SLOVENSKI STANDARD
SIST EN 5:1996

01-marec-1996

Določanje izparilnega ostanka v gorivih s prepihavanjem

Determination of existent gum in fuels by jet evaporation

Bestimmung des vorhandenen Abdampfrückstandes in Kraftstoffen nach dem Aufblasverfahren

Détermination des gommes actuelles dans les carburants par la méthode d'évaporation au jet

Ta slovenski standard je istoveten z: **EN 5:1974**

ICS:

75.160.20 Tekoča goriva Liquid fuels

SIST EN 5:1996 **en**

EUROPEAN STANDARD
NORME EUROPEENNE
EUROPÄISCHE NORM

EN 5

First edition
October 1974

UDC : 665.73/75 : 662.753 : 620.1 : 543.814
Descriptors : Petroleum products, gasoline, aviation fuels, chemical analysis, determination of content, gums

English version

DETERMINATION OF EXISTENT GUM IN FUELS BY JET EVAPORATION

Détermination des gommes actuelles dans les carburants par la méthode d'évaporation au jet

Bestimmung des vorhandenen Abdampfrückstandes in Kraftstoffen nach dem Aufblaseverfahren

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Up-to-date lists of the national standards organizations which have adopted this European Standard, and the relevant bibliographical references, may be obtained on application to the CEN Central Secretariat, or to the sales offices of any CEN member.

This European Standard exists in three versions (English, French and German) recognized by CEN as equivalent. National versions in other languages rank as translations, the authenticity of which should, in case of doubt, be checked against one of the recognized versions.

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CEN

EUROPEAN COMMITTEE FOR STANDARDIZATION
Comité Européen de Normalisation
Europäisches Komitee für Normung

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BRIEF HISTORY

This European Standard was drawn up by CEN/WG 19 "Methods of Test for Petroleum Products", the secretariat of which is held by the British Standards Institution.

This project was accepted into the work programme of WG 19 in February 1965 with the intention of preparing a Unification Document based on ASTM D 381 - IP 131. In April 1969, the working group accepted a request from the Co-ordinating European Council for the Development of Performance Tests for Fuels and Engine Lubricants, for the provision of a series of test methods for use in the specification of European reference fuels and it was agreed that these methods should be prepared in the form of European Standards.

This European Standard is technically identical with ASTM D 381-70 : IP 131/70.

It was adopted by CEN on 31 October 1974, on the strength of its acceptance by the following member-countries:

Austria, Belgium, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, United Kingdom.

1 SCOPE AND FIELD OF APPLICATION

1.1 This European Standard describes a method for the determination of the existent gum in motor gasoline, aviation gasoline, volatile distillates used in their preparation and aircraft turbine fuel, at the time of test.

1.2 The determination of the unwashed gum content of motor gasoline is also described.

2 DEFINITIONS

2.1 Existent gum - the evaporation residue of aviation gasoline aircraft turbine fuel or the heptane-insoluble portion of the evaporation residue of motor gasoline.

2.2 Unwashed gum - the evaporation residue of motor gasoline consisting of existent gum and nonvolatile additive components.

3 SUMMARY OF METHOD

A measured test portion of fuel is evaporated under controlled conditions of temperature and flow of air or steam. For aviation gasoline and aircraft turbine fuel, the resulting residue is weighed and reported as milligrams per 100 ml. For motor gasoline, the residue is weighed before and after extracting with n-heptane and the results reported as milligrams per 100 ml.

4 SIGNIFICANCE

The true significance of this method for determining gum in motor gasoline is not firmly established. It has been proved that high gum can cause induction-system deposits and sticking of intake valves, and in most instances it can be assumed that low gum will ensure absence of induction-system difficulties. It should, however, be realized that the test is not of itself correlative to induction-system deposits. The primary purpose of the test, as applied to motor gasoline, is the measurement of the oxidation products formed in the sample prior to or under the conditions of the test, which are not as severe as those encountered in practical use. As many motor gasolines are purposely blended with non-volatile oils or additives, the heptane extraction step is necessary to remove these from the evaporation residue so that the deleterious material, gum, may be determined.

5 MATERIALS

5.1 Air, supply of filtered air at a gauge pressure not more than 0.35 bar (35 kN/m^2). *

5.2 Gum solvent - A mixture of equal volumes of toluene and acetone.

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* 10^5 N/m^2 = 1 bar = 1.019 72 kgf/cm^2

5.3 n-Heptane, knock test grade, conforming to the requirements given in Annex A.

