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An American National Standard

Standard Terminology Relating to Petroleum, Petroleum Products, and Lubricants[1]

This standard is issued under the fixed designation D 4175; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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

ε[1] NOTE—Terms were added editorially in October 2003.

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. Some abbreviations, acronyms and symbols are included in the list.

abrasion, *n*—wear by displacement of material caused by hard particles or hard protuberances. **D 4998**

abrasive wear—wear due to hard particles or hard protuberances forced against and moving along a solid surface. **D 5182**

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. **D 4174**

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

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

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. **D 2008**

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

$$a = Af/bc$$

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.

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. **D 3244**

accepted reference value, *n*—a value that serves as an agreed-upon reference for comparison and that is derived as (*1*) a theoretical or established value, based on scientific principles, (*2*) an assigned value, based on experimental work of some national or international organization, such as the U.S. National Institute of Standards and Technology (NIST), or (*3*) a consensus value, based on collaborative experimental work under the auspices of a scientific or engineering group. **D 6299, [E11] E 456, E 177**

accuracy, *n*—the closeness of agreement between a test result and an accepted reference value. **D 6792**

acid number, *n*—the quantity of base, expressed as milligrams of potassium hydroxide per gram of sample, required to titrate a sample to a specified end point.

DISCUSSION—This test method expresses the quantity of base as milligrams of potassium hydroxide per gram of sample, that is required to titrate a sample in the solvent from its initial meter reading in millivolts to a meter reading in millivolts corresponding to a freshly prepared non-aqueous basic buffer solution or a well-defined inflection

[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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point as specified in the test method.

DISCUSSION—This test method provides additional information. The quantity of base, expressed as milligrams of potassium hydroxide per gram of sample, required to titrate a sample in the solvent from its initial meter reading in millivolts to a meter reading in millivolts corresponding to a freshly prepared nonaqueous acidic buffer solution or a well-defined inflection point as specified in the test method shall be reported as the *strong acid number.*

DISCUSSION—The causes and effects of the so-called strong acids and the causes and effects of the other acids can be very significantly different. Therefore, the user of this test method shall differentiate and report the two, when they are found. **D 664**

acid number, *n*—the quantity of base, expressed in milligrams of potassium hydroxide per gram of sample that is required to titrate a sample to a specified end point. **D 974, D 3339, D 5770**

DISCUSSION—In this test method, the indicator is *p*-naphtholbenzein titrated to a green/green-brown end point in a toluene-water-isopropanol solvent. **D 974**

DISCUSSION—In this test method, acids or salts with dissociation constants greater than 10^{-9}, are titrated to a green end point with *p*-naphtholbenzein indicator. **D 3339**

DISCUSSION—In this test method, the acid number is calculated from the number of drops required to produce a change in solution color from blue-green to orange, compared to the number of drops required to produce an identical color change using a reference standard. Because this is a direct comparison method, the acid number value can be reported in milligrams of potassium hydroxide per gram of sample. **D 5770**

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. **D 1093**

activated sludge, *n*—the precipitated solid matter, consisting mainly of bacteria and other aquatic microorganisms, that is produced in a domestic wastewater treatment plant; activated sludge is used primarily in secondary sewage treatment to microbially oxidized dissolved organic matter in the effluent. **D 6139**

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. **D 6046**

acute ecotoxicity, *n*—the propensity of a test material to produce adverse behavioral, biochemical or physiological effects in non-human organisms or populations in a short period, usually not constituting a substantial portion of the life span. **D 6384**

acute ecotoxicity test, *n*—a comparative ecotoxicity test in which a representative subpopulation of organisms is exposed to different treat rates of a test material and is observed for a short period, usually not constituting a substantial portion of their life span. **D 6384**

acute toxicity test, *n*—a comparative toxicity test in which a representative subpopulation of organisms is exposed to different treat rates of a test material and is observed for a short period usually not constituting a substantial portion of their life span. **D 6081**

additive, *n*—a material added to another, usually in small amounts, to impart or enhance desirable properties or to suppress undesirable properties. **D 5862, [D02.95] D 4175**

adhesive wear (scuffing), *n*—wear due to localized bonding between contacting solid surfaces leading to material transfer between the two surfaces or loss from either surface. **D 5182**

adiabaticity, *n*—the condition in which there is no significant gain or loss of heat throughout the length of the column.

DISCUSSION—When distilling a mixture of compounds as is the case of crude petroleum, there will be a normal increase in reflux ratio down the column. In the case where heat losses occur in the column, the internal reflux is abnormally greater than the reflux in the head. The opposite is true when the column gains heat, as with an overheated mantle. **D 2892**

aerobe, *n*—an organism that requires oxygen to remain metabolically active.

DISCUSSION—Aerobes use oxygen as their terminal electron acceptor in their primary energy-generating metabolic pathways. Aerobes require oxygen for survival, using *aerobic* metabolic processes to generate energy for growth and survival. **D 6469**

aerobic, *adj*—(*1*) taking place in the presence of oxygen; (*2*) living or active in the presence of oxygen. **D 6006, D 6046**

aggressiveness index (A.I.), *n*—the value computed from the sum of the pH + log alkalinity + log hardness of water sample where both alkalinity and hardness are reported as $CaCO_3$L.

DISCUSSION—As A.I. decreases, water becomes more corrosive. At A.I. $\geq$ 12, water is noncorrosive. At 10 $\leq$ A.I. < 12, water is moderately corrosive. At A.I. < 10, water is strongly corrosive. **D 6469**

air-fuel ratio, *n—in internal combustion engines*, the mass ratio of air-to-fuel in the mixture being induced into the combustion chambers. **D 5302, D 6593**

DISCUSSION—In this test method, air-fuel ratio is controlled indirectly by exhaust gas analysis for CO and O_2 contents. During Stages I and II, O_2 is the primary determinant, while CO is the primary determinant in Stage III. **D 5302**

DISCUSSION—In this test method, air-fuel ratio (AFR), is controlled by the EEC IV engine control module. **D 6593**

ampule, *n*—a glass vessel for the storage of liquid materials, possessing a long narrow neck for the purpose of providing a flame-sealed closure. **D 6596**

anaerobe, *n*—an organism that cannot grow or proliferate in the presence of oxygen.

DISCUSSION—Anaerobes use molecules other than oxygen in their primary energy-generating metabolic pathways, such as sulfate, nitrate, ketones, and other high-energy organic molecules. Although anaerobes may survive in the presence of oxygen, anaerobic growth typically occurs only in an oxygen depleted environment. **D 6469**

anaerobic, *adj*—(*1*) taking place in the absence of oxygen; (*2*) living or active in the absence of oxygen. **D 6006, D 6046**

analysis cycle time, *n*—the period of time required to properly

obtain and analyze a representative sample of the process stream material. **D 6624**

analysis of variance (ANOVA), *n*—a procedure for dividing the total variation of a set of data into two or more parts, one of which estimates the error due to selecting and testing specimens and the other part(s) possible sources of added variation. **D 6300, [D13] D 123**

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. **D 611**

ANOVA, *n*—*in statistics*, acronym for analysis of variance.

anoxic, *adj*—oxygen free. **D 6469**

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. **D 4814**

antimicrobial, *n*—see **biocide**. **D 6469**

API—abbreviation for American Petroleum Institute.

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

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

D 287

apparent viscosity, *n*—*of a lubricating grease*, the ratio of shear stress to shear rate calculated from Poiseuille's equation, and is measured in poises (see 10.1). **D 1092**

apparent viscosity, *n*—the determined viscosity obtained by use of this test method. **D 3829**

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. **D 128**

asphaltenes, *n*—wax-free organic material insoluble in heptane, but soluble in hot toluene (benzene).

DISCUSSION—Benzene is included in this definition solely on the basis of its classical references in the definition of asphaltenes. The precision of this test method when using toluene has been found to be the same as when using benzene. **D 6560**

assignable cause, *n*—a factor that contributes to variation and that is feasible to detect and identify. **D 6299, [E11] E 456**

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. **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. **D 6045**

ASTM supercharge octane number of a fuel below 100, *n*—the whole number nearest the percentage by volume of *iso*octane (equals 100) in a blend with *n*-heptane (equals 0) that matches the knock characteristics of the fuel when compared by this test method. **D 909**

ASTM supercharge rating of a fuel above 100, *n*—the amount of tetraethyllead (TEL) in *iso*octane, expressed in millilitres per U.S. gallon. **D 909**

ATV—*in statistics*, abbreviation for assigned test value.

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. **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. **D 4693**

aviation gasoline, *n*—gasoline possessing specific properties suitable for fueling aircraft powered by reciprocating spark ignition engines.

DISCUSSION—Principal properties include volatility limits, stability, detonation-free performance in the engine for which it is intended and suitability for low temperature performance. **D 910**

bacterium (pl. bacteria), *n*—a single cell microorganism characterized by the absence of defined intracellular membranes that define all higher life forms.

DISCUSSION—All bacteria are members of the biological diverse kingdoms *Prokaryota* and *Archaebacteriota*. Individual taxa within these kingdoms are able to thrive in environments ranging from sub-zero temperatures, such as in frozen foods and polar ice, to superheated waters in deep-sea thermal vents, and over the pH range < 2.0 to > 13.0. Potential food sources range from single carbon molecules (carbon dioxide and methane) to complex polymers, including plastics. Oxygen requirements range from obligate anaerobes, which die on contact with oxygen, to obligate aerobes, which die if oxygen pressure falls below a species specific threshold. **D 6469**

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 *iso*octane 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. **D 5984**

base number, *n*—the quantity of acid, expressed in milligrams of potassium hydroxide per gram of sample that is required to titrate a sample to a specified end point. **D 974, D 4739**

DISCUSSION—In this test method, the indicator is *p*-naphtholbenzein titrated to an orange end point in a toluene-water-isopropanol solvent. **D 974**

DISCUSSION—In this test method, the sample is titrated to a meter reading corresponding to a freshly prepared nonaqueous acidic buffer solution. **D 4739**

base oil, *n*—a base stock or a blend of two or more base stocks

used to produce finished lubricants, usually in combination with additives. **D 6074**

base stock, *n*—a hydrocarbon lubricant component, other than an additive, that is produced by a single manufacturer to the same specifications (independent of feed source or manufacturer's location), and that is identified by a unique formula number or product identification number, or both. **D 6074**

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. **D 1093**

basis weight of paper, *n*—basis weight is expressed in grams per square metre. In countries where the metric system is not universal, basis weight is also expressed in pounds per ream.

DISCUSSION—For factors to convert basis weight in grams per square metre to other commercial terms, see Test Method D 646. **D 2423**

bias, *n*—the difference between the population mean of the test results and an accepted reference value. **D 6300, [E11] E 456**

bias, *n*—a systematic error that contributes to the difference between a population mean of the measurements or test results and an accepted reference or true value. **D 6299, [E11] E 177, E 456**

bias, relative, *n*—the difference between the population mean of the test results and an accepted reference value, which is the agreed upon value obtained using an accepted reference method for measuring the same property. **D 6300**

bioburden, *n*—the level of microbial contamination (*biomass*) in a system.

DISCUSSION—Typically, bioburden is defined in terms of either biomass or numbers of cells per unit volume or mass or surface area material tested (g biomass / mL; g biomass / g; cells / mL sample, and so forth). The specific parameter used to define bioburden depends on critical properties of the system evaluated and the investigator's preferences. **D 6469**

biocide, *n*—a poisonous substance that can kill living organisms.

DISCUSSION—Biocides are further classified as bactericides (kill bacteria), fungicides (kill fungi), and microbiocides (kill both bacteria and fungi). They are also referred to as *antimicrobials*. **D 6469**

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

DISCUSSION—Biodegradation is only one mechanism by which materials are removed from the environment. **D 6046**

biodegradation, *n*—the process of chemical breakdown or transformation of a substance caused by organisms or their enzymes. **D 5864**

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

DISCUSSION—Biodegradation is only one mechanism by which materials are transformed in the environment. **D 6006**

biodeterioration, *n*—the loss of commercial value or performance characteristics, or both, of a product (fuel) or material (fuel system) through biological processes. **D 6469**

biodiesel (B-100), *n*—fuel comprised of mono-alkyl esters of long chain fatty acids derived from vegetable oils or animal fats. **D 6584**

biofilm, *n*—a film or layer of microorganisms, biopolymers, water, and entrained organic and inorganic debris that forms as a result of microbial growth and proliferation at phase interfaces (liquid-liquid, liquid-solid, liquid-gas, and so forth). (Synonym—**skinnogen**.) **D 6469**

biomass, *n*—any material, excluding fossil fuels, which is or was a living organism or component of a living organism. **D 5864**

biomass, *n*—density of biological material per unit sample volume, area, or mass (g biomass / g (or / mL or / cm^2) sample). **D 6469**

biosurfactant, *n*—a biologically produced molecule that acts as a soap or detergent. **D 6469**

black oil, *n*—lubricant containing asphaltic materials. Black oils are used in heavy-duty equipment applications, such as mining and quarrying, where extra adhesiveness is desired. **D 97**

blank, *n*—*in biodegradability testing*, a test system containing all system components with the exception of the test substance. **D 6006**

bleed (bleeding), *n*—*of lubricating greases*, the separation of a liquid lubricant from a lubricating grease for any cause. **D 6185**

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. **D 5844**

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

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

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

DISCUSSION—It is expressed in millilitres of liquid per hour for a given column or in millilitres per hour per square centimetre of cross-sectional area for comparative purposes. In the latter case, it refers to the test mixture of *n*-heptane and methylcyclohexane in the efficiency evaluation (see Annex A1) and is measured at the bottom of the column. The maximum boilup of the *n*-heptane-methylcyclohexane test mixture is that which the column can handle under stable conditions without flooding. In routine adiabatic operation, the boilup rate can be estimated roughly from the takeoff rate multiplied by the reflux ratio plus one. **D 2892**

bond, *v*—to connect two parts of a system electrically by means of a conductive wire to eliminate voltage differences. **D 6217**

bonded glycerin, *n*—is the glycerin portion of the mono-, di-, and triglyceride molecules. **D 6584**

borderline pumping temperature, *n*—the lowest temperature

at which the critical yield stress or critical viscosity that allows a fluid to be pumped occurs.

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, that are uncharacteristic of the given tribological system's long term behavior. (Synonym—*run-in, wear-in*.) **D 6425, [G02] G 40**

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 behavior. **D 5706, D 5707, [G02] G 40**

bromine index, *n*—the number of milligrams of bromine that will react with 100 g of sample under the conditions of the test. **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. **D 5533, D 5966**

bulk sample, *n*—a large sample, either from one place or made up of several incremental samples of the same material. **D 4296**

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. **D 2779**

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. **D 3827**

burn, *vt*—*in emission spectroscopy*, to vaporize and excite a specimen with sufficient energy to generate spectral radiation. **D 6595**

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. **D 6448, D 6823**

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. **D 5003**

calcined petroleum coke, *n*—green petroleum coke which has been thermally treated to drive off the volatile matter and to develop crystalline structure. **D 2638**

calcined petroleum coke, *n*—raw petroleum coke that has been thermally treated to drive off the volatile matter and to develop crystalline structure. **D 6376**

calibrate, *v*—to determine the indication or output of a measuring device with respect to that of a standard. **D 5533, D 5862, D 5966, D 5967**

calibrated test stand, *n*—a test stand on which the testing of reference material(s), conducted as specified in the standard, provided acceptable test results.

