GLOSSARY OF DRILLING FLUID
AND ASSOCIATED TERMS

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ABSORPTION—The penetration or apparent disappearance of molecules or ions of one or more substances into the interior of a solid or liquid. For example, in hydrated bentonite, the planar water that is held between the mica-like layers is the result of absorption.

ACID—Any chemical compound containing hydrogen capable of being replaced by positive elements or radicals to form salts. In terms of the dissociation theory, it is a compound which, on dissociation in solution, yields excess hydrogen ions. Acids lower the pH. Examples of acids or acidic substances are: hydrochloric acid, tannic acid, sodium acid pyrophosphate.

ACIDITY—The relative acid strength of liquids as measured by pH. A pH value below 7. See pH.

ADHESION—The force which holds together unlike molecules.

ADSORPTION—A surface phenomenon exhibited by a solid (adsorbent) to hold or concentrate gases, liquids, or dissolved substances (adsorptive) upon its surface, a property due to adhesion. For example, that water held to the outside surface of hydrated bentonite is adsorbed water.

AERATION—The technique of injecting air or gas in varying amounts into a drilling fluid for the purpose of reducing hydrostatic head. Compare Air Cutting.

AGGLOMERATE—The larger groups of individual particles usually originating in sieving or drying operations.

AGGLOMERATION—The grouping of individual particles.

AGGREGATE—A group of two or more individual particles held together by strong forces. Aggregates are stable to normal stirring, shaking, or handling as powder or a suspension. They may be broken by drastic treatment such as ball milling a powder or by shearing a suspension.

AGGREGATION—Formation of aggregates. In drilling fluids, aggregation results in the stacking of the clay platelets face to face. The viscosity and gel strength decrease in consequence.

AIR CUTTING—The inadvertent mechanical incorporation and dispersion of air into a drilling-fluid system. Compare Aeration.

ALKALI—Any compound having marked basic properties. See Base.

ALKALINITY—The combining power of a base measured by the maximum number of equivalents of an acid with which it can react to form a salt. In water analysis, it represents the carbonates, bicarbonates, hydroxides, and occasionally the borates, silicates, and phosphates in the water. It is determined by titration with standard acid to certain datum points. See API RP 13B* for specific directions for determination of phenolphthalein.

(P) and methyl orange (M) alkalinites of the filtrate in drilling fluids and the alkalinity of the mud itself (P.). Also see P., M., and P.

ALUMINUM STEARATE—An aluminum salt of stearic acid used as a defoamer. See Stearate.

ANALYSIS, MUD OR DRILLING-FLUID—Examination and testing of the drilling fluid to determine its physical and chemical properties and condition.

ANHYDRITE—See Calcium Sulfate. Anhydrite is often encountered while drilling. It may occur as thin stringers or massive formations.

ANHYDROUS—Without water.

ANILINE POINT—The lowest temperature at which equal volumes of freshly distilled aniline and an oil which is being tested are completely miscible. This test gives an indication of the character (paraffinic, naphthenic, asphaltic, aromatic, midcontinent, etc.) of the oil. The aniline point of a diesel or crude used in drilling mud is also an indication of the deteriorating effect these materials may have on natural or synthetic rubber. The lower the aniline point of an oil the more severe it usually is in damaging rubber parts.

ANION—A negatively charged atom or radical, such as Cl-, OH-, SO4-, etc., in solution of an electrolyte. Anions move toward the anode (positive electrode) under the influence of an electrical potential.

ANNUAL VELOCITY—The velocity of a fluid moving in the annulus.

ANNUUS OR ANNULAR SPACE—The space between the drill string and the wall of the hole or casing.

ANTIFOAM—A substance used to prevent foam by greatly increasing the surface tension. Compare Defoamer.

API GRAVITY—The gravity (weight per unit volume) of crude oil or other related fluids as measured by a system recommended by the American Petroleum Institute. It is related to specific gravity by the following formula:

\[ \text{API} = \frac{141.5}{\text{sp gr}} - 131.5 \]

APPARENT VISCOSITY—The viscosity a fluid appears to have on a given instrument at a stated rate of shear. It is a function of the plastic viscosity and the yield point. The apparent viscosity in centipoises, as determined by the direct-indicating viscometer (which see), is equal to \( \frac{1}{2} \) the 600-rpm reading. See also Viscosity, Plastic Viscosity, and Yield Point. In a Newtonian fluid, the apparent viscosity is numerically equal to the plastic viscosity.