5.4 Steam, supply of steam free of oily residue and at a gauge pressure not less than 0.35 bar(35 kN/m^2) .

6 APPARATUS

6.1 Balance, capable of weighing to 0.1 mg.

6.2 Beakers, of 100 ml capacity, as illustrated in Fig. 1. Arrange the beakers in sets, the number in each set depending upon the number of beaker wells in the evaporating bath. Permanently mark each beaker in the set with an identifying number or letter, reserving the lowest weight beaker for use a tare.

6.3 Cooling vessel, desiccator or other type of tightly covered vessel for cooling the beakers before weighing. The use of a drying agent is not recommended.

6.4 Evaporation bath, either a solid metal block bath or a liquid bath, electrically heated, and constructed in accordance with the general principles shown in Fig. 1. The bath should have wells and outlets for two or more beakers. The rate of flow from each outlet when fitted with the conical adapters should be 1000 ± 150 ml/s. A liquid bath, if used, shall be filled to within 25 mm of the top with a suitable liquid. Temperature may be maintained by means of thermostatic controls or by refluxing liquids of suitable composition.

6.5 Flow meter capable of metering a total flow of air or steam equal to n x 1000 ml/s, where n is the number of heating wells in the apparatus.

6.6 Sintered glass filtering funnel, 150 ml capacity, range of maximum pore diameter between 150-250 µm.

6.7 Steam superheater, gas fired or electrically heated, capable of delivering to the bath inlet the required amount of steam at 232°C ± 3°C.

6.8 Thermometer, conforming to the essential requirements set out in Annex B.

7 ASSEMBLY OF AIR-JET APPARATUS

7.1 Assemble the air-jet apparatus as shown in figure 1. With the apparatus at room temperature, adjust the flow of air so as to obtain, at each outlet, a flow of 600 ml/s, controlling this value by a suitable regulator outside the apparatus. Check, in the same way, that the remaining outlets have a similar flow.

Make the necessary adjustments in order that the flow at each outlet shall lie between 510 and 690 ml/s; once these adjustments have been made note the total flow rate indicated by the flow meter.

NOTE 1. A total reading on the flow meter corresponding to 600 ± 90 ml/s at each outlet will ensure, using a flow meter calibrated under ambient conditions, a flow of 1000 ± 150 ml/s at a temperature of 155 ± 5°C provided that the pressure at the outlet of the flow meter is not greater than 0.35 bar (35 kN/m^2).

7.2 In order to set the apparatus in operation, heat the bath until the temperature reaches 162°C; then introduce air into the apparatus until the reading established in 7.1 is obtained on the flow meter.

Measure the temperature in each well with a thermometer (6.8) placed with the bulb resting on the bottom of the beaker in the well. Any well having a temperature that differs by more than 5°C from 155°C is not suitable for standard tests.

8. ASSEMBLY OF STEAM-JET APPARATUS

8.1 Assemble the steam-jet apparatus as shown in Fig. 1.

8.2 Preparation. To set the apparatus in operation heat the bath; when the temperature reaches 232°C operate the superheater and slowly admit superheated steam until a flow rate of 1000 ± 150 ml/s per outlet is obtained. In order to do this adjust the admission of steam so as to reproduce the total flow meter reading established in carrying out the preliminary procedures described in 8.3 and 8.4 and without changing the other adjustments which were then made. Regulate the temperature of the bath within the range of 239 ± 7°C and of the superheater to provide a well temperature of 232 ± 3°C. Measure the temperature with a thermometer (6.8), placed with the bulb resting on the bottom of a beaker in the well. Any well having a temperature that differs by more than 3°C from 232°C is not suitable for standard tests.

8.3 Calibration of flowmeter. Calibrate the flowmeter by successively condensing the steam flow from each outlet and weighing the total quantity of water recovered. To accomplish this, attach a copper tube to a steam outlet and extend the tube into a 2 litre cylinder that has been filled with crushed ice and then weighed. Exhaust the steam into the cylinder for approximately 60 s. Adjust the position of the cylinder so that the end of the copper tube is immersed in the water to a depth of less than 50 mm to prevent excessive back pressure. Weigh the cylinder. The gain in mass represents the amount of steam condensed. Calculate the steam rate as follows :

