



Standard Terminology Relating to Petroleum, Petroleum Products, and Lubricants¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This standard is the compilation of terminology developed by Committee D02 on Petroleum Products and Lubricants, except that it does not include terms/definitions specific only to the standards in which they appear.

1.1.1 The terminology, mostly definitions, is unique to petroleum, petroleum products, and lubricants. Meanings of the same terms outside of applications to petroleum, petroleum products, and lubricants can be found in other compilations and in dictionaries of general usage.

1.1.2 The terms/definitions exist in two places (1) in the standards in which they appear and (2) in this compilation.

2. Terminology

2.1 Alphabetical listing of terms with definitions for each term showing attributions as to source and subcommittee jurisdiction is in bold print following the definition. Those showing no attributes are under the jurisdiction of Subcommittee CS 95.

abrasion, *n*—wear by displacement of material caused by hard particles or hard protuberances. [D02.0B] D 4998

absolute filtration rating, *n*—the diameter of the largest hard spherical particle that will pass through a filter under specified test conditions. This is an indication of the largest opening in the filter element. [D02.0N] D 4174

absorbance, *A*, *n*—the molecular property of a substance that determines its ability to take up radiant power, expressed by:

$$A = \log_{10} (1/T) = -\log_{10} T \quad (1)$$

where *T* is the transmittance as defined in 3.1.3.

DISCUSSION—Absorbance expresses the excess absorption over that of a specified reference or standard. It is implied that compensation has been affected for reflectance losses, solvent absorption losses, and refractive effects, if present, and that attenuation by scattering is small compared with attenuation by absorption. [D02.04] D 2008

absorptivity, *a*, *n*—the specific property of a substance to absorb radiant power per unit sample concentration and path length, expressed by:

¹ This terminology is under the jurisdiction of Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.95 on Terminology.

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$$a = Af/bc \quad (2)$$

where:

A = the absorbance defined in 3.1.4,

f = the dilution factor defined in 3.1.5,

b = sample cell path length, and

c = the quantity of absorbing substance contained in a volume of solvent.

[D02.04] D 2008
acceptance limit (AL), *n*—a numerical value that defines the point between acceptable and unacceptable quality.

DISCUSSION—The *AL* is not necessarily the specification limit. It is the value that takes into account the specification value, the test method precision, and the confidence level desired for defining minimum acceptable quality relative to the specification value.

[D02.94] D 3244

acidity, *n*—the quality, state or degree of being acid.

DISCUSSION—In this test method, the criterion for acidity is a pink or red color when methyl orange indicator is used.

[D02.06] D 1093

acute ecotoxicity, *n*—the propensity of a material to produce adverse behavioral, biochemical, or physiological effects in non-human organisms or populations in a short period of time, usually not constituting a substantial portion of the life span of the organism. [D02.0N] D 6046

additive, *n*—a material added to another, usually in small amounts, to impart or enhance desirable properties or to suppress undesirable properties. [D02.0B] D 5862

aerobic, *adj*—(1) taking place in the presence of oxygen; (2) living or active in the presence of oxygen.

[D02.0N] D 6006, D 6046

air-fuel ratio, *n*—in internal combustion engines, the mass ratio of air-to-fuel in the mixture being induced into the combustion chambers.

DISCUSSION—In this test method, air-fuel ratio is controlled indirectly by exhaust gas analysis for CO and O₂ contents. During Stages I and II, O₂ is the primary determinant, while CO is the primary determinant in Stage III.

[D02.0B] D 5302

anaerobic, *adj*—(1) taking place in the absence of oxygen; (2) living or active in the absence of oxygen.

[D02.0N] D 6006, D 6046

analyzer lag, *n*—Deprecated term. Use the preferred term *instrument response time*.

aniline point, *n*—the minimum equilibrium solution temperature for equal volumes of aniline (aminobenzene) and sample.

aniline point, *n*—the minimum equilibrium solution temperature for equal volumes of aniline and sample.