DISCUSSION—In several automotive lubricant standard test methods, the ASTM Test Monitoring Center provides testing guidance and determines acceptability. **D 6681**

calibration, *n*—the act of determining the indication or output of a measuring device or a given engine with respect to a standard. **D 6202**

calibration, *n*—the determination of the values of the significant parameters by comparison with values indicated by a set of reference standards. **D 6595**

calibration curve, *n*—the graphical or mathematical representation of a relationship between the assigned (known) values of standards and the measured responses from the measurement system. **D 6595**

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. **D 6202**

calibration standard, *n*—a standard having an accepted value (reference value) for use in calibrating a measurement instrument or system. **D 6595**

candidate oil, *n*—an oil that is intended to have the performance characteristics necessary to satisfy a specification and is to be tested against that specification. **D 6618, D 6681**

DISCUSSION—These oils are mainly submitted for testing as *candidates* to satisfy a specified performance; hence the designation of the term. **D 6681**

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. **D 128**

carbon, *n*—*in manual transmissions and final drive axles*, a hard, dry, generally black or gray deposit that can be removed by solvents but not by wiping with a cloth. **D 5704**

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. **D 4530**

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

DISCUSSION—The residue is not composed entirely of carbon but is a coke that can be further changed by carbon pyrolysis. The term carbon residue is retained in deference to its wide common usage. **D 189, D 524**

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

DISCUSSION—In the context of this method, ignition performance is understood to mean the ignition delay of the fuel as determined in a standard test engine under controlled conditions of fuel flow rate, injection timing and compression ratio. **D 613**

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.

Check Fuel, *n—for quality control testing*, a spark-ignition engine fuel of selected characteristics having an octane number accepted reference value ($O.N._{ARV}$) determined by round-robin testing under reproducibility conditions. **D 2699, D 2700**

chronic ecotoxicity test, *n*—a comparative ecotoxicity test in which a representative subpopulation of organisms is exposed to different treat rates of a test material and is observed for a period of time which constitutes a major portion of their life span. **D 6384**

chronic toxicity test, *n*—a comparative toxicity test in which a representative subpopulation of organisms are exposed to different treat rates of a test material and is observed for a period of time which constitutes a major portion of their life span. **D 6081**

CIE, *n*—the abbreviation for the French title of the International Commission on Illumination, or Commission Internationale de l'Eclairage. **D 6045, [E12] E 284**

CIE Standard Illuminant C, *n*—Colorimetric illuminant, representing daylight with a correlated color temperature of 6774 K, defined by the CIE in terms of a relative spectral power distribution. **D 6045, [E12] E 284**

CIE 1931 standard observer, *n*—ideal colorimetric observer with color matching functions $x(\lambda)$, $y(\lambda)$, $z(\lambda)$ corresponding to a field of view subtending a 2° angle on the retina; commonly called the "2° Standard Observer." **D 6045, [E12] E 284**

C.L.A., *n*—in measuring surface finish, the arithmetic average of the absolute distances of all profile points from the mean line for a given distance. **D 6425**

classification, *n—in engine oils*, the systematic arrangement into categories in accordance with different levels of performance in specified engine tests. **D 4485**

clogging, *n*—the restriction of a flow path due to the accumulation of material along the flow path boundaries. **D 5533, D 5844**

closeness sum of squares (CSS), *n*—a statistic used to quantify the degree of agreement between the results from two test methods after bias-correction using the methodology of this practice. **D 6708**

cloud point, *n—in petroleum products and biodiesel fuels*, the temperature of a liquid specimen when the smallest observable cluster of wax crystals first appears 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. **D 5771**

cloud point, *n—in petroleum products and biodiesel fuels*, 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. **D 5772, D 5773**

coagulate, *v*—to cause to become viscous or thickened into a coherent mass. **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. **D 893**

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

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

DISCUSSION—A distinction is often made between *static coefficient of friction* and *kinetic coefficient of friction.* **D 2714**

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

$$\mu = (F_f/F_n)$$

D 6425, [G02] G 40

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. **D 4857**

cold-stuck piston ring, *n—in internal combustion engines*, a piston ring that is stuck when the piston and ring are at room temperature, but inspection shows 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 ring-face during engine operation. **D 6593**

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. **D 4857, D 4858**

compensation line, *n*—a line of plot on log-log paper where the coordinates are scar diameter in millimetres and applied load in kilograms-force (or newtons) obtained under dynamic conditions.

DISCUSSION—Shown in Fig. 1 as line ABE. **D 2596**

compensation scar diameter, *n*—the average diameter, in millimetres, of the wear scar on the stationary balls caused by the rotating ball under an applied load in the presence of a lubricant, but without causing either seizure or welding. **D 2596, [D02.L0] D 2783**

composite sample—a thoroughly mixed gross sample. **D 4296**

compression ratio, *n*—the ratio of the volume of the combustion chamber including the precombustion chamber with the piston at bottom dead center to the comparable volume with the piston at top dead center. **D 613**

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. **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. **D 217**

consortium (pl. consortia), *n*—microbial community comprised of more than one, species that exhibits properties not shown by individual community members.

DISCUSSION—Consortia often mediate biodeterioration processes that individual taxa cannot. **D 6469**

control limits, *n*—limits on a control chart that are used as criteria for signaling the need for action or for judging whether a set of data does or does not indicate a state of statistical control. **D 6299, [E11] E 456**

corrected load, *n*—the load in kilograms-force (or newtons) for each run obtained by multiplying the applied load by the ratio of the Hertz scar diameter to the measured scar diameter at that load. **D 2783**

corrected load, *n*—the load in kilograms-force (or newtons) obtained by multiplying the applied load by the ratio of the Hertz scar diameter to the measured scar diameter at that load.

DISCUSSION—In this test method, the corrected load is calculated for each run. **D 2596**

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. **D 5844**

cracked gases, *n*—hydrocarbon gases that contain unsaturates. **D 2650**

critical parts, *n*—those components used in the test that are known to affect test severity. **D 6709**

cross-method reproducibility (R_{XY}), *n*—a quantitative expression of the random error associated with the difference between two results obtained by different operators using different apparatus and applying the two methods *X* and *Y*, respectively, each obtaining a single result on an identical test sample, when the methods have been assessed and an appropriate bias-correction has been applied in accordance with this practice; it is defined as the 95 % confidence limit for the difference between two such single and independent results.

DISCUSSION—A statement of cross-method reproducibility must include a description of any bias correction used in accordance with this practice.

DISCUSSION—Cross-method reproducibility is a meaningful concept only if there are no statistically observable sample-specific relative biases between the two methods, or if such biases vary from one sample to another in such a way that they may be considered random effects. (see 6.7.) **D 6708**

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

cup grease, *n*—any lubricating grease having physical properties, such as consistency and texture, suitable for its 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. **D 128**

cylinder height, *n—for the CFR engine*, the relative vertical position of the engine cylinder with respect to the piston at top dead center (tdc) or the top machined surface of the crankcase. **D 2699, D 2700**

cylinder stock, *n*—lubricant for independently lubricated engine cylinders, such as those of steam engines and air compressors. Cylinder stock are also used for lubrication of valves and other elements in the cylinder area. **D 97**

debris, *n—in internal combustion engines*, solid contaminant materials unintentionally introduced into the engine or resulting from wear. **D 5302, D 5862, D 6593**

DISCUSSION—Examples include such things as gasket material, silicone sealer, towel threads, and metal particles. **D 5302, D 6593**

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

DISCUSSION—In practice, a crude petroleum is regarded as debutanized if the light hydrocarbon cut collected in the cold trap contains more than 95 % of the C_2 to C_4 hydrocarbons and less than 5 % of the C_5 hydrocarbons initially present in the sample. **D 2892**

degras (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. **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. **D 6022**

degrees of freedom, *n*—the divisor used in the calculation of variance.

DISCUSSION—This definition applies strictly only in the simplest cases. Complete definitions are beyond the scope of this practice. **D 6300, [ISO/TC 28] ISO 4259**

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.

denaturants, *n*—natural gasoline, gasoline components, unleaded gasoline, or toxic or noxious materials added to fuel ethanol to make it unsuitable for beverage use but not unsuitable for automotive fuel use. **D 6423**

denatured fuel ethanol, *n*—fuel ethanol made unfit for beverage use by the addition of denaturants. **D 6423**

density, *n*—mass per unit volume at a specified temperature. **D 4052**

density—the weight in vacuo, (that is, the mass) of a unit volume of the material at any given temperature. **D 1217**

depacifying, *adj*—the process of removing hydrogen ions (protons) from the cathodic surface of an electrolytic cell, thereby promoting continued electrolytic corrosion. **D 6469**

deplasticize, *v*—the process of breaking down polymers in plastics and similar materials, resulting in loss of the material's structural integrity. **D 6469**

determinability, *n*—a quantitative measure of the variability associated with the same operator in a given laboratory obtaining successive determined values using the same apparatus for a series of operations leading to a single result; it is defined as that difference between two such single determined values as would be exceeded in the long run in only one case in 20 in the normal and correct operation of the test method.

DISCUSSION—This definition implies that two determined values, obtained under determinability conditions, which differ by more than the determinability value should be considered suspect. If an operator obtains more than two determinations, then it would usually be satisfactory to check the most discordant determination against the mean of the remainder, using determinability as the critical difference. **D 6300**

determination, *n*—the process of carrying out the series of operations specified in the test method whereby a single value is obtained. **D 3244**

detonation meter, *n—for knock testing*, the signal conditioning instrumentation that accepts the electrical signal from the detonation pickup and provides an output signal for display. **D 2699, D 2700**

detonation pickup, *n—for knock testing*, a magnetostrictive-type transducer that threads into the engine cylinder and is exposed to combustion chamber pressure to provide an electrical signal that is proportional to the rate-of-change of cylinder pressure. **D 2699, D 2700**

developer, *n—of an ASTM test method*, the assigned ASTM group, working under the supervision of its governing subcommittee and main committee, that formats the test method in accordance with the Form and Style for ASTM Standards, and continually refines the test method. **D 6594**

developer, *n—of a test procedure*, an individual or organization that selects the test apparatus and operating conditions. **D 6594**

dial indicator reading, *n—for the CFR engine*, a numerical indication of cylinder height, in thousandths of an inch, indexed to a basic setting at a prescribed compression pressure when the engine is motored. **D 2699, D 2700**

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. **D 892**

diffuser, *n—for gas*, a device for dispersing gas into a liquid. (Test Method D 892).

DISCUSSION—Although diffusers can be made of either metallic or non-metallic materials, in this test method the diffuser is sintered stainless steel. **D 6082**

digital counter reading, *n—for the CFR engine*, a numerical indication of cylinder height, indexed to a basic setting at a prescribed compression pressure when the engine is motored. **D 2699, D 2700**

dilution factor, f, *n*—the proportion of solvent increase made to reduce the concentration and thus the absorbance of a solute, expressed by the ratio of the volume of the diluted solution to the volume of original solution containing the same quantity of solute as the diluted solution. **D 2008**

DIN—abbreviation for Deutsches Institut für Normung (the German Standards Body).

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. **D 3244**

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. **D 2892**

distillation residue, *n*—that portion of the sample remaining after distillation using specified procedures. **D 1093**

distillation temperature, *n—in column distillation*, the temperature of the saturated vapor measured just above the top

of the fractionating column. (Synonym—*head temperature, vapor temperature*.)

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. **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. **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. **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. **D 2510**

DT—*in viscometry*, abbreviation for degree of thickening.

dynamic, *adj—in petroleum products*—the condition where the vapor above the test specimen and the test specimen are not in temperature equilibrium at the time that the ignition source is applied.

DISCUSSION—This is primarily caused by the heating of the test specimen at the constant prescribed rate with the vapor temperature lagging behind the test specimen temperature. **D 92, D 93**

dynamic fuel level, *n—for knock testing*, test procedure in which the fuel-air ratio for maximum knock intensity for sample and reference fuels is determined using the falling level technique that changes carburetor fuel level from a high or rich mixture condition to a low or lean mixture condition, at a constant rate, causing knock intensity to rise to a maximum and then decrease, thus permitting observation of the maximum knockmeter reading. **D 2699, D 2700**

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

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

DISCUSSION—It is expressed as a percentage of the packed volume for packed columns so that the data can be compared. For real plate columns, it is expressed in millilitres per plate. The data can only be compared with others of the same diameter because of different tray spacing. Data for packed columns cannot be compared with those of real plate columns except in absolute units of millilitres per theoretical plate (see Table 1). Dynamic hold-up increases with increasing distillation rate up to the flood point and varies from one kind of fractionator to another. **D 2892**

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

DISCUSSION—This terminology should be used instead of the standard ECXX when the test material is not completely soluble at the test treat rates. **D 6081**

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. **D 4289**

electrical resistivity, *n*—the electrical resistance offered by a material to the flow of current, times the cross-sectional area of current flow and per unit length of current path, the reciprocal of conductivity. It is also known as resistivity, or specific resistance. **D 6120**

emission spectroscopy, *n*—measurement of energy spectrum emitted by or from an object under some form of energetic stimulation; for example, light, electrical discharge, and so forth. **D 6595**

emulsion, *n*—a suspension of fine particles or globules, or both, of one or more liquids in another liquid. **D 5761**

engine motor octane requirement, *n*—one full motor octane number greater than the maximum motor octane number that results in knock (graphic knock level descriptions can be seen in Annex A1). For example, a test engine knocks on primary reference fuels with 96 and 97 motor octane numbers. The test engine does not knock on a primary reference fuel with a 98 motor octane number. The maximum motor octane number that results in knock is 97, so the motor octane requirement is 98. **D 6424**

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.

DISCUSSION—It may contain additives to enhance certain properties. Inhibition of engine rusting, deposit formation, valve train wear, oil oxidation, and foaming are examples. **D 5862, D 5966**

entrained air (or gas), *n—in liquids*, a two-phase mixture of air (or gas) dispersed in a liquid in which the liquid is the major component on a volumetric basis.

DISCUSSION—The air (or gas) is in the form of discrete bubbles of about 10 to 1000 µm in diameter. The bubbles are not uniformly dispersed. In time, they rise to the surface to coalesce to form larger bubbles which break or form foam. Subsurface coalescence can also occur, in which case, the bubbles will rise more rapidly. **D 6082**

environmental compartment, *n*—a subdivision of the environment based on physical or chemical properties, or both. **D 6006, D 6384**

DISCUSSION—Examples of environmental compartments are aerobic fresh water, aerobic marine and aerobic soil. The results of test procedures may be applied to environmental compartments but the test systems do not constitute an environmental compartment. **D 6006**

DISCUSSION—Examples of environmental compartments are aerobic fresh water, aerobic marine, aerobic soil, and anaerobic media. The results of test procedures may be applied to environmental compartments, but the test systems do not constitute an environmental compartment. **D 6384**

EP—*in tribology*, abbreviation for extreme pressure.