ASBESTOS—Term applied to many fibrous silicate minerals, some forms of which are used in certain drilling fluids.

ASPHALT—A natural or mechanical mixture of solid or viscous bitumens found in natural beds or obtained as a residue from petroleum. Asphalt, blends containing asphalt, and altered asphaltic materials (e.g., air-blown, chemically modified, etc.) have been added to certain drilling fluids for such widely different purposes as a component in oil-base muds, lost-circulation material, emulsifier, fluid-loss-control agent, wall-plastering agent, etc.

*Standard Procedure for Testing Drilling Fluids, American Petroleum Institute, Dallas, Texas, Nov. (1962), 1st Ed.

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ATOM—According to the atomic theory, the smallest unit of an element which is capable of entering into chemical combination or that can exist alone.

ATOMIC NUMBER—The relative weight of an atom of an element as compared with the weight of 1 atom of oxygen, using 16 as the weight of 1 atom of oxygen.

ATTAPULGITE CLAY—A colloidal, viscosity-building clay used principally in salt-water muds. Attapulgite, a special fuller's earth, is a hydrous magnesium aluminum silicate.

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BALANCE, MUD—A beam-type balance used in determining mud density. It consists primarily of a base, graduated beam with constant-volume cup, lid, rider, knife edge, and counterweight.

BARITE, BARYTES, OR HEAVY SPAR—Natural barium sulfate used for increasing the density of drilling fluids. If required, it is usually upgraded to a specific gravity of 4.20. The barite mineral occurs in white, grayish, greenish, and reddish ores or crystalline masses.

BARIUM SULFATE—BaSO₄. See Barite.

BARREL—A volumetric unit of measure used in the petroleum industry consisting of 42 gal.

BARREL EQUIVALENT—A laboratory unit used for evaluating or testing drilling fluids. One gram of material, when added to 350 ml of fluid, is equivalent to 1 lb of material when added to one 42-gal barrel of fluid.

BASE—A compound of a metal, or a metal-like group, with hydrogen and oxygen in the proportion to form an OH radical, which ionizes in aqueous solution to yield excess hydroxyl ions. Bases are formed when metallic oxides react with water. Bases increase the pH. Examples are caustic soda and lime.

BASE EXCHANGE—The replacement of cations associated with the clay surface by those of another species, e.g., the conversion of sodium clay to calcium clay.

BASICITY—pH value above 7. Ability to neutralize or accept protons from acids.

BENTONITE—A plastic, colloidal clay, largely made up of the mineral sodium montmorillonite, a hydrated aluminum silicate. For use in drilling fluids, bentonite has a yield in excess of 85 bbl/ton. The generic term “bentonite” is neither an exact mineralogical name, nor is the clay of definite mineralogical composition.

BICARB—See Sodium Bicarbonate.

BLOODE LINE—Flow line for air or gas drilling.

BLOWOUT—An uncontrolled escape of drilling fluid, gas, oil, or water from the well caused by the formation pressure being greater than the hydrostatic head of the fluid in the hole.

BOILERHOUSE—To make up a report on a condition as fact without knowledge of its accuracy. Sometimes referred to as “doghouse.”

BRACKISH WATER—Water containing low concentrations of any soluble salts.

BREAK CIRCULATION—To start movement of the drilling fluid after it has been quiescent in the hole.

BREAKOUT, OIL—Oil that has risen to the surface of the mud which previously had been combined in the mud as emulsion.

BRIDGE—An obstruction in a well formed by intrusion of subsurface formations.

BRINE—Water saturated with or containing a high concentration of common salt (sodium chloride) and, hence, any strong saline solution containing such other salts as calcium chloride, zinc chloride, calcium nitrate, etc.

BROMINE VALUE—The number of centigrams of bromine which are absorbed by 1 g of oil under certain conditions. This is a test for the degree of unsaturation of a given oil.

BROWNIAN MOVEMENT—Continuous, irregular motion exhibited by particles suspended in a liquid or gaseous medium, usually as a colloidal dispersion.

BS OR BS & W—Base sediment, or base sediment and water.

BUFFER—Any substance or combination of substances which, when dissolved in water, produces a solution which resists a change in its hydrogen ion concentration upon the addition of acid or base.

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CABLE-TOOL DRILLING—A method of drilling a well by allowing a weighted bit at the bottom of a cable to fall against the formation being penetrated. See Rotary Drilling.

CAKE CONSISTENCY—According to API RP 13B, such notations as “hard,” “soft,” “tough,” “rubbery,” “firm,” etc., may be used to convey some idea of cake consistency.