[D02.04] D 611

anti-knock index, *n*—the arithmetic average of the Research octane number (RON) and Motor octane number (MON).

antiknock index, *n*—the arithmetic average of the Research octane number (RON) and Motor octane number (MON), that is, (RON + MON)/2.

[D02.04] D 4814

API gravity, *n*—a special function of relative density (specific gravity) 60/60°F (15.56/15.56°C), represented by:

$$\text{API gravity, deg} = (141.5/\text{sp gr } 60/60^\circ\text{F}) - 131.5$$

[D02.04] D 287

asphalt, *n*—a dark brown-to-black cementitious material in which the predominating constituents are bitumens.

DISCUSSION—Asphalt can be a natural product or a material obtained from petroleum processing.

[D02.0G] D 128

assigned test value (ATV), *n*—the average of all results obtained in the several laboratories which are considered acceptable based on the reproducibility of the test method.

[D02.94] D 3244

ASTM color, *n*—the name of an empirical scale of expressing of the color of a petroleum liquid darker than Saybolt color based on a scale of 0.5 (lightest) to 8.0 Dil (darkest) and determined by Test Method D 1500.

[D02.05] D 6045

autoignition, *n*—the ignition of a material caused by the application of pressure, heat, or radiation, rather than by an external ignition source, such as a spark, flame, or incandescent surface.

autoignition temperature, *n*—the minimum temperature at which autoignition occurs.

automotive, *adj*—descriptive of equipment associated with self-propelled machinery, usually vehicles driven by internal combustion engines.

[D02.0B] D 4485

automotive wheel bearing grease, *n*—a lubricating grease specifically formulated to lubricate automotive wheel bearings at relatively high grease temperatures and bearing speeds.

[D02.0G] D 4693

base number, *n*—the quantity of an acid, expressed in terms of the equivalent number of milligrams of potassium hydroxide per gram of sample, that is required to titrate a sample dissolved in the specified solvent to a specified end point (for example, Test Method D 4739).

DISCUSSION—This method uses fixed amounts of isooctane and alcoholic hydrochloric acid as the sample solvent and the end point is defined as the amount of titrant required to reach a yellow end-point with a methyl red indicator solution.

[D02.06] D 5984

basicity, *n*—the quality, state or degree of being basic.

DISCUSSION—In this test method, the criterion for basicity is a pink or red color when phenolphthalein indicator is used.

[D02.06] D 1093

biodegradation, *n*—the process of chemical breakdown or transformation of a substance caused by organisms or their enzymes.

[D02.12] D 5864

biomass, *n*—any material, excluding fossil fuels, which is or was a living organism or component of a living organism.

[D02.12] D 5864

blind reference oil, *n*—a reference oil, the identity of which is unknown by the test facility.

DISCUSSION—This is a coded reference oil which is submitted by a source independent from the test facility.

[D02.0B] D 5844

blowby, *n*—in internal combustion engines, the combustion products and unburned air-and-fuel mixture that enter the crankcase.

[D02.0B] D 5302, D 5533, D 5844, D 5966, D 5967

blowby, *n*—in internal combustion engines, that portion of the combustion products and unburned air/fuel mixture which leaks past piston rings into the engine crankcase during operation.

break-in, *n*—in tribology, an initial transition process occurring in newly established wearing contacts, often accompanied by transients in coefficient of friction or wear rate, or both, which are uncharacteristic of the given tribological system's long-term behaviour.

[D02.0G] G 40, D 5706, D 5707

boilup rate, *n*—in column distillation, the quantity of vapor entering the column per unit of time.

borderline pumping temperature, *n*—the lowest temperature at which the critical yield stress or critical viscosity that allows a fluid to be pumped occurs.

bromine index, *n*—the number of milligrams of bromine that will react with 100 g of sample under the conditions of the test.

[D02.04] D 2710

bromine number, *n*—the number of grams of bromine that will react with 100 g of the sample under the conditions of the test.