EP lubricating oil, *n*—a liquid lubricant containing an extreme pressure (EP) additive. **D 6425**

equilibrium, *n—in petroleum products*—the condition where the vapor above the test specimen and the test specimen are at the same temperature at the time the ignition source is applied.

DISCUSSION—This condition may not be fully achieved in practice, since the temperature may not be uniform throughout the test specimen, and the test cover and shutter on the apparatus can be cooler. **D 93**

equilibrium fuel level, *n—for knock testing*, test procedure in which the fuel-air ratio for maximum knock intensity for sample and reference fuels is determined by making incremental step changes in carburetor fuel level, observing the equilibrium knock intensity for each step and selecting the level that produces the highest knock intensity reading. **D 2699, D 2700**

equilibrium headspace, *n*—the vapor space above the liquid in which all vapor components are in equilibrium with the liquid components. **D 5705**

ethanol, *n*—ethyl alcohol, the chemical compound C_2H_5OH. **D 4806, D 6423**

ethylene product, *n*—hydrocarbon product containing at least 99.85 mass % ethylene. **D 5234**

extreme pressure (EP) additive, *n—in a lubricant*, a substance that minimizes damage to metal surfaces in contact under high stress rubbing conditions.

facultative anaerobe, *n*—a microorganism capable of growing in both oxic and anoxic environments.

DISCUSSION—Facultative anaerobes use oxygen when it is present, and use either organic or inorganic energy sources (nitrate, sulfate, and so forth) when oxygen is depleted or absent. **D 6469**

filtering, *n—in data acquisition*, a means of attenuating signals in a given frequency range. They can be mechanical (volume tank, spring, mass) or electrical (capacitance, inductance) or digital (mathematical formulas), or a combination thereof. Typically, a low-pass filter attenuates the unwanted high frequency noise. **D 6593**

final boiling point (FBP)—the point at which a cumulative volume count equal to 99.5 % of the total volume count under the chromatogram is obtained. **D 3710**

fire point, *n*—the lowest temperature at which a liquid or solid specimen will sustain burning for 5 s.

fire point, *n—in petroleum products*, the lowest temperature corrected to a barometric pressure of 101.3 kPa (760 mm Hg), at which application of an ignition source causes the vapors of a test specimen of the sample to ignite and sustain burning for a minimum of 5 s under specified conditions of test. **D 92**

firing, *n—for the CFR engine*, operation of the CFR engine with fuel and ignition. **D 2699, D 2700**

fit-for-use, *n*—a product, system, or service that is suitable for its intended use. **D 6624**

flash point—the lowest temperature corrected to a pressure of 101.3 kPa (760 mm Hg) at which application of an ignition source causes the vapors of a specimen of the sample to ignite under specified conditions of test.

DISCUSSION—The specimen is deemed to have flashed when a flame appears and instantaneously propagates itself over the entire surface of the fluid.

DISCUSSION—When the ignition source is a test flame, the application of the test flame may cause a blue halo or an enlarged flame prior to the actual flash point. This is not a flash and should be ignored. **D 56**

flash point, *n—in petroleum products*, the lowest temperature corrected to a barometric pressure of 101.3 kPa (760 mm Hg) at which application of an ignition source causes the vapors of a specimen of the sample to ignite under specified conditions of test.

DISCUSSION—The test specimen is deemed to have flashed when a flame appears and instantaneously propagates itself over the entire surface of the test specimen.

DISCUSSION—When the ignition source is a test flame, the application of the test flame may cause a blue halo or an enlarged flame prior to the actual flash point. This is not a flash point and shall be ignored. **D 92, D 93**

flash point, *n*—the lowest temperature corrected to a pressure of 101.3 kPa at which application of an ignition source causes the vapors of a specimen of the sample to ignite momentarily under specified conditions of the test.

DISCUSSION—For the purpose of this test method, the test specimen is deemed to have flashed when the hot flame of the ignited vapor causes an instantaneous pressure increase of at least 20 kPa inside the closed measuring chamber. **D 6450**

flood point, *n—(in column distillation)* the point at which the upflowing vapor flow obstructs the down-coming reflux and the column suddenly loads with liquid.

flood point, *n*—the point at which the velocity of the upflowing vapors obstructs the downcoming reflux and the column suddenly loads with liquid.

DISCUSSION—Under these conditions no vapor can reach the head and the heat to the distillation flask must be reduced to establish normal operations again. The flood point is normally determined during the efficiency evaluation of a column using the *n*-heptane-methylcyclohexane test mixture (see Annex A1). **D 2892**

flow-proportioned average property value (FPAPV), *n*—the average property value of the collected material in the tank

or vessel, calculated by using the flow-proportioned average technique described in the practice of all measurements performed on aliquots of the material while it is flowing into the tank or vessel.

DISCUSSION—The term *property* as used in this practice can be the physical, chemical, or performance property measurements as provided by on-line, at-line analyzer systems, or, can be the deviation of such measurements from a desired value.

DISCUSSION—The FPAPV can include a value contributed by material (commonly referred to as a tank heel) present in the collection tank or vessel before the start of delivery of the current process stream material. **D 6624**

fluid coke, *n*—petroleum coke with a granular, microscopic layered structure resulting from injection of petroleum feedstock into a flowing, loose bed of coke particles. **D 5003**

foam, *n—in liquids*, a collection of bubbles formed in the liquid or on (at) its surface in which the air (or gas) is the major component on a volumetric basis. **D 892**

foam, *n—in liquids*, a collection of bubbles formed in or on the surface of a liquid in which the air or gas is the major component on a volumetric basis. **D 6082**

free alkali, *n—in lubricating grease*, unreacted basic (alkaline) material present in the product.

DISCUSSION—Many greases are made with a slight excess of alkali to ensure complete saponification. Free alkali is determined by acidification of a solvent-thinned specimen and back titration with standardized, alcoholic potassium hydroxide. It is expressed in terms of the predominating alkali and a mass % of the total grease composition (for example, mass % lithium hydroxide.) **D 128**

free fatty acid, *n—in lubricating grease*, unreacted carboxcylic acid(s) present in the product.

DISCUSSION—Some greases are made with a slight excess of carboxcylic acid to ensure a non-alkaline product. Free fatty acid is determined by neutralization of a solvent-thinned specimen with standardized, alcoholic potassium hydroxide. Regardless of the actual composition of the carboxcylic acid(s), it is expressed as free oleic acid and as a mss % of the total grease composition. **D 128**

free piston ring, *n—in internal combustion engines*, a piston ring that will fall in its groove under its own weight when the piston, with the ring in a horizontal plane, is turned 90° (putting the ring in a vertical plane). **D 5862**

DISCUSSION—A slight touch to overcome static friction is permissible. **D 5302, D 6593**

freezing point, *n—in aviation fuels*, the fuel temperature at which solid hydrocarbon crystals, formed on cooling, disappear when the temperature of the fuel is allowed to rise under specified conditions of test. **D 5972**

fresh water environment, *n*—the aerobic, fresh water environmental compartment. **D 6046**

fresh water environment, *n*—the aerobic, aqueous compartment, characteristically with a salinity of less than five parts per thousand. **D 6384**

fretting wear, *n*—a form of attritive wear caused by vibratory or oscillatory motion of limited amplitude characterized by the removal of finely-divided particles from the rubbing surfaces.

DISCUSSION—Air can cause immediate local oxidation of the wear particles produced by fretting wear. In addition, environmental moisture or humidity can hydrate the oxidation product. In the case of ferrous metals, the oxidized wear debris is abrasive iron oxide (Fe_2O_3) having the appearance of rust, which gives rise to the nearly synonymous terms, fretting corrosion and friction oxidation. A related, but somewhat different phenomenon often accompanies fretting wear. False brinelling is localized fretting wear that occurs when the rolling elements of a bearing vibrate or oscillate with small amplitude while pressed against the bearing race. The mechanism proceeds in stages: (*1*) asperites weld, are torn apart, and form wear debris that is subsequently oxidized; (*2*) due to the small-amplitude motion, the oxidized detritus cannot readily escape, and being abrasive, the oxidized wear debris accelerates the wear. As a result, wear depressions are formed in the bearing race. These depressions appear similar to the Brinell depressions obtained with static overloading. Although false brinelling can occur in this test, it is not characterized as such, and instead, it is included in the determination of fretting wear.

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friction, *n*—the resistance to sliding exhibited by two surfaces in contact with each other. Basically there are two frictional properties exhibited by any surface; static friction and kinetic friction. **D 2534**

friction force, *n*—the resisting force tangential to the interface between two bodies when, under the action of an external force, one body moves or tends to move relative to the other. **D 2714**

fuel diluent, *n—in used oil analysis*, unburnt fuel components that enter the engine crankcase causing dilution of the oil.

DISCUSSION—In this test method, the fuel diluent components being determined are from gasoline. **D 322**

fuel ethanol (Ed75-Ed85), *n*—a blend of ethanol and hydrocarbons of which the ethanol portion is nominally 75 to 85 volume % denatured alcohol. **D 6423**

fuel-air ratio for maximum knock intensity, *n—for knock testing*, that proportion of fuel to air that produces the highest knock intensity for each fuel in the knock testing unit, provided this occurs within specified carburetor fuel level limits. **D 2699, D 2700**

full rich, *n*—condition in which the mixture control is at the full stop position with the fuel flow within manufacturer's recommended settings. **D 6424**

functional properties, *n*—those properties of the mineral lubricating oil that are required for satisfactory operation of the machinery. These properties are listed in Section 5. **D 4304**

fungus (pl. fungi), *n*—single cell (yeasts) or filamentous (molds) microorganisms that share the property of having the true intracellular membranes (organelles) that characterize all higher life forms (*Eukaryotes*). **D 6469**

gasoline, *n*—a volatile mixture of liquid hydrocarbons, generally containing small amounts of additives, suitable for use as a fuel in spark-ignition, internal combustion engines. **D 4806, D 4814, D 6422**

gasoline-alcohol blend, *n*—a fuel consisting primarily of gasoline along with a substantial amount (more than 0.35 mass % oxygen, or more than 0.15 mass % oxygen if methanol is the only oxygenate) of one or more alcohols. **D 4814**

gasoline-alcohol blend, *n*—a spark-ignition engine fuel consisting primarily of gasoline along with a substantial amount of one or more alcohols.

gasoline-ethanol blend, *n*—a fuel consisting primarily of gasoline along with a substantial amount (more than 0.35 mass % oxygen) of denatured fuel ethanol. **D 4806**

gasoline-ether blend, *n*—a fuel consisting primarily of gasoline along with a substantial amount (more than 0.35 mass % oxygen) of one or more ethers. **D 4814**

gasoline-ether blend, *n*—a spark-ignition engine fuel consisting primarily of gasoline along with a substantial amount of one or more ethers.

gasoline-oxygenate blend, *n*—a fuel consisting primarily of gasoline along with a substantial amount (more than 0.35 mass % oxygen, or more than 0.15 mass % oxygen if methanol is the only oxygenate) of one or more oxygenates. **D 4814**

gasoline-oxygenate blend, *n*—a spark-ignition engine fuel consisting primarily of gasoline along with a substantial amount of one or more oxygenates.

gloss retention, *n*—the percent of the original gloss retained by the specimen after aging under specified conditions. It is the final gloss divided by the initial gloss, multiplied by 100. **D 2895**

GLP—*in laboratory practice*, abbreviation for good laboratory practice.

glycol-base antifreeze, *n*—*in engine coolants*, ethylene or propylene glycol commonly used in admixture with water and additives to lower the coolant freezing point. **D 2982**

good laboratory practices (GLP), *n*—guidelines for the management of laboratory experiments which are published by regulatory agencies or other recognized groups and are concerned with the organizational process and the conditions under which laboratory studies are planned, performed, monitored, recorded, and reported.

DISCUSSION—The major GLPs used are USEPA-TSCA, USFDA, OECD, and to some extent the MITI version from Japan for submissions in Japan. **D 6046, [D02.12] D 6384**

green petroleum coke, *n*—same as raw petroleum coke; a solid, carbonaceous residue produced by thermal decomposition of heavy petroleum fractions or cracked stocks, or both. **D 6376**

gross heat of combustion, Qg (MJ/kg)**,** *n*—the quantity of energy released when a unit mass of fuel is burned in a constant volume enclosure, with the products being gaseous, other than water that is condensed to the liquid state.

DISCUSSION—The fuel can be either liquid or solid, and contain only the elements carbon, hydrogen, nitrogen, and sulfur. The products of combustion, in oxygen, are gaseous carbon dioxide, nitrogen oxides, sulfur dioxide, and liquid water. In this procedure, 25°C is the initial temperature of the fuel and the oxygen, and the final temperature of the products of combustion. **D 240**

gross sample, *n*—a large sample made up of several portions (increments) of a mass of material. **D 4296**

ground, *vt*—to connect electrically with ground (earth). **D 5452**

guide, *n*—a series of options or instructions that do not recommend a specific course of action.

DISCUSSION—Whereas a practice describes a general usage principle, a guide only suggests an approach. The purpose of a guide is to offer guidance, based on a consensus of viewpoints, but not to establish a fixed procedure. A guide is intended to increase the awareness of the user to available techniques in a given subject area and to provide information from which subsequent evaluation and standardization can be derived. **D 6074**

guide tables, *n*—*for knock testing*, the specific relationship between cylinder height (compression ratio) and octane number at standard knock intensity for specific primary reference fuel blends tested at standard or other specified barometric pressure. **D 2699, D 2700**

handling point, *n*—an indication of the minimum temperature to which an oil should be heated in any part of the suction or delivery line of an oil-handling installation when the installation is operating.

handling point, *n*—an indication of the minimum temperature to which an oil should be heated in any part of the suction or delivery line of an oil-handling installation when the installation is operating. If the storage tank does not contain an outflow heater, this temperature is necessarily the minimum oil storage temperature. **D 3245**

hardness, *n*—resistance to permanent deformation or indentation.

hardness, *n*—*of an elastomer*, the resistance to deformation or indentation.

DISCUSSION—In this test method the hardness of an elastomer is measured with a Shore Durometer A (see Test Method D 2240). **D 4289**

headspace, *n*—the unfilled capacity of an ampule that allows for physical expansion due to temperature and pressure changes of the filled material while maintaining the integrity of the package. **D 6596**

heavy distillate, *n*—a fuel produced from the distillation of crude oil which has a kinematic viscosity at 40°C between 5.5 and 24.0 mm^2/s, inclusive. **D 6021**

heavy distillate/residual fuel oil blend, *n*—a blend of heavy distillate and residual fuel oil having a viscosity at 40°C between 5.5 and 24.0 mm^2/s, inclusive. **D 6021**

heavy duty, *adj*—*in internal combustion engine operation*, characterized by average speeds, power output, and internal temperatures that are close to the potential maximums. **D 5862, D 5967**

heavy-duty engine, *n*—*in internal combustion engines*, one that is designed to allow operation continuously at or close to its peak output. **D 5862, D 5967**

Henry's Law, *n*—the principle that the mass of a gas dissolved in a liquid is proportional to the pressure of the gas above the liquid.

