a shear rate of 400 s^{-1} , of viscosity approx 0.15 to 0.75 Pa.s ($150\text{-}750 \text{ mm}^2 \text{ s}^{-1}$)

@ 25°C and determine its kinematic viscosity at 25°C by AS 2341.3 or if desired by either AS 2341.2 or AS 2341.4 followed by division by the density determined by either AS 2341.6 or AS 2341.7.

Measure the viscosity of the same oil in the Redwood II at 25°C.

The kinematic viscosity (μ) in $\text{mm}^2 \text{ s}^{-1}$ is given by: $= 2.6T - \frac{40}{T}$

Where T is the Redwood II flow time in seconds.

The two estimates should agree within 4%.

7. Calculation and Reporting

Report the time in seconds, to the nearest 0.5 second for values below 200 seconds and to the nearest whole second for values above 200 seconds, as the Redwood No. 2 Viscosity. Reference this Test Method, T510, and the test temperature if different from 25C.

8. Techniques

- If it is necessary to rub the interior of the cup or to clean the orifice, use soft tissue paper or some soft material which will not abrade the viscometer.
- Cups are accurately calibrated for dimensions and rate of flow of standard fluids and care must be taken not to damage the orifice in anyway.
- The sample is not normally filtered if it is judged to be apparently free from foreign matter, but when uneven flow is observed, the sample is to be re-tested after filtering through a 600 μm sieve.
- After flow commences, the Kohlrausch flask which had been placed centrally may be moved sideways to allow the stream to flow down the wall of the flask to minimise bubble generation.

9. Surrogate Tests

For the purpose of assessing specification compliance the procedure described above, only, is applicable. For internal QA, surrogate tests may be used. The following guidelines are offered. For home made Redwood e.g. modified pipette, the standard orifice dimensions, 3.8 mm diameter and 50 mm length and the standard initial head of fluid 82.5 mm (to the top of the orifice) should be approximated.

For rotational viscometry, a shear rate approximating $\frac{9280}{T} \text{ s}^{-1}$

Where T is the expected Redwood II flow time, should, be selected.

All surrogates should be calibrated against a veritable Redwood II.