BTDC, *adj*—abbreviation for Before Top Dead Center; used with the degree symbol to indicate the angular position of the crankshaft relative to its position at the point of uppermost travel of the piston in the cylinder.

[D02.0B] D 5533, D 5966

Bunsen coefficient, *n*—the solubility of a gas expressed as the volume, reduced to 273 K (32°F) and 101.3 kPa (1 atm), dissolved by one volume of liquid at the specified temperature and 101.3 kPa.

Bunsen coefficient, *n*—the solubility of a gas, expressed as the gas volume reduced to 273 K (32°F) and 0.10 MPa (1 atm), dissolved by one volume of liquid at the specified temperature and 0.10 MPa.

[D02.11] D 3827

burner fuel oil, *n*—any petroleum liquid suitable for the generation of heat by combustion in a furnace or firebox as a vapor or a spray, or a combination of both.

DISCUSSION—Different grades are characterized primarily by viscosity ranges.

calcined coke, *n*—petroleum coke that has been thermally treated to drive off the volatile matter and to develop crystalline structure.

calcined coke, *n*—raw petroleum coke that has been thermally treated to drive off the volatile matter and to develop crystalline structure.

[D02.05] D 5003

calibrate, *v*—to determine the indication

measuring device with respect to that of a standard.

[D02.0B] D 5533, D 5862, D 5966, D 5967

calibration, *n*—the act of determining the indication or output of a measuring device or a given engine with respect to a standard.

[D02.0B] D 6202

calibration oil, *n*—an oil that is used to determine the indication or output of a measuring device or a given engine with respect to a standard.

[D02.0B] D 6202

candidate oil, *n*—an oil which is intended to have the performance characteristics necessary to satisfy a specification and is tested against that specification.

[D02.0B] D 5844, D 5862, D 5966

candle pitch, *n*—a dark brown-to-black, tarry or solid, by-product residue from soap and candle stock manufacture, refining of vegetable oils, refining of wool grease, or refining of refuse animal fats.

[D02.0G] D 128

carbon residue, *n*—the residue formed by evaporation and thermal degradation of a carbon-containing material.

carbon residue, *n*—*in petroleum products*, the part remaining after a sample has been subjected to thermal decomposition.

DISCUSSION—The amount of residue is dependent on the test conditions of evaporation and pyrolysis. The term may be misleading here in that the residue may contain other than carbon decomposition products. However, the term is retained due to its wide common usage.

[D02.06] D 4530

category, *n*—*in engine oils*, a designation such as SH, SJ, CF-4, CF, CF-2, CG-4, Energy Conserving, and so forth for a given level of performance in specified engine tests.

[D02.0B] D 4485

cetane index, *n*—an approximation of the cetane number (the ignition performance) of distillate diesel fuel, which does not contain a cetane improver additive, calculated from the density and the mid-boiling point temperature (see also **diesel index**).

cetane number, *cn* *n*—a measure of the ignition performance of a diesel fuel obtained by comparing it to reference fuels in a standardized engine test.

classification, *n*—*in engine oils*, the systematic arrangement into categories according to different levels of performance in specified engine tests.

[D02.0B] D 4485

clogging, *n*—the restriction of a flow path due to the accumulation of material along the flow path boundaries.

[D02.0B] D 5533, D 5844

cloud point, *n*—*in petroleum products*, the temperature of a liquid specimen, when a wax crystal structure, that is similar in appearance to a cloud, is formed upon cooling under prescribed conditions.

DISCUSSION—The cloud point appears when the temperature of the specimen is low enough to cause wax crystals to precipitate. In homogeneous liquids, the cloud is always noted first at the location in the specimen where the specimen temperature is the lowest. This is typically at the lower portion of the test jar when using the apparatus described in Test Method D 2500.

[D02.07] D 5771, D 5772, D 5773

coagulate, *v*—to cause to become viscous or thickened into a coherent mass.

[D02.06] D 893

coagulated pentane insolubles, *n*—*in used oil analysis*, separated matter that results when a coagulant is added to a

solution of used oil in pentane.