Henry's Law, *n*—the principle that the ratio of partial pressure to mole fraction of gas in solution is a constant.

DISCUSSION—In non-ideal systems the fugacity is used to replace the pressure, but the systems within the scope of this test method can be considered ideal within the limits of the accuracy statement. **D 2779**

Hertzian contact area, *n*—the apparent area of contact between two nonconforming solid bodies pressed against each other, as calculated from Hertz' equations of elastic deformation. **D 6425, [G02] G 40, [D02.G0] D 5706**

Hertzian contact pressure, *n*—the magnitude of the pressure at any specified location in a Hertzian contact area, as calculated from Hertz' equations of elastic deformation. **D 5706, [G02] G 40**

Hertz line, *n*—a line of plot on logarithmic paper, where the coordinates are scar diameter in millimetres and applied load in kilograms-force (or newtons), obtained under static conditions. **D 2783**

Hertz scar diameter, *n*—the average diameter, in millimetres, of an indentation caused by the deformation of the balls under static load (prior to test). It may be calculated from the equation

$$D_h = 8.73 \times 10^{-2} (P)^{1/3}$$

where:
D_h = Hertz diameter of the contact area, and
P = the static applied load.

D 2783

homogeneity—the uniformity of the characteristics of the packaged material across the entire packaging run determined for the purpose of demonstrating the suitability of the batch for its intended purpose.

DISCUSSION—There are two homogeneity testing cases; one in which the material is ampulized as a reference material at the time of ampulization, and one in which the material is not.

(*1*) *reference material at time of ampulization*—The material to be ampulized is a reference material that has accepted true or consensus values. Ampulization of a reference material would require homogeneity testing in order to assess the variability caused by the ampulization process on the true or consensus values for the reference material.

(*2*) *not a reference material at time of ampulization*—The material to be ampulized is *not* a reference material at the time of ampulization but is intended to have characterization and assignment of true or consensus values at some future date. Rigid homogeneity testing is not required on such a material at the time of ampulization since the true or consensus values have not yet been determined. However, ampules must be retained at the beginning, middle, and end of the ampulization process. It is recommended that qualitative testing be done on at least one sample from each of the beginning, middle, and end of the ampulization process. The remaining ampules should then be retained for future homogeneity testing to determine quantitative or consensus values. **D 6596**

hot-flame reaction, *n*—a rapid, self-sustaining, luminous, sometimes audible, reaction of the sample or its decomposition products with the atmosphere.

hot sticking, *n—of piston rings*, a condition in which the ring is stuck in its groove while the engine is running, normally indicated by varnish or other deposits on the outer face of the ring, by signs of blowby on the piston skirt, or both. **D 4857**

hot-stuck piston ring, *n—in internal combustion engines*, a piston ring that is stuck when the piston and ring are at room temperature, and inspection shows that it was stuck during engine operation.

DISCUSSION—The portion of the ring that is stuck cannot be moved with moderate finger pressure. A hot-stuck ring is characterized by varnish or carbon across some portion of its face, indicating that portion of the ring was not contacting the cylinder wall during engine operation. **D 5302**

hot tack, *n*—the cohesive strength during the cooling stage before solidification of a heat seal bond formed by a wax-polymer blend. **D 3706**

house fuel, *n—for octane rating*, an unleaded, straight hydrocarbon fuel used for engine warm-up and all non-octane rating testing. **D 6424**

hydraulic fluid, *n*—liquid used in hydraulic systems for transmitting power. **D 6080**

hydrolytic stability, *n*—the resistance of a material to permanent changes in properties due to reaction with water.

ignition delay, *n*—that period of time, expressed in degrees of crank angle rotation, between the start of fuel injection and the start of combustion. **D 613**

immediate seizure region, *n*—that region of the scar-load curve characterized by seizure or welding at the startup or by large wear scars.

DISCUSSION—Under conditions of this test method, the immediate seizure region is shown by line CD. Also, initial deflection of indicating pen on the optional friction-measuring device is larger than with nonseizure loads. **D 2596**

incipient seizure or initial seizure region, *n*—that region at which, with an applied load, there is a momentary breakdown of the lubricating film.

DISCUSSION—This breakdown is noted by a sudden increase in the measured scar diameter, shown in Fig. 1 as line BC, and a momentary deflection of the indicating pen of the optional friction-measuring device. **D 2596**

increment, *n*—a portion of a material to be combined with other portions of the same material to provide a larger sample which will represent the whole material. **D 4296**

index of refraction, *n*—see **refractive index**.

inhibition load XX (ILXX), *n*—a statistically or graphically estimated loading rate of test material that is expected to cause a XX % inhibition of a biological process (such as growth or reproduction) which has an analog as opposed to a digital measure. **D 6046, [D02.12] D 6081**

DISCUSSION—An example of a digital measure would be alive or dead. This terminology should be used for hydraulic fluids instead of the standard inhibition concentration (ICXX) when the hydraulic fluid is not completely soluble under test conditions. **D 6046**

DISCUSSION—An example of a digital measure would be alive/dead. This terminology (ILXX) should be used instead of the standard ICXX when the test material is not completely soluble at the test treat rates. **D 6081**

inhibition load XX (ILXX), *n*—a statistically or graphically estimated loading rate of test material that is expected to cause a XX % inhibition of a biological process (such as growth or reproduction) of a representative subpopulation of organisms under specified conditions and is expressed as an analog as opposed to digital measure.

DISCUSSION—An example of a digital measure would be alive/dead. This terminology (ILXX) should be used instead of the standard ICXX when the test material is not completely soluble at the test treat rates.

D 6384

initial boiling point (IBP), *n*—the point at which a cumulative volume count equal to 0.5 % of the total volume count under the chromatogram is obtained. **D 3710**

injection timing (injection advance), *n*—that time in the combustion cycle, measured in degrees of crank angle, at which fuel injection into the combustion chamber is initiated. **D 613**

inoculum, *n*—spores, bacteria, single celled organisms or other live materials that are introduced into a test medium. **D 6006**

inoculum, *n*—living spores, bacteria, single celled organisms, or other live materials that are introduced into a test medium. **D 6384**

insolubles, *n—in lubricating grease analysis*, the material remaining after the acid hydrolysis, water extraction, and solvent extraction of soap-thickened greases.

DISCUSSION—Consisting of such products as graphite, molybdenum disulfide, insoluble polymers, and so forth. **D 128**

instrument response time, *n*—the time required for an indicating or detecting device to undergo a defined displacement following an abrupt change in the property being measured.

internal reflux, *n*—the liquid normally running down inside a distillation column. (Synonym—*reflux*.)

internal reflux—the liquid normally running down inside the column.

DISCUSSION—In the case of an adiabatic column when distilling a pure compound, the internal reflux is constant from top to bottom and is equal to the reflux at the reflux divider. When distilling crude petroleum, the fractionation occurring in the dynamic holdup will cause a temperature gradient to be established with attendant greater amount of internal reflux at the bottom of the column. **D 2892**

IP—abbreviation for Institute of Petroleum.

jet fuel, *n*—any liquid suitable for the generation of power by combustion in aircraft gas turbine engines.

DISCUSSION—Different grades are characterized primarily by volatility ranges and by freezing points.

kinematic viscosity, *n*—the ratio of the viscosity to the density of a liquid.

DISCUSSION—Kinematic viscosity is a measure of the resistance to flow of a liquid under gravity. **D 6080**

kinetic coefficient of friction, *n*—the coefficient of friction under conditions of macroscopic relative motion between two bodies. **D 2714**

kinetic friction, *n*—the force that resists motion when a surface is moving with a uniform velocity; it is, therefore, equal and opposite to the force required to maintain sliding of the surface with uniform velocity. **D 2534**

knock, *n—in a spark ignition engine*, abnormal combustion, often producing audible sound, caused by autoignition of the air/fuel mixture. **D 2699, D 2700**

knock, *n—in an aircraft spark-ignition engine*, abnormal combustion caused by autoignition of the air/fuel mixture. **D 6424**

knock condition, *n—for octane rating*, when the knock intensity in any cylinder is light knock or greater as described in Annex A1. **D 6424**

knock intensity, *n—for knock testing*, a measure of the level of knock. **D 2699, D 2700**

knock number, *n—for octane rating*, a numerical quantification of knock intensity. **D 6424**

knockmeter, *n—for knock testing*, the 0 to 100 division indicating meter that displays the knock intensity signal from the detonation meter. **D 2699, D 2700**

lag phase, *n*—the period of diminished physiological activity and cell division following the addition of microorganisms to a new culture medium. **D 6139**

last nonseizure load, *n*—the last load at which the measured scar diameter is not more than 5 % greater than the compenation value at that load.

DISCUSSION—Shown in Fig. 1 as Point B. **D 2596**

lethal load XX (LLXX), *n*—a statistically or graphically estimated loading rate of test material that is expected to be lethal to 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 lethal concentration (LCXX) when the hydraulic fluid is not completely soluble under test conditions. **D 6046**

lethal load XX (LLXX), *n*—a statistically or graphically estimated loading rate of test material that is expected to be lethal to XX % of a representative subpopulation of organisms under specified conditions.

DISCUSSION—This terminology should be used instead of the standard LCXX when the material is not completely soluble at the test treat rates. **D 6081**

lethal load XX (LLXX), *n*—a statistically or graphically estimated loading rate of test material that is expected to be lethal to XX % of a subpopulation of organisms under specified conditions.

DISCUSSION—This terminology should be used for lubricants instead of the standard LCXX to designate that the material is not completely soluble at the test treat rates. **D 6384**

light-duty, *adj—in internal combustion engine operation*, characterized by average speeds, power output, and internal temperatures that are generally much lower than the potential maximums. **D 4485, D 5966**

light-duty engine, *n—in internal combustion engine types*, one that is designed to be normally operated at substantially less than its peak output. **D 4485, D 5966**

DISCUSSION—This type of engine is typically installed in automobiles and small trucks, vans, and buses. **D 4485**

linearly mixable, *adj*—a property is deemed to be linearly mixable in a mass or volume measurement unit if the property of the mixed material can be calculated from the quantities and properties of the materials used to produce the mixture.

DISCUSSION—The general equations describing this linearly mixable attribute are as follows:

$$P_{MIXED} = \frac{A_1 \cdot P_1 + A_2 \cdot P_2 + A_3 \cdot P_3 + A_4 \cdot P_4 + \ldots + A_N \cdot P_N}{A_1 + A_2 + A_3 + A_4 + \ldots + A_N}$$

$$A_{MIXED} = A_1 + A_2 + A_3 + A_4 + \ldots + A_N$$

where:

A_N = quantity of material N,
P_N = property of material N,
P_{MIXED} = property of mixed material, and
A_{MIXED} = quantity of mixed material.

DISCUSSION—The material being mixed can be from the same process stream over time. **D 6624**

liquefied petroleum gas (LPG), *n*—a mixture of normally gaseous hydrocarbons, predominantly propane or butane or both, that has been liquefied by compression or cooling, or both, to facilitate storage, transport, and handling.

load-carrying capacity, *n—of a lubricating grease*, the maximum load or pressure that can be sustained by a lubricating grease without failure of the sliding contact surfaces as evidenced by seizure or welding. **D 2509**

load-wear index (or the load-carrying property of a lubricant)**,** *n*—an index of the ability of a lubricant to minimize wear at applied loads. Under the conditions of this test, specific loadings in kilograms-force (or newtons) having intervals of approximately 0.1 logarithmic units, are applied to the three stationary balls for ten runs prior to welding. The load-wear index is the average of the sum of the corrected loads determined for the ten applied loads immediately preceding the weld pair. **D 2783**

load-wear index, *n*—an index of the ability of a lubricant to prevent wear at applied loads. (Synonym—*load-carrying property of a lubricant.*)

loading rate, *n*—the ratio of test material to aqueous medium used in the preparation of a water accommodated fraction (WAF) and in interpretation of the results of a toxicity study with a poorly water soluble lubricant or lubricant component. **D 6046**

loading rate, *n*—the ratio of test material to aqueous medium used in the preparation of WAF, WSF, or mechanical dispersion and in the interpretation of the results of a toxicity study with a poorly water-soluble lubricant or lubricant component. **D 6081**

log phase, *n*—the period of growth of microorganisms during which cells divide at a positive constant rate. **D 6139**

lot, *n*—a definite quantity of a product or material accumulated under conditions that are considered uniform for sampling purposes. **D 6299, [E11] E 456**

LPG—abbreviation for liquefied petroleum gas.

lubricant, *n*—any material interposed between two surfaces that reduces the friction or wear between them.

lubricant, *n*—any material interposed between two surfaces that reduces the friction or wear, or both, between them. **D 5533, D 5862**

lubricant, *n*—any material interposed between two surfaces that reduces friction or wear between them.

DISCUSSION—In this test method, the lubricant is an oil which may or may not contain additives such as foam inhibitors. **D 6082**

lubricant base stock, *n*—a liquid that may be used alone as a lubricant, but normally is used as a major ingredient in formulated lubricants.

lubricating grease, *n*—a semi-fluid to solid product of a dispersion of a thickener in a liquid lubricant. **D 128, D 217**

DISCUSSION—The qualifying term, lubricating, should always be used. The term, grease, used without the qualifier refers to a different product, namely certain natural or processed animal fats, such as tallow, lard, and so forth. **D 128**

DISCUSSION—The dispersion of the thickener forms a two-phase system and immobilizes the liquid lubricant by surface tension and other physical forces. Other ingredients are commonly included to impart special properties. **D 217**

lubricating oil, *n*—a liquid lubricant, usually comprising several ingredients, including a major portion of base oil and minor portions of various additives. **D 5966**

lubricity, *n*—a qualitative term describing the ability of a lubricant to minimize friction between and damage to surfaces in relative motion under load. **D 4857, D 4863**

lugging, *adj*—in *internal combustion engine operation*, characterized by a combined mode of relatively low-speed and high-power output. **D 4485**

luminometer number, *n*—a measure of the flame temperature in a wick lamp burning the candidate material as fuel at a specified flame radiation level in the green-yellow band of the visible spectrum.

maximum pore diameter, *n—in gas diffusion*, the diameter of a capillary of circular cross section which is equivalent (with respect to surface tension effects) to the largest pore of the diffuser under consideration.

DISCUSSION—The pore dimension is expressed in micrometres in this method. **D 892**

mean square, *n—in analysis of variance*, a contraction of the expression "mean of the squared deviations from the appropriate average(s)" where the divisor of each sum of squares is the appropriate degrees of freedom. **D 6300, [D13] D 123**

mechanical dispersion, *n*—a mixture produced by the application of mechanical shearing forces to a multi-phase system, one component of which is water, so as to distribute one or more of the materials uniformly throughout the mass of the water with the water existing as a continuous phase. **D 6046**

mechanical dispersion, *n*—a low energy aqueous medium produced by continuous stirring of the test solution and containing both dissolved and undissolved components of the test material. **D 6081**

melting point (cooling curve) of petroleum wax, *n*—temperature at which melted petroleum wax first shows a minimum rate of temperature change when allowed to cool under prescribed conditions. **D 87**

membrane color, *n*—a visual rating of particulates on a filter membrane against ASTM Color Standards.

membrane filter, *n*—a porous article of closely controlled pore size through which a liquid is passed to separate matter in suspension.

