INTERNATIONAL STANDARD

ISO 6615

Second edition
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Petroleum products — Determination of carbon residue — Conradson method

Produits pétroliers — Détermination du résidu de carbone — Méthode Conradson

Reference number
ISO 6615:1993(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 6615 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*.

This second edition cancels and replaces the first edition (ISO 6615:1983), which has been technically revised.

Annex A forms an integral part of this International Standard. Annex B is for information only.

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Petroleum products — Determination of carbon residue — Conradson method

WARNING — The use of this International Standard may involve hazardous materials, operations and equipment. This International Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this International Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard specifies a method for determining the amount of carbon residue, in the range of 0,01 % (*m/m*) to 30,0 % (*m/m*), left after evaporation and pyrolysis of an oil, and is intended to provide some indication of relative coke-forming tendency. The method is generally applicable to relatively non-volatile petroleum products which partially decompose on distillation at atmospheric pressure. Petroleum products containing ash-forming constituents as determined by ISO 6245 will exhibit an erroneously high carbon residue, depending upon the amount of ash formed.

NOTES

1 The term "carbon residue" is used throughout this International Standard to designate the carbonaceous residue formed after evaporation and pyrolysis of a petroleum product. The residue is not entirely composed of carbon, but is a coke which can be further changed by pyrolysis. The term "carbon residue" is retained in this method only in deference to its widespread use.

2 Values obtained by this method are not numerically the same as those obtained by ISO 4262, nor have satisfactory correlations been found between the results obtained by the two methods for all materials which may be tested, because the carbon residue test is applied to a wide variety of petroleum products. The Conradson carbon residue is finding use to characterize heavy residue fuel, coker feed stocks, etc., which cannot readily be loaded into a Ramsbottom coker bulb, and when it is desirable to examine or further test the residue. ISO 10370 (micro method) gives results similar to this method on a wide range of petroleum products, and may in time replace both this method and ISO 4262.

3 The carbon residue of distillate and residual fuel oils gives an approximate ranking of such fuels in terms of their propensity to form deposits in specific applications.

4 The presence of alkyl nitrates in distillate fuels, or ash-forming additives in either distillate or residue fuels, will give carbon residue results that are higher than the corresponding values on the fuel without additives. These values may not correlate with the propensity of a fuel to form deposits.

5 The carbon residue of base lubricating oils may give an indication of the propensity of the oil to lay down deposits in combustion chambers, and/or of the relative chemical constitution of oils of similar viscosity. Most finished lubricating oils contain ash-forming additives, and thus the carbon residue of finished lubricants cannot be used in this manner.

6 The carbon residue of a gas oil is a useful guide in the manufacture of gas.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1772:1975, *Laboratory crucibles in porcelain and silica.*

ISO 3170:1988, *Petroleum liquids — Manual sampling.*

ISO 3171:1988, *Petroleum liquids — Automatic pipeline sampling.*

ISO 3405:1988, *Petroleum products — Determination of distillation characteristics.*

3 Principle

3.1 A weighed test portion is placed in a crucible and subjected to destructive distillation. The residue undergoes cracking and coking reactions during a fixed period of severe heating. At the end of the specified heating period, the test crucible containing the carbonaceous residue is cooled in a desiccator and weighed. The residue remaining is calculated as a mass percentage of the original test portion.

3.2 For light products where over 90 % (*V/V*) distils at below 370 °C, the procedure may be carried out on the residue remaining after 90 % (*V/V*) has been distilled. The procedure for obtaining this residue is given in annex A.

4 Apparatus

The assembled apparatus is shown in figure 1. The constituent parts are described in 4.1 to 4.6.

4.1 Crucible, either a wide-form porcelain crucible that is glazed throughout, size 1/45 specified in ISO 1772, or a silica crucible, 29 ml to 31 ml capacity, 46 mm to 49 mm in rim diameter.

4.2 Skidmore iron crucible, flanged and ringed, 65 ml to 82 ml capacity, 53 mm to 57 mm inside and 60 mm to 67 mm outside diameters of flange, 37 mm to 39 mm in height, supplied with a cover without delivery tubes and having the vertical opening closed. The horizontal opening of approximately 6,5 mm shall be kept clean. The outside diameter of the flat bottom shall be 30 mm to 32 mm.

4.3 Spun sheet-iron crucible with cover, 78 mm to 82 mm outside diameter at the top, 58 mm to 60 mm in height, and approximately 0,8 mm thick.

Place at the bottom of this crucible, and level before each test, a layer of approximately 25 ml of dry sand, or enough to bring the Skidmore crucible, when placed inside with cover on, nearly to the top of the sheet-iron crucible.

4.4 Wire support triangle, of bare Nichrome wire of diameter approximately 2,0 mm to 2,3 mm, having an opening small enough to support the bottom of the sheet-iron crucible at the same level as the bottom of the insulator block or hollow sheet-metal box (4.6).

4.5 Circular sheet-iron hood, 120 mm to 130 mm diameter, the height of the lower perpendicular side being from 50 mm to 53 mm, provided at the top with a chimney 50 mm to 60 mm in height, and of 50 mm to 56 mm inside diameter, which is attached to the lower part having the perpendicular side by a cone-shaped member, bringing the total height of the complete hood to 125 mm to 130 mm.

As a guide for the height of the flame above the chimney, a bridge made of approximately 3 mm diameter iron or Nichrome wire, and having a height of 50 mm above the top of the chimney, shall be attached.

NOTE 7 The hood may be made from a single piece of metal, provided that it conforms to the dimensions given in 4.5.

4.6 Insulator, consisting of a ceramic heat-resistant block, refractive ring or hollow sheet-metal box, 150 mm to 175 mm in diameter if round or on a side if square, 32 mm to 38 mm thick, provided with a metal-lined, inverted cone-shaped opening through the centre, of diameter 83 mm at the bottom and 89 mm at the top. In the case of the refractory ring, no metal lining is necessary provided the ring is of hard, heat-resistant material.

4.7 Burner, Meker type or equivalent, having an orifice approximately 24 mm in diameter.

4.8 Cooling container, dessicator, or suitable vessel, not containing a desiccating agent.

5 Samples and sampling

5.1 Samples should be obtained in accordance with ISO 3170, ISO 3171 or an equivalent national standard.

5.2 Products examined by this International Standard are not always completely homogeneous, and therefore appropriate precautions shall be taken during the procurement of both bulk and laboratory test samples.