CAKE THICKNESS—The measurement of the thickness of the filter cake deposited by a drilling fluid against a porous medium, most often following the standard API filtration test. Cake thickness is usually reported in 32nd of an inch. See Filter Cake and Wall Cake.

CALCULUM—One of the alkaline earth elements with a valence of 2 and an atomic weight of about 40. Calcium compounds are a common cause of the hardness of water. It is also a component of lime, gypsum, limestone, etc.

CALCIUM CARBONATE—CaCO₃. An insoluble calcium salt sometimes used as a weighting material (limestone, oyster shell, etc.), in specialized drilling fluids. It is also used as a unit and/or standard to report hardness.

CALCIUM CHLORIDE—CaCl₂. A very soluble calcium salt sometimes added to drilling fluids to impart special properties, but primarily to increase the density of the fluid phase.

CALCIUM CONTAMINATION—Dissolved calcium ions in sufficient concentration to impart undesirable properties in a drilling fluid, such as flocculation, reduction in yield of bentonite, increase in fluid loss, etc. See also Calcium Sulfate, Gyp, Anhydrite, Lime, and Carbonate.

CALCIUM HYDROXIDE—Ca(OH)₂. The active ingredient of slaked lime. It is also the main constituent in cement (when wet). This material is referred to as “lime” in field terminology.
CALCITREATED MUDS—Calcium-treated muds are drilling fluids to which quantities of soluble calcium compounds have been added or allowed to remain from the formation drilled in order to impart special properties.

CALCULUM SULFATE—(Anhydrite: CaSO₄; plaster of paris: CaSO₄·1/2 H₂O; and gypsum: CaSO₄·2H₂O). Calcium sulfate occurs in muds as a contaminant or may be added to certain muds to impart special properties.

CATION—The positively charged particle in the solution of an electrolyte which, under the influence of an electrical potential, moves toward the cathode (negative electrode). Examples are: Na⁺, H⁺, NH₄⁺, Ca²⁺, Mg²⁺, Al³⁺.

CAUSTIC OR CAUSTIC SODA—See Sodium Hydroxide.

CAVE-IN—See Sloughing. Cave-in is a serious form of sloughing.

CAVERNOUS FORMATIONS—A formation having voluminous voids, usually the result of dissolving by formation waters which may or may not be still present.

CC OR CUBIC CENTIMETER—A metric-system unit for the measure of volume. It is essentially equal to the milliliter and commonly used interchangeably. One cubic centimeter of water at room temperature weighs approximately 1 g.

CEMENT—A mixture of calcium aluminates and silicates made by combining lime and clay while heating. Slaked cement contains about 62.5 percent calcium hydroxide, which is the major source of trouble when cement contaminates mud.

CENTPOISE (CP)—A unit of viscosity equal to 0.01 poise. A poise equals 1 g per meter-second, and a centipoise is 1 g per centimeter-second. The viscosity of water at 20°C is 1.005 cp (1 cp = 0.000672 lb/ft·sec).

CENTRIFUGE—A device for the mechanical separation of high specific gravity solids from a drilling fluid. Usually used on weighted muds to recover weight material and discard drill solids. The centrifuge uses high-speed mechanical rotation to achieve this separation, as distinguished from the cyclone-type separator in which the fluid energy alone provides the separating force. See Cyclone and Desander.

CHEMICALS—In drilling-fluid terminology, a chemical is any material that produces changes in the viscosity, yield point, gel strength, and fluid loss, as well as surface tension.

CHEMICAL BARIER—A container in which various chemicals are mixed prior to addition to the drilling fluid.

CHROMATE—A compound in which chromium has a valence of 6, e.g., sodium dichromate. Chromate may be added to drilling fluids either directly or as a constituent of chrome lignites or chrome lignosulfonates. In certain areas, chromate is widely used as an anodic corrosion inhibitor, often in conjunction with lime.

CHROME LIGNITE—Mined lignite, usually leonardite, to which chromate has been added and/or reacted. The lignite can also be causticized with either sodium or potassium hydroxide.

CIRCULATION—The movement of drilling fluid from the suction pit through pump, drill pipe, bit, an- nular space in the hole, and back again to the suction pit. The time involved is usually referred to as circulation time.

CIRCULATION, LOSS OF (OR LOST)—The result of drilling fluid escaping into the formation by way of crevices or porous media.

CIRCULATION RATE—The volume flow rate of the circulating drilling fluid usually expressed in gallons or barrels per minute.