DISCUSSION—RR:D02-1012[2] contains information on membrane filters that meet the requirements therein. **D 2276, D 5452**

membrane filter, *n*—a thin medium of closely controlled pore size through which a liquid is passed and on which particulate matter in suspension is retained. **D 6217**

metabolite, *n*—a chemical substance produced by any of the many complex chemical and physical processes involved in the maintenance of life. **D 6469**

methanol, *n*—methyl alcohol, the chemical compound CH_3OH. **D 5797, D 5983**

methyl tertiary-butyl ether (MTBE), *n*—the chemical compound $(CH_3)_3COCH_3$. **D 5983**

microbial activity test, *n*—any analytical procedure designed to measure the rate or results of one or more microorganism processes.

DISCUSSION—Examples of microbial activity tests include loss or appearance of specific molecules or measuring the rate of change of parameters, such as acid number, molecular weight distribution (carbon number distribution), and specific gravity. **D 6469**

microbial degradation, *n*—(Synonym—**biodegradation**.) **D 6384**

microbially induced corrosion (MIC), *n*—corrosion that is enhanced by the action of microorganisms in the local environment. **D 6469**

micro separometer rating (MSEP), *n*—a numerical value indicating the ease of separating emulsified water from a sample by coalescence.

mixed aniline point, *n*—the minimum equilibrium solution temperature of a mixture of two volumes of aniline (aminobenzene), one volume of sample, and one volume of *n*-heptane of specified purity.

mixed aniline point, *n*—the minimum equilibrium solution temperature of a mixture of two volumes of aniline, one volume of sample, and one volume of *n*-heptane of specified purity. **D 611**

mixed base, *adj—in lubricating grease*, the description of a thickener system composed of soaps of two metals. **NLGI Lubricating Grease Guide**

DISCUSSION—Although mixed-base grease can be made with soaps of more than two metals, in practice, such is rarely, if ever, encountered. All of the soaps need not be thickeners, although the major soap constituent will be one capable of forming a lubricating grease structure. Because the mixed soaps are seldom present in equal amounts. The predominant soap is referred to first. **NLGI Lubricating Grease Guide, [D02.G0] D 128**

mixed liquor, *n—in sewage treatment*, the contents of an aeration tank including the activated sludge mixed with primary effluent or the raw wastewater and return sludge. **D 6139, D 6384**

mold, *n*—form of fungal growth, characterized by long strands of filaments (hyphae) and, under appropriate growth conditions, aerial, spore-bearing structures.

DISCUSSION—In fluids, mold colonies typically appear as soft spheres; termed *fisheyes*. **D 6469**

MON—*in gasoline knock testing*, abbreviation for Motor octane number.

monitor, *n*—something that reminds or warns.

DISCUSSION—A plastic holder for a membrane filter held in a field sampling apparatus. **D 2276**

montan wax, *n*—a wax-like material comprised primarily of montanic acid and its ester, higher aliphatic alcohols, and resins obtained from the solvent extraction of lignite. **D 128**

motor octane number, *n—for spark-ignition engine fuel*, the numerical rating of knock resistance obtained by comparison of its knock intensity with that of primary reference fuels when both are tested in a standardized CFR engine operating under the conditions specified in this test method. **D 2700**

motor octane number of primary reference fuels above 100, *n*—determined in terms of the number of millilitres of tetraethyl lead in *iso*octane. **D 6424**

motor octane number of primary reference fuels from 0 to 100, *n*—the volume % of *iso*octane (equals 100.0) in a blend with *n*-heptane (equals 0.0). **D 6424**

motoring, *n—for the CFR engine*, operation of the CFR engine without fuel and with the ignition shut off. **D 2699, D 2700**

MTBE—abbreviation for methyl *tert*-butyl ether.

μ (Greek letter Mu)—*in statistics*, symbol for true value.

multiple headspace extraction, *n*—a technique to determine the total concentration of a gas trapped in a liquid by analysis of successive gas extractions from the vapor space of a closed vessel containing a known amount of the sample. **D 6021**

multivariate calibration, *n*—a process for creating a calibration model in which multivariate mathematics is applied to correlate the absorbances measured for a set of calibration samples to reference component concentrations or property values for the set of samples.

DISCUSSION—The resultant multivariate calibration model is applied to the analysis of spectra of unknown samples to provide an estimate of the component concentration or property values for the unknown sample.

DISCUSSION—Included in the multivariate calibration algorithms are Partial Least Squares, Multilinear Regression, and Classical Least Squares Peak Fitting. **D 6277**

naturally aspirated aircraft engine, *n*—aircraft piston engine that breathes without forced means from either turbochargers or superchargers. **D 6424**

net heat of combustion, Qn (MJ/kg)**,** *n*—the quantity of energy released when a unit mass of fuel is burned at constant pressure, with all of the products, including water, being gaseous.

DISCUSSION—The fuel can be either liquid or solid, and contain only the elements carbon, hydrogen, oxygen, nitrogen, and sulfur. The products of combustion, in oxygen, are carbon dioxide, nitrogen oxides, sulfur dioxide, and water, all in the gaseous state. In this procedure, the combustion takes place at a constant pressure of 0.1012 MPa (1 atm), and 25°C is the initial temperature of the fuel and the oxygen, and the final temperature of the products of combustion. **D 240**

[2] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR: D02-1012.

Newtonian flow, *n*—a Newtonian liquid is one that flows immediately on application of even the smallest force, and for which the rate of flow is directly proportional to the force applied. **D 5620**

Newtonian fluid, *n*—a fluid that at a given temperature exhibits a constant viscosity at all shear rates or shear stresses. **D 6080**

Newtonian oil or fluid, *n*—an oil or fluid that at a given temperature exhibits a constant viscosity at all shear rates or shear stresses. **D 3829**

NIST, *n*—acronym for National Institute of Standards and Technology.

NLGI, *n*—National Lubricating Grease Institute **D 128**

NLGI number, *n*—a numerical scale for classifying the consistency range of lubricating greases and based on the Test Method D 217 worked penetration.
NLGI Lubricating Grease Guide, [D02.G0] D 128

no-flow point, *n*—the temperature corresponding to a specified degree of blockage of a screen by separated solids.

no-knock condition, *n—for octane rating*, where the knock intensity in all cylinders is less than light knock. Refer to Annex A1 for description of knock intensity. **D 6812**

nominal filtration rating, *n*—(Deprecated term) an arbitrary micrometre value for a filter medium indicated by a filter manufacturer.

nominal filtration rating, *n*—an arbitrary micrometre value indicated by a filter manufacturer. Due to lack of reproducibility this rating is deprecated. **D 4174, ANSI B93.2**

noncombustive reaction, *n*—a reaction other than combustion or thermal degradation undergone by certain materials upon exposure to elevated temperatures.

noncompounded engine oil, *n*—a lubricating oil having a viscosity within the range of viscosities of oils normally used in engines, and that may contain anti-foam agents or pour depressants, or both, but not other additives. **D 5119**

non-Newtonian flow, *n*—a non-Newtonian liquid is one whose viscosity depends on the rate of shear. Some will not flow until the force applied is greater than a definite value called the yield point. **D 5620**

non-Newtonian oil or fluid, *n*—an oil or fluid that at a given temperature exhibits a viscosity that varies with changing shear stress or shear rate. **D 3829**

non-reference oil, *n*—any oil other than a reference oil; such as a research formulation, commercial oil, or candidate oil. **D 5533, D 5844**

non-soap thickener (synthetic thickener, inorganic thickener, organic thickener), *n—in lubricating grease*, any of several specially treated or synthetic materials, excepting metallic soaps, that can be thermally or mechanically dispersed in liquid lubricants to form the lubricating grease structure. **NLGI, [D02.G0] D 128**

non-standard test, *n*—a test that is not conducted in conformance with the requirements in the standard test method; such as running on an uncalibrated test stand, using different test equipment, applying different equipment assembly procedures, or using modified operating conditions. **D 5844, D 5967**

normal distribution, *n*—the distribution that has the probability function:

$$f(\chi) = (1/\sigma)\,(2\pi)^{-1/2}\exp[-(\chi-\mu)^2/2\sigma^2]$$

where:
χ = a random variate,
μ = the mean distribution, and
σ = the standard deviation of the distribution.
(Synonym—*Gaussian distribution, law of error*.)
D 6300, [D13] D 123

obligate aerobe, *n*—microorganism with an absolute requirement for atmospheric oxygen in order to function.

DISCUSSION—Obligate aerobes may survive periods in anoxic environments but will remain dormant until sufficient oxygen is present to support their activity. **D 6469**

obligate anaerobe, *n*—microrganism that cannot function when atmospheric oxygen is present.

DISCUSSION—Obligate anaerobes may survive periods in oxic environments but remain dormant until conditions become anoxic. **D 6469**

observed dropping point, *n*—the value noted on the thermometer monitoring the internal temperature of the grease test cup when the first drop of material falls from the test cup and reaches the bottom of the test tube. **D 2265**

octane number, *n—for spark ignition engine fuel*, any one of several numerical indicators of resistance to knock obtained by comparison with reference fuels in standardized engine or vehicle tests. **D 2699, D 2700, D 2885**

DISCUSSION—In the context of this test method, octane number is understood to mean the numerical indicator of knock obtained by comparison with primary reference fuels in a standardized CFR engine operating under conditions specified in either the Research, Test Method D 2699 or Motor, Test Method D 2700, standards. **D 2885**

odor, *n—of a wax*, the numerical rating corresponding to the odor scale description that best fits the sample being tested. **D 1833**

oil separation, *n*—the appearance of a liquid fraction from an otherwise homogeneous lubricating composition. **D 1742**

operationally valid standard test, *n—in automotive lubricant testing*, a standard test that meets operational validity requirements, where specified.

DISCUSSION—Operational validity is determined after a test is completed. Requirements can include (*1*) mid-limit ranges for the average values of primary and secondary parameters that are narrower than the specified control ranges, (*2*) allowable deviations for primary and secondary parameters from the specified control ranges, (*3*) downtime limitations, and (*4*) special parameter limitations. **D 5844**

operator, *n*—a person who normally and regularly carries out a particular test. **D 3244**

Ostwald coefficient, *n*—the solubility of a gas, expressed as the volume of gas dissolved per volume of liquid when both are in equilibrium at the specified partial pressure of gas and at the specified temperature. **D 2779, D 3827**

out of specification data, *n—in data acquisition*, sampled value of a monitored test parameter that has deviated beyond the procedural limits. **D 6593**

outaging, *n*—practice of removing a portion of liquid contents from a conventional sampling cylinder after filling to provide expansion room. **D 5273**

outlier, *n*—a result far enough in magnitude from other results to be considered not a part of the set. **D 6300, RR:D02-1007**[3]

oxic, *adj*—an environment with a sufficient partial pressure of oxygen to support aerobic growth. **D 6469**

oxidation, *n—of engine oil*, the reaction of the oil with an electron acceptor, generally oxygen, that can produce deleterious acidic or resinous materials often manifested as sludge formation, varnish formation, viscosity increase, or corrosion, or a combination thereof. **D 6681**

oxygenate, *n*—an oxygen-containing ashless organic compound, such as an alcohol or ether, which may be used as a fuel or fuel supplement. **D 4806**

P*—in electromagnetics*, symbol for radiant power.

particulate, *adj*—of or relating to minute separate particles.

DISCUSSION—Solids generally composed of oxides, silicates, and fuel insoluble salts. **D 2276**

peak EGT, *n—for octane rating*, as the mixture is manually leaned from a state rich of stoichiometric, the exhaust gas temperature will increase with the removal of excess fuel. As the mixture is continually leaned, a peak temperature will be attained, after which continued leaning will result in lower exhaust gas temperatures. **D 6424**

penetration, *n—of a propellant or of petrolatum*, the depth, in tenths of a millimetre, that a standard cone penetrates the sample under prescribed conditions of weight, time, and temperature.

penetration, *n—of petroleum wax*, the depth, in tenths of a millimetre, to which a standard needle penetrates into the wax under defined conditions. **D 1321**

penetration of petrolatum, *n*—the depth, in tenths of a millimetre, that a standard cone will penetrate the sample under fixed conditions of mass, time, and temperature. **D 937**

penetrometer, *n*—an instrument that measures the consistency or hardness of semiliquid to semisolid materials by measuring the depth to which a specified cone or needle under a given force falls into the material. **D 217, D 1403, [D02.10] D 1321**

DISCUSSION—In this test method, either a standard penetrometer 6.2 or an optical penetrometer cone A1.3 can be used to determine the consistency of lubricating greases. The penetrating force is determined by the mass of the cone and the shaft. **D 217**

DISCUSSION—In this test method, a standard penetrometer needle (6.3) is used to determine the hardness of petroleum wax. The penetration force is determined by the total mass (100 g) of the needle, plunger, and 50 g weight. **D 1321**

DISCUSSION—In these test methods, either a one-quarter scale cone (A1.1) or a one-half scale cone (A1.3) can be used to determine the consistency of lubricating greases. The penetration forces are determined by the respective masses of the cones and shafts. **D 1403**

pentane insolubles, *n—in used oil analysis*, separated matter resulting when a used oil is dissolved in pentane. **D 893, D 4055**

DISCUSSION—In this test method, the separation is effected by centrifugation. **D 893**

DISCUSSION—In this method, the separation is effected by filtration through a membrane. **D 4055**

percent evaporated, *n—in batch distillation*, the sum of the percent recovered and the percent loss.

percent loss, *n—in batch distillation*, 100 minus the percent total recovery.

permanent shear stability index (PSSI), *n*—a measure of the irreversible decrease, resulting from shear, in an oil's viscosity contributed by an additive.

DISCUSSION—PSSI is a property calculated for a single component. Viscosity Loss (q.v.) is a property measured for a finished oil. **D 6022**

permeability, *n—in gas diffusion*, the flow of gas, through the gas diffuser.

DISCUSSION—In this test method, the permeability is measured at a pressure of 2.45 kPa (250 mm of water) in millilitres per minute. **D 892**

permeability, *n—in gas diffusion*, the rate of a substance that passes through a material (diffuser) under given conditions. **D 6082**

peroxide number, *n*—the milliequivalents of constituents in 1000 g of wax that will oxidize potassium iodide. **D 1832**

petroleum coke, *n*—a solid, carbonaceous residue produced by thermal decomposition of heavy petroleum fractions or cracked stocks, or both. **D 5003, D 5004, D 6376**

phase separation, *n*—the formation of two layers, a lower aqueous constituent and an upper hydrocarbon constituent, separated by either a common boundary or a layer of emulsion.