DISCUSSION—The addition of a coagulant will aid in separating finely divided materials that may have been held in suspension because of the dispersant characteristics of the oil.

[D02.06] D 893

coagulated toluene insolubles, *n*—*in used oil analysis*, coagulated and separated matter not soluble in pentane or toluene.

[D02.06] D 893

coefficient of friction, μ or f , *n*—*in tribology*, the dimensionless ratio of the friction force (F) between two bodies to the normal force (N) pressing these two bodies together.

$$\mu \text{ or } f = (F/N) \quad (3)$$

DISCUSSION—A distinction is often made between *static coefficient of friction* and *kinetic coefficient of friction*.

[D02.0L] D 2714

cold sticking, *n*—*of piston rings*, a condition in which the ring is free in its groove while the engine is running but stuck when the piston is cold, normally indicated by the absence of varnish or other deposits on the outer face of the ring and of signs of blowby on the piston skirt.

[D02.0B] D 4857

cold-stuck piston ring, *n*—*in internal combustion engines*, one that is stuck when the piston and ring are at room temperature, but inspection indicates that it was free during engine operation.

DISCUSSION—A cold-stuck piston ring cannot be moved with moderate finger pressure. It is characterized by a polished face over its entire circumference, indicating essentially no blowby passed over the outside of the ring during engine operation.

[D02.0B] D 5302

combustion chamber, *n*—*in reciprocating internal combustion engines*, the volume bounded by the piston crown and any portion of the cylinder walls extending above the piston crown when in the top dead center position, and the inner surface of the cylinder head including any spark plugs and other inserted components.

[D02.0B] D 4857, D 4858

congealing point, *n*—that temperature at which molten petroleum wax ceases to flow, when allowed to cool under prescribed conditions.

congealing point, *n*—*of petroleum wax*, that temperature at which molten petroleum wax, when allowed to cool under prescribed conditions, ceases to flow.

[D02.10] D 938

consistency, *n*—*of lubricating grease*, the degree of resistance to movement under stress.

DISCUSSION—The term consistency is used somewhat synonymously with penetration. Generally, consistency refers to worked penetration of a grease.

[D02.0G] D 217

corrosion, *n*—the chemical or electrochemical reaction between a material, usually a metal surface, and its environment that can produce a deterioration of the material and its properties.

[D02.0B] D 5844

cracked gases, *n*—hydrocarbon gases that contain unsaturates.

[D02.04] D 2650

crude oil, *n*—(*Syn. crude petroleum, crude*) a naturally occurring hydrocarbon mixture, generally in a liquid state, which may also include compounds of sulfur, nitrogen, oxygen, metals, and other elements.

cup grease, *n*—any lubricating grease having physical properties, such as consistency and texture, suitable for use in

spring-loaded or screw-type lubricating cups.

DISCUSSION—Cup greases are predominantly NLGI No. 3 or 4 calcium greases, but grease types other than calcium are also used.

[D02.0G] D 128

debris, *n*—*in internal combustion engines*, solid contaminant materials unintentionally introduced into the engine or resulting from wear.

[D02.0B] D 5533, D 5862

debutanization, *n*—*of crude oil*, the removal of the light hydrocarbons up to and including *n*-butane, and retention of the heavier hydrocarbons.

degreas (wool fat, wool grease, wool wax), *n*—a fat-like material comprised primarily of sterols, other higher alcohols, and fatty acids, obtained from the solvent extraction of sheep's wool.

[D02.0G] D 128

degree of thickening (DT), *n*—the ratio of an oil's viscosity with an additive to that oil's viscosity without the additive. A measure of the amount by which an additive increases the base fluid viscosity.

[D02.07] D 6022

demulsibility, *n*—*in petroleum products*, the ability of a mixture of liquids (usually hydrocarbons and water) to separate into its components after the mixture has been vigorously agitated.

density, *n*—mass per unit volume at a specified temperature.