CLARIFIED—A slang term commonly used to describe moderate to severe flocculation of mud due to various contaminants; also called "gelled-up."

CLAY—A plastic, soft, variously colored earth, commonly a hydrous silicate of alumina, formed by the decomposition of feldspar and other aluminum silicates. See also Attapulgite, Bentonite, High Yield, Low Yield, and Natural Clays. Clay minerals are essentially insoluble in water but disperse under hydration, shearing forces such as grinding, velocity effects, etc., into the extremely small particles varying from submicron to 100-micron sizes.

CLAY EXTENDER—Any of several substances, usually high molecular weight organic compounds that, when added in low concentrations to a bentonite or to certain other clay slurries, will increase the viscosity of the system, e.g., polyvinyl acetate-maleic anhydride copolymer. See Low-solids Mud.

CMC—See Sodium Carboxymethylcellulose.

COAGULATION—In drilling-fluid terminology, a synonym for flocculation.

COALESCE—The change from a liquid to a thickened curd-like state by chemical reaction. Also the combination of globules in an emulsion caused by molecular attraction of the surfaces.

COHESION—The attractive force between the same kind of molecules, i.e., the force which holds the molecules of a substance together.

COLLOID—A state of subdivision of matter which consists either of single large molecules or of aggregations of smaller molecules dispersed to such a degree that the surface forces become an important factor in determining its properties. The size and electrical charge of the particles determine the different phenomena observed with colloids, e.g., Brownian movement. The sizes of colloids range from 1 × 10⁻⁷ cm to 5 × 10⁻⁴ cm (0.001 to 0.50 microns) in diameter, although the particle size of some emulsions can be in the micron range.

COLLOIDAL COMPOSITION—A colloidal suspension containing one or more colloidal constituents.

COLLOIDAL SUSPENSION—Finely divided particles of ultramicroscopic size swimming in a liquid.

CONDUCTIVITY—A measure of the quantity of electricity transferred across unit area per unit potential gradient per unit time. It is the reciprocal of resistivity. Electrolytes may be added to the drilling fluid to alter its conductivity for logging purposes.

CONNATE WATER—Water that probably was laid down and entrapped with sedimentary deposits as distinguished from migratory waters that have flowed into deposits after they were laid down.

CONSISTENCY—The viscosity of a non-reversible fluid in poise, for a certain time interval at a given pressure and temperature.
CONSISTOMETER—A thickening-time tester having a stirring apparatus to measure the relative thickening time for mud or cement slurries under predetermined temperatures and pressures. See API RP 10B.*

CONTAMINATION—The presence in a drilling fluid of any foreign material that may tend to produce detrimental properties of the drilling fluid.

CONTINUOUS PHASE—The fluid phase which completely surrounds the dispersed phase that may be colloids, oil, etc.

CONTROLLED AGGREGATION—A condition in which the clay platelets are maintained stacked by a polyvalent cation, such as calcium, and are deflocculated by use of a thinner.

CONVENTIONAL MUD—A drilling fluid containing essentially clay and water.

COPOLYMER—A substance formed when two or more substances polymerize at the same time to yield a product which is not a mixture of separate polymers but a complex having properties different from either polymer alone. See Polymer. Examples are polyvinyl acetate-maleic anhydride copolymer (clay extender and selective flocculant), acrylamide-carboxylic acid copolymer (total flocculant), etc.

CORROSION—The adverse chemical alteration on a metal or the eating away of the metal by air, moisture, or chemicals; usually an oxide is formed.

CRATER—The formation of a large funnel-shaped cavity at the top of a hole resulting from a blowout or occasionally from caving.

CREAMING OF EMULSIONS—The settling or rising of the particles of the dispersed phase of an emulsion as observed by a difference in color shading of the layers formed. This can be either upward or downward creaming, depending upon the relative densities of the continuous and dispersed phases.

CREATED FRACTURES—Induced fractures by means of hydraulic or mechanical pressure exerted on the formation.

CUTTINGS—Small pieces of formation that are the result of the chipping and/or crushing action of the bit. See Samples.

CYCLE TIME, DRILLING-FLUID—The time of a cycle, or down the hole and back, is the time required for the pump to move the drilling fluid in the hole. The cycle in minutes equals the barrels of mud in the hole divided by barrels per minute.

CYCLONE—A device for the separation of various particles from a drilling fluid, most commonly used as a desander. The fluid is pumped tangentially into a cone, and the fluid rotation provides enough centrifugal force to separate particles by mass weight. See Centrifuge.