DISCUSSION—Test specimens having droplets clinging to the sides of the container or collected on its bottom, that are visible to the unaided eye, are considered to be phase separated. **D 6422**

picosiemens per metre, *n*—the unit of electrical conductivity is also called a conductivity unit (CU). A siemen is the SI definition of reciprocal ohm sometimes called mho.

$$1\ \text{pS/m} = 1 \times 10^{-12}\ \Omega^{-1}\,\text{m}^{-1} = 1\ \text{cu} = 1\ \text{picomho/m}$$

D 2624, D 4308

PLOQ, *n*—pooled limit of quantitation. **D 6259**

plugging, *n*—the restriction of a flow path due to the accumulation of material along the flow path boundaries. **D 5862**

pooled limit of quantitation, *n*—level of property or concentration of analyte above which quantitative test results can be obtained with a specified degree of confidence. See 3.2.1 for acronym. **D 6259**

pour point, *n—in petroleum products*, the lowest temperature at which movement of the test specimen is observed under the prescribed conditions of the test. **D 5949**

[3] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR: RR:D02-1007.

preadaptation, *n*—the incubation of an inoculum in the presence of the test substance which is done prior to the initiation of the test and under conditions similar to the test conditions.

DISCUSSION—The aim of preadaptation is to improve the precision of the test method by decreasing variability in the rate of biodegradation produced by the inoculum. Preadaptation may mimic the natural processes which cause changes in the microbial population of the inoculum leading to more rapid biodegradation of the test substance, but it is not expected to change the final degree of biodegradation. **D 6006**

pre-adaptation, *n*—the pre-incubation of an inoculum in the presence of the test material and under conditions similar to the test conditions.

DISCUSSION—The aim of pre-adaptation is to improve the precision of the test method by decreasing variability in the rate of biodegradation produced by the inoculum. Pre-adaptation may mimic the natural processes which cause changes in the microbial population of the inoculum leading to more rapid biodegradation of the test material but not to a change in the final extent of biodegradation. **D 6046**

pre-adaptation, *n*—the incubation of an inoculum in the presence of the test material which is done prior to the initiation of the test and under conditions similar to the test conditions. **D 6384**

pre-condition, *n*—the pre-incubation of an inoculum under the conditions of the test in the absence of the test material. **D 6139**

precision, *n*—the closeness of agreement between test results obtained under prescribed conditions. **D 6299, [E11] E 456**

precision, *n*—the degree of agreement between two or more results on the same property of identical test material. In this practice, precision statements are framed in terms of *repeatability* and *reproducibility* of the test method.

DISCUSSION—The testing conditions represented by repeatability and reproducibility should reflect the normal extremes of variability under which the test is commonly used. Repeatability conditions are those showing the least variation; reproducibility, the usual maximum degree of variability. Refer to the definitions of each of these terms for greater detail. **D 6300**

precision, *n*—the degree of agreement between two or more results on the same property of identical test material. In this practice, precision statements are framed in terms of the repeatability and reproducibility of the test method. **D 3244**

pre-flame reaction, *n*—*in fuel testing*, a slow, nonluminous reaction of the sample or its decomposition products with the atmosphere in the combustion chamber.

preignition, *n*—*in a spark-ignition engine*, ignition of the mixture of fuel and air in the combustion chamber before the passage of the spark. **D 4857, D 4858**

pressure drop—the difference between the pressure measured in the condenser and the pressure measured in the distillation flask.

DISCUSSION—It is expressed in kilopascals (mm Hg) per metre of packed height for packed columns, or kilopascals (mm Hg) overall for real plate columns. It is higher for aromatics than for paraffins, and for higher molecular weights than for lighter molecules, at a given boilup rate. **D 2892**

primary biodegradation, *n*—degradation of the test material by microorganisms resulting in a change in the test material's physical or chemical properties, or both. **D 6384**

primary biodegradation, *n*—degradation of the test substance resulting in a change in its physical or chemical properties, or both. **D 6006**

primary biodegradation test, *n*—a test that monitors the disappearance of a test material by measuring some physical attribute of the material.

DISCUSSION—The extent to which the results of a primary biodegradation test correspond to the biological conversion of the test material will depend on the attribute which is being measured. An example of a measurement of a physical attribute is infrared (IR) measurement of the C-H bond of a methylene carbon at 2930 cm^{-1} for the CEC (Coordinating European Council) biodegradation test. **D 6384**

primary biodegradation test, *n*—a test which follows the disappearance of a test substance by measuring some attribute of the substance.

DISCUSSION—The extent to which the results of a primary biodegradation test correspond to the biological conversion of the test substance will depend on the attribute which is being measured. **D 6006**

primary reference fuel blends above 100 octane, *n*—the millilitres per U.S. gallon of tetraethyllead in *iso*octane that define octane numbers above 100 in accordance with an empirically determined relationship. **D 2699, D 2700**

primary reference fuel blends below 100 octane, *n*—the volume % of *iso*octane in a blend with *n*-heptane that defines the octane number of the blend, *iso*octane being assigned as 100 and *n*-heptane as 0 octane number. **D 2699, D 2700**

primary reference fuels, *n*—*for knock testing*, *iso*octane, *n*-heptane, volumetrically proportioned mixtures of *iso*octane with *n*-heptane, or blends of tetraethyllead in *iso*octane that define the octane number scale. **D 2699, D 2700**

primary reference fuels, *n*—*for octane rating*, blended fuels of reference grade *iso*octane and *n*-heptane. **D 6424**

propene concentrate, *n*—*in liquefied natural gas technology*, concentrate containing more than 50 % propene. (Synonym—*propylene*.)

propylene concentrate—concentrate containing more than 90 % propylene. **D 4864**

propylene concentrate, *n*—hydrocarbon product containing more than 50 % propylene.

DISCUSSION—Grades of propylene concentrates listed in this guide are: polymer, 99.0 % minimum propylene content; chemical, 92.0 %; and refinery, 60 %. **D 5273**

PSSI—*in viscometry*, abbreviation for permanent shear stability index.

purchaser, *n*—*of an ASTM test*, a person or organization that pays for the conduct of an ASTM test method on a specified product.

DISCUSSION—The preferred term is *purchaser*. Deprecated terms that have been used are *client, requester, sponsor* and *customer*. **D 6202**

quenching oil, *n*—oil used for cooling metals during a heat-treating operation.

R—*in a distillation column*, abbreviation for reflux ratio.

r—*in statistics*, abbreviation for repeatability.

R—*in statistics*, abbreviation for reproducibility.

Ra, *n*—in measuring surface finish, the arithmetic average of the absolute distances of all profile points from the mean line for a given distance. **D 5706, D 5707**

radiant energy, *n*—energy transmitted as electromagnetic waves. **D 1840, D 2008**

radiant power, P, *n*—the rate at which energy is transported in a beam of radiant energy. **D 1840, D 2008**

random error, *n*—the chance variation encountered in all test work despite the closest control of variables. **D 6300, RR:D02-1007[3]**

raw petroleum coke, *n*—petroleum coke that has not been calcined. **D 5003 D 6376**

reading, *n*—*in data acquisition*, the reduction of data points that represent the operating conditions observed in the time period as defined in the test procedure. **D 6593**

ream of paper (news and wrapping), *n*—500 sheets each 610 by 914 mm (24 by 36 in.). **D 2423**

receiver, *n*—any individual or organization who receives or accepts the product delivered by the supplier. **D 3244**

reclaiming, *n*—the use of cleaning methods during recycling primarily to remove insoluble contaminants, thus making the oil suitable for further use. The methods may include settling, heating, dehydration, filtration, and centrifuging. **D 6448, D 6823**

recycling, *n*—*in petroleum technology*, the acquisition of oil that has become unsuitable for its intended use, and processing it to regain useful materials. **D 6448**

reference material (RM), *n*—a material or substance of which one or more properties are sufficiently well established to enable the material to be used for the calibration of an apparatus, the assessment of a method, or the assignment of values to similar materials. **D 6596**

reference oil, *n*—an oil of known performance characteristics, used as a basis for comparison.

DISCUSSION—Reference oils are used to calibrate testing facilities, to compare the performance of other oils, or to evaluate other materials (such as seals) that interact with oils. **D 5533, D 5844**

reference viscosity, *n*—the viscosity of Newtonian standard reference fluids certified at each of several temperatures by the supplier.

reflux ratio, R, *n*—*in a distillation column*, the ratio of the condensate at the head of the column that is returned to the column (*reflux*) to that withdrawn as product.

reflux ratio, R, *n*—the ratio of reflux to distillate.

DISCUSSION—The vapor reaching the top of the column is totally condensed and the resulting liquid is divided into two parts. One part *L* (reflux), is returned to the column and the other part, *D* (distillate), is withdrawn as product. The reflux ratio ($R = L/D$), can vary from zero at total takeoff ($L = 0$) to infinity at total reflux ($D = 0$). **D 2892**

refractive dispersion, *n*—the difference between the refractive indexes of a substance for light of two different wavelengths, both indexes being measured at the same temperature. For convenience in calculations, the value of the difference thus obtained is usually multiplied by 10 000. **D 1218**

refractive index, *n*—the ratio of the velocity of light (of specified wavelength) in air, to its velocity in the substance under examination. This is the relative index of refraction. If absolute refractive index (that is, referred to vacuum) is desired, this value should be multiplied by the factor 1.00027, the absolute refractive index of air.

refractive index, *n*—the ratio of the velocity of light (of specified wavelength) in air, to its velocity in the substance under examination. It may also be defined as the sine of the angle of incidence divided by the sine of the angle of refraction, as light passes from air into the substance. This is the relative index of refraction. If absolute refractive index (that is, referred to vacuum) is desired, this value should be multiplied by the factor 1.00027, the absolute refractive index of air. The numerical value of refractive index of liquids varies inversely with both wavelength and temperature. **D 1218**

relative density, *n*—the ratio of the density of a material at a stated temperature to the density of water at a stated temperature. **D 4052**

relative density (specific gravity), *n*—the ratio of the mass (weight in vacuo) of a given volume of material at a temperature, t_1, to the mass of an equal volume of water at a reference temperature, t_2; or it is the ratio of the density of the material at t_1 to the density of water at t_2. When the reference temperature is 4.00°C, the temperature at which the relative density of water is unity, relative density (specific gravity) and density are numerically equal. **D 1217, D 1480**

relative molar response, *n*—the measured area of a compound divided by the moles present in the synthetic mixture relative to an arbitrarily chosen component. **D 3710**

repeatability, *n*—the quantitative expression of the random error associated with a single operator in a given laboratory obtaining repetitive results by applying the same test method with the same apparatus under constant operating conditions on identical test material within a short interval of time on the same day. It is defined as the difference between two such results at the 95 % confidence level.

DISCUSSION—Interpret as the value equal to or below which the absolute difference between two single test results obtained in the above conditions may expect to lie with a probability of 95 %.

DISCUSSION—The difference is related to repeatability standard deviation but is not the standard deviation or its estimate. **D 6300**

repeatability conditions, *n*—conditions where mutually independent test results are obtained with the same test method in the same laboratory by the same operator with the same equipment within short intervals of time, using test specimens taken at random from a single sample of material. **D 6299, [E11] E 456, E 177**

repeatability conditions, *n*—conditions under which test results are obtained with the same test method in the same laboratory by the same operator with the same equipment in the shortest practical period of time using test units or test specimens taken at random from a single quantity of material

that is as nearly homogeneous as possible (see 10.3 of Practice E 691).

DISCUSSION—The *same operator, same equipment* requirement means that for a particular step in the measurement process the same combination of operator and equipment is used for every test result. Thus, one operator may prepare the test specimens, a second measure the dimensions, and a third measure the mass in a test method for measuring density.

DISCUSSION—By *in the shortest practical period of time* is meant that the test results, at least for one material, are obtained in a time period not less than in normal testing and not so long as to permit significant change in test material, equipment, or environment. See Terminology E 456. **D 6259**

representative sample, *n*—a part of a homogeneous material, or a part of the composited and mixed portions of a material, which carries all the true properties and physical characteristics of the whole material. **D 4296**

reproducibility, R, *n*—quantitative expression of the random error associated with operators working in different laboratories, each obtaining single results on identical test material when applying the same method.

reproducibility, *n*—a quantitative expression of the random error associated with different operators from different laboratories, using different apparatus, each obtaining a single result by applying the same method on an identical test sample. It is defined as the 95 % confidence limit for the difference between two such single and independent results.

DISCUSSION—Interpret as the value equal to or below which the absolute difference between two single test results on identical material obtained by operators in different laboratories, using the standardized test may be expected to lie with a probability of 95 %.

DISCUSSION—The difference is related to the reproducibility standard deviation but is not the standard deviation or its estimate.

DISCUSSION—In those cases where the normal use of the test method does not involve sending a sample to a testing laboratory, either because it is an in-line test method or because of serious sample instabilities or similar reasons, the precision test for obtaining reproducibility may allow for the use of apparatus from the participating laboratories at a common site (several common sites, if feasible). The statistical analysis is not affected thereby. However, the interpretation of the reproducibility value will be affected and therefore the precision statement shall, in this case, state the conditions to which the reproducibility value applies. **D 6300**

reproducibility conditions, *n*—conditions under which test results are obtained in different laboratories with the same test method, using test specimens taken at random from the same sample of material. **D 6299, [E11] E 456, E 177**

re-refining, *n*—the use of refining processes during recycling to produce high quality base stocks for lubricants or other petroleum products. Re-refining may include distillation, hydrotreating, or treatments employing acid, caustic, solvent, clay, or other chemicals, or combination thereof. **D 6823**

Research octane number, *n—for spark-ignition engine fuel*, the numerical rating of knock resistance obtained by comparison of its knock intensity with that of primary reference fuel blends when both are tested in a standardized CFR engine operating under the conditions specified in this test method. **D 2699**

residual fuel, *n*—a liquid fuel containing bottoms remaining from crude distillation or thermal cracking; sometimes referred to as heavy fuel oil.

DISCUSSION—Residual fuels comprise Grades 4, 5, and 6 fuel oils, as defined in Specification D 396. **D 97**

residual fuel oil, *n*—any liquid or liquefiable petroleum product having a kinematic viscosity at 100°C between 5.0 and 50.0 mm^2/s, inclusive, burned for the generation of heat in a furnace or firebox or for the generation of power in an engine. **D 6021**

residual fuel oil, *n*—a fuel oil comprising a blend of viscous long, short, or cracked residue from a petroleum refining process and lighter distillates blended to a fuel oil viscosity specification. **D 5705**

residuum, *n*—a liquid or semi-liquid product obtained as residue from the distillation of petroleum and consisting primarily of asphaltic hydrocarbons.

DISCUSSION—Also known as asphaltic oil, asphaltum oil, liquid asphalt, black oil, petroleum tailings, and residual oil. **D 128**

response factor, *n*—a constant of proportionality that converts area to liquid volume. **D 3710**

rest conductivity, *n*—the reciprocal of the resisitivity of uncharged fuel in the absence of ionic depletion or polarization.

DISCUSSION—It is the electrical conductivity at the initial instant of current measurement after a dc voltage is impressed between electrodes. **D 2624**

result, *n*—the value obtained by following the complete set of instructions of a test method.

result, *n*—the value obtained by following the complete set of instructions of a test method. It may be obtained from a single determination or several determinations, depending on the instruction of the test method. **D 3244**

RON—*in gasoline knock testing*, abbreviation for Research octane number.

rosin oil, *n*—a viscous, oily liquid obtained as a condensate when the residue (rosin) from turpentine production is subjected to dry, destructive distillation.