[D02.04] D 4052

determination, *n*—the process of carrying out the series of operations specified in the test method whereby a single value is obtained.

[D02.94] D 3244

diesel fuel oil, *n*—any petroleum liquid suitable for the generation of power by combustion in compression ignition (diesel) engines.

DISCUSSION—Different grades are characterized primarily by viscosity ranges and by minimum cetane numbers.

diesel index, *n*—an approximation of the cetane number (the ignition performance) of diesel fuel, calculated from the density and the aniline point. (No longer widely used for distillate fuels but applicable to some blended distillate residual fuels (see also **cetane index**).)

diffuser, *n*—*for gas*, a device for dispersing gas into a fluid.

DISCUSSION—In this test method the diffuser may be made of either metallic or non-metallic materials.

[D02.06] D 892

dilution factor, f, *n*—the ratio of the volume of a diluted solution to the volume of the original solution containing the same quantity of solute as the diluted solution.

dispersant, *n*—*in engine oil*, an additive that reduces deposits on oil-wetted engine surfaces primarily through suspension of particles.

dispute, *n*—when there is a question as to product quality because a test value obtained falls outside the acceptance limit.

[D02.94] D 3244

distillation residue, *n*—that portion of the sample remaining after distillation using specified procedures.

[D02.06] D 1093

distillation pressure, *n*—the pressure measured as close as possible to the point where the vapor temperature is taken, normally at the top of the condenser.

distillation temperature, *n*—(Syn. *head temperature*, *vapor*

temperature), *in column distillation*, the temperature of the saturated vapor measured just above the top of the fractionating column.

drain and dry mode, *n*—the effect from being sprayed, dipped, or brushed with a fluid lubricant and the excess material draining from the surface leaving behind a thin film that remains wet and must act as a lubricant on its own, without benefit of recirculation or continuous supply.

[D02.0L] D 5620

drop melting point of petroleum wax, *n*—the temperature at which material becomes sufficiently fluid to drop from the thermometer used in making the determination under definite prescribed conditions.

[D02.10] D 127

dropping point, *n*—a numerical value assigned to a grease composition representing the corrected temperature at which the first drop of material falls from the test cup and reaches the bottom of the test tube.

DISCUSSION—In the normal and proper operation of this test method, the observed dropping point is corrected by adding to it a value representing one third of the difference between the oven block temperature and the observed dropping point temperature. This corrected value is recorded as the dropping point of the grease.

[D02.0G] D 2265

dry point, *n*—*in batch distillation*, the temperature observed at the instant the last drop of liquid evaporates from the lowest point in the flask.

dry solid film lubricants, *n*—dry coatings consisting of lubricating powders in a solid matrix bonded to one or both surfaces to be lubricated.

[D02.06L] D 2510

dynamic hold-up, *n*—*in column distillation*, the quantity of liquid held up in the column under normal operating conditions.

ecotoxicity, *n*—the propensity of a material to produce adverse behavioral, biochemical, or physiological effects in non-human organisms or populations.

[D02.0N] D 6046

effect load XX (ELXX), *n*—a statistically or graphically estimated loading rate of test material that is expected to cause one or more specified effects in XX % of a group of organisms under specified conditions for a specified time.

DISCUSSION—This terminology should be used for hydraulic fluids instead of the standard effect concentration (ECXX) when the hydraulic fluid is not completely soluble under test conditions.

[D02.0N] D 6046

elastomer, *n*—a natural or synthetic polymer having the property of substantially recovering its size and shape after removal of a deforming force.

elastomer, *n*—a natural or synthetic polymer having the rubber-like property of substantially recovering its size and shape after removal of a deforming force.

[D02.0G] D 4289

emulsion, *n*—a suspension of fine particles or globules, or both, of one or more liquids in another liquid.

[D02.03] D 5761

engine oil, *n*—a liquid that reduces friction or wear, or both, between the moving parts within an engine; removes heat, particularly from the underside of pistons; and serves as a combustion gas sealant for piston rings.