D—

Darcy—A unit of permeability. A porous medium has a permeability of 1 darcy when a pressure of 1 atm on a sample 1 cm long and 1 sq cm in cross section will force a liquid of 1 cp viscosity through the sample at the rate of 1 cc per sec.

DEFLOCCULATION—Breakup of floes of gel structures by use of a thinner.

DEFOMER OR DEFOMING AGENT—Any substance used to reduce or eliminate foam by reducing the surface tension. Compare Antifoam.

DEHYDRATION—Removal of free or combined water from a compound.

DIESEL-OIL PLUG—See Gunk Plug.

DELIQUESCENCE—The liquefaction of a solid substance due to the solution of the solid by adsorption of moisture from the air, e.g., calcium chloride.

DENSITY—Matter measured as mass per unit volume expressed in pounds per gallon (ppg), pounds per square inch per 1,000 ft of depth (psi/1,000 ft), and pounds per cubic ft (lb/cu ft). Density is commonly referred to as “weight.”

DESANDER—See Cyclone.

DIATOMACEOUS EARTH—An infusorial earth composed of siliceous skeletons of diatoms and being very porous. Sometimes used for combatting lost circulation and as an additive to cement; also has been added to special drilling fluids for a particular purpose.

DIFFERENTIAL PRESSURE—The difference in pressure between the hydrostatic head of the drilling-fluid column and the formation pressure at any given depth in the hole. It can be positive, zero, or negative with respect to the hydrostatic head.

DIFFERENTIAL-PRESSURE (WALL) STICKING—Sticking which occurs because part of the drill string (usually the drill collars) becomes embedded in the filter cake resulting in a non-uniform distribution of pressure around the circumference of the pipe. The conditions essential for sticking require a permeable formation and a pressure differential across a nearly impermeable filter cake and drill string.

DIFFUSION—The spreading, scattering, or mixing of a material (gas, liquid, or solid).

DILATANT FLUID—A dilatant or inverted plastic fluid is usually made up of a high concentration of well-dispersed solids which exhibits a non-linear consistency curve passing through the origin. The apparent viscosity increases instantaneously with increasing rate of shear. The yield point, as determined by conventional calculations from the direct-indicating viscometer readings, is negative; however, the true yield point is zero.

DILUENT—Liquid added to dilute or thin a solution.

DIRECT-INDICATING VISCOMETER—See Viscometer, Direct-indicating.

DISPERBANT—Any chemical which promotes dispersion of the dispersed phase.

DISPERSED PHASE—The scattered phase (solid, liquid, or gas) of a dispersion. The particles are finely divided and completely surrounded by the continuous phase.

DISPERSION (OF AGGREGATES)—Subdivision of aggregates. Dispersion increases the specific surface of the particle; hence results in an increase in viscosity and gel strength.

DISPERSOID—A colloid or finely divided substance.
Dissociation—The splitting up of a compound or element into two or more simple molecules, atoms, or ions. Applied usually to the effect of the action of heat or solvents upon dissolved substances. The reaction is reversible and not as permanent as decomposition; i.e., when the solvent is removed, the ions recombine.

Distillation—Process of first vaporizing a liquid and then condensing the vapor into a liquid (the distillate), leaving behind non-volatile substances, the total solids, of a drilling fluid. The distillate is the water and/or oil content of a fluid.

Dog-leg—The “elbow” caused by a sharp change of direction in the well bore.

Drilling In—The operation during the drilling procedure at the point of drilling into the pay formation.

Drilling Mud or Fluid—A circulating fluid used in rotary drilling to perform any or all of various functions required in the drilling operation.

Drilling Out—The operation during the drilling procedure when the cement is drilled out of the casing before further hole is made or completion attempted.

Drill-stem Test (DST) — A test to determine whether oil and/or gas in commercial quantities has been encountered in the well bore.

Dynamic—The state of being active or in motion; opposed to static.

Electric Logging—Electric logs are run on a wire line to obtain information concerning the porosity, permeability, fluid content of the formations drilled, and other information. The drilling-fluid characteristics may need to be altered to obtain good logs.

Electrolyte — A substance which dissociates into charged positive and negative ions when in solution or a fused state and which will then conduct an electric current. Acids, bases, and salts are common electrolytes.

Emulsifier or Emulsifying Agent—A substance used to produce an emulsion of two liquids which do not mix. Emulsifiers may be divided, according to their behavior, into ionic and non-ionic agents. The ionic types may be further divided into anionic, cationic, and amphoteric, depending upon the nature of the ion-active groups.