$$R = (m_o - m_1)\ 1000/kt$$

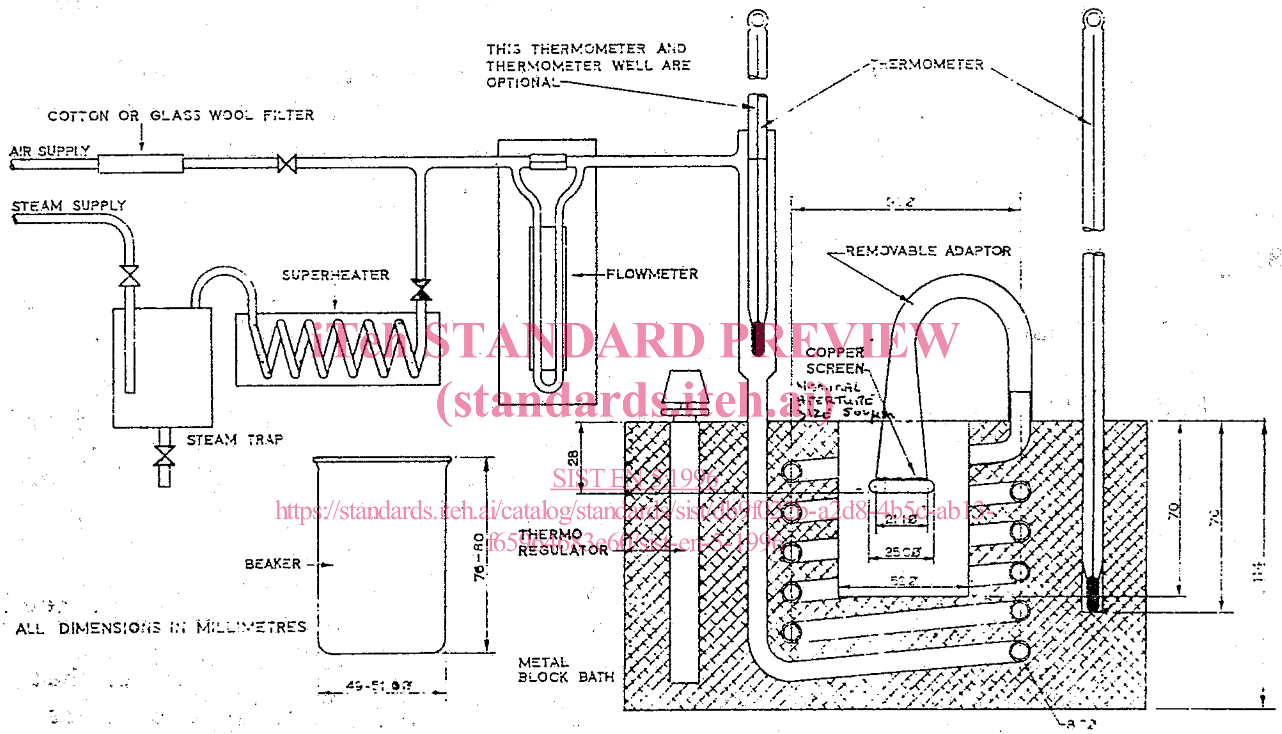

FIG 1

APPARATUS FOR DETERMINING EXISTENT GUM BY JET EVAPORATION

where : R is the steam rate, in ml/s of steam at 232°C
m_o is the mass, in grams, of cylinder with condensed steam
m_1 is the mass, in grams, of cylinder and ice
k is the mass (0.434 g) of 1000 ml of steam at 232°C at atmospheric pressure and
t is the condensing time, in seconds

8.4 Flow adjustment. Adjust the flow rate so as to obtain 1000 ml/s at the outlet under test; this value should be controlled as described in 8.3. Check, in the same way, that the remaining outlets have a uniform flow. Make the adjustments required so that the flow rates do not differ by more than 150 ml/s from the specified rate. When all the outlets have been adjusted to deliver 1000 ± 150 ml/s of steam note the flow meter reading and use this setting for preparing the apparatus as in 8.2.

9. PROCEDURE

9.1 Wash the beakers, including the tare, with the gum solvent until free of gum. Rinse thoroughly with water and immerse in detergent cleaning solution. Remove the beakers from the cleaning solution by means of stainless steel forceps and handle only with forceps thereafter. Wash the beakers thoroughly, first with tap water and then with distilled water, and dry in an oven at 150°C for at least 1 h. Cool the beakers for at least 2 h in the cooling vessel placed in the vicinity of the balance.

NOTE 2. The type of detergent and conditions for its use need to be established in each laboratory. The criterion for satisfactory cleaning shall be a matching of the quality of that obtained with chromic acid cleaning solution on used beakers (fresh chromic acid, 6 h soaking period, rinsing with distilled water and drying). For this comparison visual appearance and weight loss on heating the glassware under test conditions may be used.

Detergent cleaning avoids the potential hazards and inconvenience related to handling corrosive chromic acid solution. The latter remains as the reference cleaning practice and as such may function as an alternative to the preferred procedure of cleaning with detergent solutions.

9.2 Select the required conditions for aviation and motor gasolines or aircraft turbine fuel from Table 1 and set the apparatus in operation following the procedures of 7.2 or 8.2 as appropriate. If an external preheater is used, regulate the temperature of the vaporizing medium to give the prescribed test well temperature.