DISCUSSION—Also used to describe specially compounded oils having a rosin base. **D 128**

rust, *n—of ferrous alloys*, a corrosion product consisting primarily of hydrated iron oxides. **D 5844**

rust (coatings), *n*—the reddish material, primarily hydrated iron oxide, formed on iron or its alloys resulting from exposure to humid atmosphere or chemical attack. **D 5533**

Ry, *n—in measuring surface finish*, the vertical distance between the top of the highest peak and the bottom of the deepest valley in one sampling length. **D 5706, D 5707**

Ry, *n—in measuring surface finish*, the vertical distance between the top of the highest peak and the bottom of the deepest valley in one sampling length of the roughness profile. **D 6425**

Rz, *n—in measuring surface finish*, the average of all *Ry* values (peak to valley heights) in the assessment length. **D 6425**

Rz (DIN), *n—in measuring surface finish*, the average of all Ry values (peak to valley heights) in the assessment length. **D 5706, D 5707**

SAE—abbreviation for Society of Automotive Engineers, Inc.

salt water, *n*—the aerobic, aqueous compartment, characteristically with a salinity equal to or greater than five parts per thousand. **D 6384**

sample, *n*—a part taken as representative of a whole material. **D 4296**

saponification, *n*—the interaction of fats, fatty acids, or esters generally with an alkali to form the metallic salt, which is commonly called soap.

DISCUSSION—Soap thickeners are most often made by in situ saponification in the lubricating grease base oil. However, the use of pre-formed soaps is also common; dispersion is effected by mechanical means and usually with heat. **D 128**

saponification number, *n—in petroleum technology*, the number of milligrams of potassium hydroxide that is consumed by 1 g of oil under the conditions of the test.

saponification number, *n*—the number of milligrams of potassium hydroxide consumed by 1 g of a sample under the conditions of the test.

DISCUSSION—The value of the saponification number in these test methods can be affected by the presence of other alkali-reactive species, as described in Note 1. **D 94**

saponify, *v*—to hydrolyze a fat with alkali to form an alcohol and the salt of a fatty acid. **D 94**

Saybolt color, *n*—an empirical definition of the color of a clear petroleum liquid.

Saybolt color, *n*—the name of an empirical scale for expressing of the color of a clear petroleum liquid based on a scale of –16 (darkest) to +30 (lightest) and determined by Test Method D 156. **D 6045**

scoring, *n—in tribology*, a severe form of wear characterized by the formation of extensive grooves and scratches in the direction of sliding. **D 5844, [G02] G 40**

scoring, *n*—the formation of severe scratches in the direction of sliding.

DISCUSSION—Scoring may be due to local solid phase welding or to abrasion. The term scuffing is sometimes used as a synonym for scoring. **D 4998**

scratches, *n*—the result of mechanical removal or displacement, or both, of material from a surface by the action of abrasive particles or protuberances sliding across the surfaces. **D 5182**

scratching, *n*—the formation of fine lines in the direction of sliding that may be due to asperites on the harder slider or to hard particles between the surfaces or embedded in one of them.

DISCUSSION—Scratching is considered less damaging than scoring or scuffing. **D 4998**

scuff, scuffing, *n—in lubrication*, damage caused by instantaneous localized welding between surfaces in relative motion which does not result in immobilization of the parts. **D 4863**

scuffing, *n—in lubrication*, surface damage resulting from localized welding at the interface of rubbing surfaces with subsequent fracture in the proximity of the weld area.

scuffing, *n*—localized damage caused by the occurrence of solid phase welding between sliding surfaces, without local surface melting.

DISCUSSION—The term **scoring** is sometimes used as a synonym for scuffing. **D 4998**

seizure, *n—in lubrication*, welding between surfaces in relative motion that results in immobilization of the parts. **D 4857**

seizure or welding, *n*—localized fusion of rubbing metal, usually indicated by streaks of transferred metal, increased friction and wear, or unusual noise and vibration. **D 2509**

shear, *adj*—a relative movement of molecules or molecular aggregates that occurs in flowing liquids. A shear flow is one in which the spatial velocity gradient is perpendicular to the direction of flow.

DISCUSSION—Not all flow geometries meet this definition. **D 6022**

shear, *v*—to subject a liquid to shear flow.

DISCUSSION—Shearing an oil can sometimes cause scission of certain molecular species, resulting in a decrease in viscosity. Not all oils exhibit this response. Common ways of shearing oils to elicit this effect include injection through a small orifice and flow through gears or bearings. Irradiation with sonic energy can also decrease the viscosity of some oils. **D 6022**

shear degradation, *n*—the decrease in molecular weight of a polymeric thickener (VI improver) as a result of exposure to high shear stress. **D 6080**

shear rate, *n—in fluid flow*, the velocity gradient across the fluid.

shear rate, *n*—the velocity gradient in fluid flow. **D 6080**

shear rate, *n*—the rate at which a series of adjacent layers of grease move with respect to each other; proportional to the linear velocity of flow divided by the capillary radius, and is thus expressed as reciprocal seconds. **D 1092**

shear stability, *n*—the resistance of a polymer-thickened fluid to shear degradation. **D 6080**

shear stress, *n*—the motivating force per unit area for fluid flow. **D 6080**

shelf life, *n*—the period of time, under specified storage conditions, for which the reference material (RM) will possess the same properties or true values, within established acceptance limits. **D 6596**

shock treatment, *n*—the addition of an antimicrobial agent sufficient to cause rapid and substantial (several orders of magnitude) reductions in number of living microbes in a fluid or system receiving that concentration. **D 6469**

SI—abbreviation for Le Système International d′Unités (SI), The International System of Units (SI): The Modern Metric System.

single base, *adj—in lubricating grease*, relating to a thickener comprised of soaps of only one metal. **D 128**

skinnogen, *n*—(Synonym—**biofilm**.)

DISCUSSION—Generally applied to a biofilm formed at the fuel-water

interface. **D 6469**

sludge, *n—in internal combustion engines*, a deposit, principally composed of insoluble resins and oxidation products from fuel combustion and the lubricant, that does not drain from engine parts but can be removed by wiping with a cloth. **D 5302**

sludge, *n*—a precipitate or sediment from oxidized mineral oil and water. **D 4310**

sludge, *n—in manual transmissions and final drive axles*, a deposit principally composed of the lubricating oil and oxidation products that do not drain from parts but can be removed by wiping with a cloth. **D 5704**

smoke point, *n*—the maximum height of a smokeless flame of fuel burned in a wick-fed lamp.

soap, *n—in lubricating grease*, a product formed in the saponification (neutralization) of fats, fatty acids, or esters by inorganic bases. **D 128**

solidification point, *n—of petroleum wax*, that temperature in the cooling curve of the wax where the slope of the curve first changes significantly as the wax sample changes from a liquid to a solid state.

solidification point of petroleum wax, *n*—that temperature in the cooling curve of the wax where the slope of the curve first changes significantly as the wax sample changes from a liquid to a solid state. **D 3944**

solubility parameter, *n—of liquids*, the square root of the heat of vaporization minus work of vaporization (cohesive energy density), per unit volume of liquid, at 298 K.

soluble oil, *n*—an oil-rich concentrate that will mix with water to form an emulsion imparting such properties as lubrication, cooling, and corrosion inhibition.

sonication, *n*—the act of subjecting a material to the shearing forces of high-frequency sound waves.

DISCUSSION—Sonication of a two phase liquid system may result in the dispersal of one phase as fine droplets in the other phase. **D 6006, [D02.12] D 6384**

soot, *n—in internal combustion engines*, sub-micron size particles, primarily carbon, created in the combustion chamber as products of incomplete combustion. **D 5862**

sour, *v*—to increase the concentration of hydrogen sulfide. **D 6469**

Soxhlet apparatus, *n*—a device, usually of glass, used to extract soluble material from a mixture of soluble and insoluble (generally solid) materials, by passing a volatile solvent through the sample and recirculating the solvent by refluxing. **D 128**

spark plug fouling, *n*—deposition of essentially nonconducting material onto the electrodes of a spark plug that may, but will not necessarily, prevent the plug from operating. **D 4857, D 4858**

spark plug whiskering, or spark plug bridging, *n*—a deposit of conductive material on the spark plug electrodes that tends to form a bridge between them, thus shorting out the plug. **D 4857, D 4858**

spatulate, *n*—to mix or blend by spreading and folding with a flat thin, usually metal, tool. **D 6185**

specimen, *n*—a piece or portion of a sample used to make a test. **D 6594**

specular gloss, *n—in waxed paper and paperboard technology*, the degree to which a surface simulates a mirror in its capacity to reflect incident light.

specular gloss, *n*—the degree to which a surface simulates a mirror in its capacity to reflect incident light. **D 1834**

specific gravity, *n—deprecated term*, the ratio of the density of a substance to that of a reference substance such as water (for solids and liquids) or hydrogen (for gases) under specified conditions (see **relative density**).

sponsor, *n—of an ASTM test method*, an organization that is responsible for ensuring supply of the apparatus used in the test procedure portion of the test method.

DISCUSSION—In some instances, such as a test method for chemical analysis, an ASTM working group can be the *sponsor* of a test method. In other instances, a company with a self-interest may or may not be the *developer* of the test procedure used within the test method, but is the *sponsor* of the test method. **D 6750**

spread, *n—in knock measurement*, the sensitivity of the detonation meter expressed in knockmeter divisions per octane number. **D 2699, D 2700**

SRV, *n*—Schwingung, Reibung, Verschleiss, (German); oscillating, friction, wear, (English translation). **D 5707**

stability testing, *n*—tests required to demonstrate the chemical stability of the ampulized reference material (RM) for the purpose of determining the shelf life of the RM. **D 6596**

stable engine conditions, *n—for octane rating*, cylinder head temperatures change less than 5°C (9°F) during a 1 min period. Any changes or minor adjustments to throttle, mixture, or engine conditions mandate restarting the clock for determining stable conditions. **D 6424**

standard deviation, *n*—the most usual measure of the dispersion of observed values or results expressed as the positive square root of the variance. **D 6300, [E11] E 456**

standard knock intensity, *n—for knock testing*, that level of knock established when a primary reference fuel blend of specific octane number is used in the knock testing unit at maximum knock intensity fuel-air ratio, with the cylinder height (dial indicator or digital counter reading) set to the prescribed guide table value. The detonation meter is adjusted to produce a knockmeter reading of 50 for these conditions. **D 2699, D 2700**

standard test, *n*—a test on a calibrated test stand, using the prescribed equipment that is assembled according to the requirements in the test method, and conducted according to the specified operating conditions.

DISCUSSION—The specified operating conditions in some test methods include requirements for determining a test's operational validity. These requirements are applied after a test is completed, and can include (*1*) mid-limit ranges for the *average* values of primary and secondary parameters that are narrower than the specified control ranges for the *individual* values, (*2*) allowable *deviations* for *individual* primary and secondary parameters from the specified control ranges, (*3*) downtime limitations, and (*4*) *special* parameter limitations. **D 6750**

static hold-up or wettage, *n*—the quantity of liquid retained in the column after draining at the end of a distillation.

DISCUSSION—It is characteristic of the packing or the design of the plates, and depends on the composition of the material in the column at the final cut point and on the final temperature. **D 2892**

storage point, *n*—an indication of the minimum temperature to which an oil should be heated in any part of an oil-handling installation when starting up after a shutdown. It is also an indication of the minimum temperature at which the oil should be stored in a tank fitted with an outflow heater. **D 3245**

straight-run gases, *n*—hydrocarbon gases that do not contain unsaturates. **D 2650**

stripping, *n*—the process whereby volatile fractions are removed from a liquid material.

DISCUSSION—In this test method, lighter components such as water and gasoline are removed by the application of heat while passing an inert gas through the liquid. **D 3607**

stuck lifter, *n*—*in internal combustion engines*, a lifter plunger that does not return to its original position by its own force upon removal from the engine. **D 5844**

sulfate reducing bacterial (SRB), pl., *n*—any bacteria with the capability of reducing sulfate to sulfide.

DISCUSSION—The term SRB applies to representatives from a variety of bacterial taxa that share the common feature of sulfate reduction ($SO_4^=$ to $S^=$). SRB are major contributors to MIC. **D 6469**

sulfated ash, *n*—the residue remaining after the sample has been carbonized, and the residue subsequently treated with sulfuric acid and heated to constant weight. **D 874**

sum of squares, *n*—in analysis of variance, a contraction of the expression "sum of the squared deviations from the appropriate average(s)" where the average(s) of interest may be the average(s) of specific subset(s) of data or of the entire set of data. **D 6300, [D13] D 123**

supernatant, *n*—the liquid above settled solids. **D 6384**

supplier, *n*—any individual or organization responsible for the quality of a product just before it is taken over by the receiver. **D 3244**

surface tension (γ), *n*—the specific surface free energy of a liquid gas interface, millinewton per metre (ergs/cm^2). **D 3825**

surfactants, *n*—surface active molecular species that exhibit both water soluble and oil soluble properties, and affect the physical behavior at the interface between water and oil phases by forming emulsions or changing the wetting characteristics of solid surfaces exposed to water and oil. **D 5000**

suspended solids (of activated sludge or other inoculum samples), *n*—solids present in activated sludge or inoculum samples that are not removed by settling under specified conditions. **D 6139**

syneresis, *n*—of lubricating greases, the separation of liquid lubricant from a lubricating grease due to shrinkage or rearrangement of the structure.

DISCUSSION—Syneresis is a form of bleeding caused by physical or chemical changes of the thickness. Separation of free oil or the formation of cracks that occur in lubricating greases during storage in containers is most often due to syneresis. **D 6185**

synthetic, *adj—in lubricants*, originating from the chemical synthesis of relatively pure organic compounds from one or more of a wide variety of raw materials.

system noise, *n*—the difference between the maximum and minimum area readings per second for the first 20 area readings in the blank run. **D 3710**

T—*in electromagnetics*, symbol for transmittance.

takeoff rate, *n*—the rate of product takeoff from the reflux divider expressed in millilitres per hour. **D 2892**

takeoff rate, *n—in column distillation*, the volume of product withdrawn from the reflux divider over a specified period.

tar, *n*—a brown or black, bituminous, liquid or semi-solid comprised primarily of bitumens condensed in the processing of coal, petroleum, oil-shale, wood, or other organic materials. **D 128**

target octane number, *n*—the research or motor octane number quality desired for a specific product.

taxa, pl., *n*—the units of classification of organisms, based on their relative similarities.

DISCUSSION—Each *taxonomic unit* (group of organisms with greatest number of similarities) is assigned, beginning with the most inclusive to kingdom, division, class, order, family, genus, and species. Bacteria and fungi are often further classified by strain and biovariation. **D 6469**

TEL—abbreviation for tetraethyllead (a gasoline antiknock agent).

terrestrial (or soil) environment, *n*—the aerobic environmental compartment which is found in and on natural soils. **D 6046, [D02.12] D 6384**

test oil, *n*—any oil subjected to evaluation in an established procedure. **D 6557**

test sample, *n*—a portion of the product taken at the place where the product is exchanged, that is, where the responsibility for the product quality passes from the supplier to the receiver. Actually, this is rarely possible and a suitable sampling location should be mutually agreed on. **D 3244**

test start, *n*—introduction of test oil into the engine. **D 6709**

theoretical carbon dioxide ($ThCO_2$), *n*—the amount of CO_2 which could theoretically be produced from the complete biological oxidation of all of the carbon in a test material. **D 6139**

theoretical O_2(oxygen), *n*—the amount of oxygen that is theoretically required to oxidize a material.

DISCUSSION—The appropriate abbreviation is ThO_2. **D 6384**

theoretical O_2, *n*—the amount of oxygen which would theoretically be required to completely oxidize a material. **D 6046**

theoretical CO_2, *n*—the amount of CO_2 which could in theory be produced from the complete oxidation of all the carbon in a material. **D 6046**

theoretical plate, *n*—the section of a column required to achieve thermodynamic equilibrium between a liquid and its vapor.

DISCUSSION—The height equivalent to one theoretical plate (HETP) for packed columns is expressed in millimetres. In the case of real plate columns, the efficiency is expressed as the percentage of one theoretical

plate that is achieved on one real plate. **D 2892**

thermal and oxidative stability, *n—in lubricating oils used for manual transmissions and final drive axles*, a lack of deterioration of the lubricating oil under high-temperature conditions that is observed as viscosity increase of the lubricating oil, insolubles formation in the lubricating oil, or deposit formation on the parts, or a combination thereof. **D 5704**

thermal stability, *n*—the resistance to permanent changes in properties caused solely by heat.

thickener, *n—in lubricating grease*, a substance composed of finely divided solid particles dispersed in a liquid lubricant to form the product's structure.

DISCUSSION—The thickener can be fibres (such as various metallic soaps) or plates or spheres (such as certain non-soap thickeners), which are insoluble or, at most, only very slightly soluble in the liquid lubricant. The general requirements are that the solid particles be extremely small, uniformly dispersed, and capable of forming a relatively stable, gel-like structure with the liquid lubricant. **D 128**

thimble, *n—in Soxhlet apparatus*, a closed-end porous cylinder used to hold the material to be extracted, usually made of thick matted filter paper but sometimes made of ceramic. **D 128**

thin film fluid lubricant, *n*—fluid lubricants consisting of a primary liquid with or without additives of lubricating powders and without binders or adhesives, which form a film on one or both surfaces to be lubricated and perform their function after application and after excess material has drained from the application area, and without additional material being supplied by either a continuous or intermittent method. **D 5620**

tight piston ring, *n—in internal combustion engines*, a piston ring that will not fall in its groove under its own weight when the piston, with the ring in a horizontal plane, is turned 90° (putting the ring in a vertical plane); by subsequent application of moderate finger pressure, the ring will be displaced. **D 5862**

time constant, *n—in data acquisition*, a value which represents a measure of the time response of a system. For a first order system responding to a step change input, it is the time required for the output to reach 63.2 % of its final value. **D 6593**

toluene insolubles, *n*—that portion of the pentane insolubles not soluble in toluene (methylbenzene).

toluene insolubles, *n—in used oil analysis*, the portion of pentane insolubles not soluble in toluene. **D 893**

toluene standardization fuels, *n—for knock testing*, those volumetrically proportioned blends of two or more of the following: reference fuel grade toluene, *n*-heptane, and *iso*octane that have prescribed rating tolerances for $O.N._{ARV}$ determined by round-robin testing under reproducibility conditions. **D 2699, D 2700**

total fluid constituent, *n—in lubricating grease analysis*, the *n*-hexane-soluble material extracted from the lubricating grease sample.

DISCUSSION—Typical materials include petroleum oil, non-petroleum fluid, soluble fats, and soluble additives. **D 128**

total glycerin, *n*—is the sum of free and bonded glycerin. **D 6584**

total n-hexane-insoluble material, *n—in lubricating grease analysis*, that portion of grease (excluding free alkali) that is essentially insoluble in n-hexane.

DISCUSSION—Typical materials include thickeners, fillers, inorganic salts, asphaltenes or any combinations of these (also includes insoluble materials found in the analysis of contaminated grease). Free alkali content is generally insignificant. **D 128**

total sum of squares (TSS), *n*—a statistic used to quantify the information content from the inter-laboratory study in terms of total variation of sample means relative to the standard error of each sample mean. **D 6708**

toxicity, *n*—the propensity of a test material to produce adverse behavioral, biochemical, or physiological effects in a living organism. **D 6081, D 6384**

transmittance, T, *n*—the fraction of radiant energy entering a substance that reaches its further boundary.

transmittance, T, *n*—the molecular property of a substance that determines its transportability of radiant power, expressed by:

$$T = P/P_o$$

where:

P = the radiant power passing through the sample, and
P_o = the radiant power incident upon the sample.

D 2008

trap, *n*—a device utilized to selectively retain specific portions (individual or groups of hydrocarbons or oxygenates) of the test sample and to release the retained components by increasing the trap temperature. **D 6296**

Tristimulus Values, *n*—the amounts of three specified stimuli required to match a color.

DISCUSSION—In the CIE system, they are assigned the symbols X, Y, and Z. **D 6045, [E12] E 284**

true value, μ, *n—in statistics*, the value towards which the average of single results obtained by N laboratories tends, when N becomes very large.

true value, (μ), *n*—for practical purposes, the value towards which the average of single results obtained by *N* laboratories tends, when *N* becomes very large. Consequently, such a true value is associated with the particular test method employed.

DISCUSSION—It is recognized that there are cases where a true value not equal to the method average can exist. As used in this practice, the method average value is intended to mean "true value" even if the method is biased. **D 3244**

Type I mineral oils, *n*—oils for steam and gas turbine lubricating systems where the machinery does *not* require lubricants with enhanced load carrying capacity. Such oils normally contain rust and oxidation inhibitors plus other additives as needed to meet the specified performance characteristics. Type I oils usually are available in ISO-VG 32, 46, 68, and 100 (see Classification D 2422). **D 4304**

Type II mineral oils, *n*—oils for steam and gas turbine lubricating systems where the machinery requires enhanced

load carrying capacity. These oils are similar to Type I and are typically used in gas turbines with a load carrying gear marine turbines. Such oils contain rust and oxidation inhibitors, plus mild extreme pressure (EP) additives and other additives as needed to meet the specified performance characteristics. Type II oils usually are available in ISO-VG 32, 46, 68, 100, and 150. **D 4304**

ullage, *n*—that volume of a closed system or container which is filled with vapor.

ultimate biodegradation, *n*—degradation achieved when the test substance is totally utilized by microorganisms resulting in the production of CO_2, (and possibly methane in the case of anaerobic biodegradation), water, inorganic compounds, and new microbial cellular constituents (biomass or secretions, or both). **D 5864**

ultimate biodegradation test, *n*—a test that estimates the extent to which the carbon in a product has been converted to CO_2 or methane, either directly, by measuring the production of CO_2 or methane, or indirectly, by measuring the consumption of O_2.

DISCUSSION—The measurement of new biomass is not attempted. **D 5864**

unsaponifiable matter, *n—in lubricating grease*, organic materials, either added or found with fatty materials, which do not react during saponification. **D 128**

unsulfonated residue, *n—in oils*, that portion of an oil remaining unsulfonated after treatment with concentrated sulfuric acid. **D 483**

used oil, *n—in petroleum product recycling*, oil whose characteristics have changed since being originally manufactured, and which is suitable for recycling (see also **waste oil**).

used oil, *n*—any oil that has been in a piece of equipment (for example, an engine, gearbox, transformer, or turbine), whether operated or not (see also **used oil,** *in petroleum product recycling*).

used oil, *n—in petroleum product recycling*, oil whose characteristics have changed since being originally manufactured, and that is suitable for recycling. **D 6448, D 6823**

used oil, *n*—any oil that has been in a piece of equipment (for example, an engine, gearbox, transformer or turbine) whether operated or not.

DISCUSSION—Typically, in this test method, the acidity of oxidized hydraulic or steam turbine oils is measured. **D 3339**

vapor-liquid ratio, *n—of a liquid*, the ratio, at a specified temperature and pressure, of the volume of vapor in equilibrium with liquid to the volume of liquid sample charged, at 32°F (0°C).

vapor pressure, *n*—the pressure exerted by the vapor of a liquid when in equilibrium with the liquid. **D 1267**

variance, *n*—a measure of the dispersion of a series of accepted results about their average. It is equal to the sum of the squares of the deviation of each result from the average, divided by the number of degrees of freedom. **D 6300, RR:D02-1007[3]**

variance, between-laboratory, *n*—that component of the overall variance due to the difference in the mean values obtained by different laboratories. **D 6300, [ISO/TC 28] ISO 4259**

DISCUSSION—When results obtained by more than one laboratory are compared, the scatter is usually wider than when the same number of tests are carried out by a single laboratory, and there is some variation between means obtained by different laboratories. Differences in operator technique, instrumentation, environment, and sample "as received" are among the factors that can affect the between laboratory variance. There is a corresponding definition for between-operator variance.

DISCUSSION—The term "between-laboratory" is often shortened to "laboratory" when used to qualify representative parameters of the dispersion of the population of results, for example, as "laboratory variance." **D 6300**

varnish, *n—in internal combustion engines*, a hard, dry, generally lustrous deposit that can be removed by solvents but not by wiping with a cloth. **D 5302**

varnish, *n—in manual transmissions and final drive axles*, a hard, dry, generally lustrous deposit that can be removed by solvents but not by wiping with a cloth. **D 5704**

viable titer, *n*—the number of living microbes present per unit volume, mass, or area.

DISCUSSION—Viable titer is reported in terms of either colony forming units (CFU) or most probable number (MPN) per millilitre, milligram, or centimetre squared. **D 6469**

viscosity, *n*—the ratio between the applied shear stress and rate of shear. It is sometimes called the coefficient of dynamic viscosity. This value is thus a measure of the resistance to flow of the liquid. The SI unit of viscosity is the pascal second (Pa.s). The centipoise (cP) is one millipascal second (mPa.s) and is often used. **D 3829**

viscosity index (VI), *n*—an arbitrary number used to characterize the variation of the kinematic viscosity of a fluid with temperature. **D 6080**

viscosity loss (VL), *n*—a measure of the decrease in an oil's viscosity.

DISCUSSION—Viscosity Loss is a property measured for a finished oil. Permanent Shear Stability Index (q.v.) is a property calculated for a single component. Some test methods report VL as a relative change, which is dimensionless (for example, Test Methods D 2603, D 3945, D 5275, D 5621). Some test methods and specifications report VL as an absolute change, which has the same dimensions as the viscosity measurements (for example, Specification D 4485 and Test Method D 5119). **D 6022**

VL—*in viscometry*, abbreviation for viscosity loss.

volatile fuels—relatively wide boiling range volatile distillate.

DISCUSSION—These are identified as Jet B in Specification D 1655 or the military grade known as JP-4. Any fuel or mixture having a flash point less than 38°C must be considered volatile. **D 5452**

volume count, *n*—the product of the area under a peak and a response factor. **D 3710**

waste oil, *n—in petroleum technology*, oil having characteristics making it unsuitable either for further use or for economic recycling. **D 6448**

water accommodated fraction (WAF), *n*—the predominately aqueous portion of a mixture of water and a poorly water-soluble material which separates in a specified period of time

after the mixture has undergone a specified degree of mixing and includes water, dissolved components, and dispersed droplets of the poorly water soluble material.

DISCUSSION—The chemical composition of the WAF depends on the ratio of poorly soluble material to water in the original mixture as well as the details of the mixing procedure. **D 6046**

water soluble fraction (WSF), *n*—the filtrate or centrifugate of the water accommodated fraction which includes all parts of the WAF, except the dispersed droplets of the poorly soluble material. **D 6081, D 6384**

wax blocking point, *n*—the lowest temperature at which film disruption occurs across 50 % of the waxed paper surface when the test strips are separated. **D 1465**

wax loading, *n*—the weight of wax present primarily as a surface film but including the minor part embedded in the surface fibers of corrugated board. It is expressed as weight per unit area, usually in grams per square metre or pounds per thousand square feet of board. **D 3708**

wax picking point, *n*—the temperature at which the first film disruption occurs on the waxed paper when test strips are separated. **D 1465**

wear, *n*—damage to a solid surface, generally involving progressive loss of material, due to relative motion between that surface and a contacting substance or substances. **D 2714, D 2782, D 5620, [G02] G 40**

wear, *n*—the loss of material from, or relocation of material on, a surface.

DISCUSSION—Wear generally occurs between two surfaces moving relative to each other, and is the result of mechanical or chemical action or a combination of mechanical and chemical actions. **D 5844, D 5862**

wear, *n*—the loss of material from two or more surfaces in relative motion. **D 5579**

wear, *n*—the removal of metal from a rubbing surface by mechanical action, or by a combination of mechanical and chemical actions. **D 2509**

wear, *n*—the removal of metal from the test pieces by a mechanical or chemical action, or by a combination of mechanical and chemical actions. **D 5119**

wear rate, *n*—the rate of material removal or dimensional change due to wear per unit of exposure parameter; for example, quantity of material removed (mass, volume, thickness) in unit distance of sliding or unit time. **D 3702**

weight of applied coating wax, *n*—the weight of applied coating per unit area of board, usually grams per square metre or pounds per thousand square feet of board covered. **D 3522**

weight of wax coating, *n*—the weight of wax present as a surface film on corrugated paperboard, expressed as weight per unit area, usually grams per square metre or pounds of coating per thousand feet of board covered.

DISCUSSION—This definition excludes any portion of wax that is located below the surface, that may have been permitted to soak into the fibrous paperboard structure. **D 3521**

weight percent impregnating wax, *n*—the weight percent of wax in the facing relative to the weight of unwaxed facing measured at 23°C (73°F) and 50 % relative humidity. **D 3522**

weld point—under the conditions of this test, the lowest applied load in kilograms at which the rotating ball welds to the three stationary balls, indicating the extreme-pressure level of the lubricants-force (or newtons) has been exceeded.

DISCUSSION—Some lubricants do not allow true welding, and extreme scoring of the three stationary balls results. In such cases, the applied load which produces a maximum scar diameter of 4 mm is reported as the weld point. **D 2783**

weld point, *n*—the lowest applied load at which sliding surfaces seize and then weld.

DISCUSSION—Under the conditions of this test, the lowest applied load in kilograms-force (or newtons) at which the rotating ball seizes and then welds to the three stationary balls, indicating the extreme-pressure level of the lubricating grease has been exceeded. See Fig. 1, Point D.

DISCUSSION—Some lubricating greases do not allow true welding, and extreme scoring of the three stationary balls results. In such cases, the applied load which produces a maximum scar diameter of 4 mm is reported as the weld point. **D 2596**

wettage, *n*—see **static hold-up or wettage**.

wppm, *abbr.*—an abbreviation for part per million by weight. **D 6384**

WSF—*in aquatic toxicity testing*, abbreviation for water soluble fraction.

yield stress, *n*—*in solids*, the maximum stress that can be applied without causing permanent deformation.

yield stress, *n*—*in fluids*, the shear stress required to initiate flow.