Emulsion—A substantially permanent heterogeneous liquid mixture of two or more liquids which do not normally dissolve in each other but which are held in suspension or dispersion, one in the other, by mechanical agitation or, more frequently, by adding small amounts of substances known as emulsifiers. Emulsions may be mechanical, chemical, or a combination of the two. They may be oil-in-water or water-in-oil types.

Emulsoid—Colloidal particles which take up water.

End Point—Indicates the end of some operation or when a definite change is observed. In titration this change is frequently a change in color of an indicator which has been added to the solution or the disappearance of a colored reactant.

Engineer, Mud or Drilling-fluid—One versed in drilling fluids whose duties are to manage, carry through, and maintain the various types of oil-well mud programs.

EP Additive—See Extreme-pressure Lubricant.

EPM or Equivalents per Million—Unit chemical weight of solute per million unit weights of solution. The epm of a solute in solution is equal to the ppm (parts per million) divided by the equivalent weight. Refer also to Fpm.

Equivalent Circulating Density—For a circulating fluid, the equivalent circulating density in lb/gal equals the hydrostatic head (psi) plus the total annular pressure drop (psi) divided by the depth (ft) and by 0.052.

Equivalent Weight or Combining Weight—The atomic or formula weight of an element, compound, or ion divided by its valence. Elements entering into combination always do so in quantities proportional to their equivalent weights.

Extreme-pressure Lubricant—Additives which, when added to the drilling fluid, impart lubrication to the bearing surfaces when subjected to extreme pressure conditions.

Fault—Geological term denoting a formation break, upward or downward, in the subsurface strata. Faults can significantly affect the area mud and casing programs.

Fermentation—Decomposition process of certain organic substances, e.g., starch in which a chemical change is brought about by enzymes, bacteria, or other micro-organisms. Often referred to as “souring.”

Fiber or Fibrous Materials—Any tough stringy material used to prevent loss of circulation or to restore circulation. In field use, fiber generally refers to the larger fibers of plant origin.

Filling the Hole—Pumping drilling fluid continuously or intermittently into the well bore to maintain the fluid level in the hole near the surface. The purpose is to avoid danger of blowout, water intrusion, and/or caving of the well bore, e.g., as the pipe is withdrawn.

Filler Line—The line through which fluid is added to the hole.

Filter Cake—The suspended solids that are deposited on a porous medium during the process of filtration. See also Cake Thickness.

Filter-Cake Texture—The physical properties of a cake as measured by toughness, slickness, and brittleness. See also Cake Consistency.

Filter-Cake Thickness—A measurement of the solids deposited on filter paper in 32nd of an inch during the standard 30-min API filter test. See Cake Thickness. In certain areas the filter-cake thickness is a measurement of the solids deposited on filter paper for a 7½-min duration.

Filter Loss—See Fluid Loss.

Filter Paper—Porous unsized paper for filtering liquids. API filtration test specifies one thickness of 0-cm filter paper Whatman No. 50, S&S No. 576, or equivalent.

Filter Press—A device for determining fluid loss of a drilling fluid having specifications in accordance with API RP 13B.
Filtrate—The liquid that is forced through a porous medium during the filtration process. For test, see Fluid Loss.

Filtration — The process of separating suspended solids from their liquid by forcing the latter through a porous medium. Two types of fluid filtration occur in a well: dynamic filtration while circulating, and static filtration when at rest.

Filtration Qualities—The filtration characteristics of a drilling mud. Generally these qualities are inverse to the thickness of the filter cake deposited on the face of a porous medium and the amount of filtrate allowed to escape from the drilling fluid into or through the medium.

Filtration Rate—See Fluid Loss.

Fishing—Operations on the rig for the purpose of retrieving from the well bore sections of pipe, collars, junk, or other obstructive items which are in the hole.

Flat Gel — A condition wherein the 10-min gel strength is substantially equal to the initial gel strength.

Flipped—When the opposite occurs of what is intended in a drilling fluid. In an invert water-in-oil emulsion, the emulsion is said to be flipped when the continuous and dispersed phases reverse.

Flocculates—Groups of aggregates or particles in suspension subject to being broken up by normal shaking and stirring and reforming on standing.

Flocculating Agent—Substances, such as most electrolytes, some polysaccharides, certain natural or synthetic polymers, that bring about the thickening of the consistency of a drilling fluid. In Bingham plastic fluids, the yield point and gel strength increase.

Flocculation—Loose association of particles in lightly bonded groups, non-parallel association of clay platelets. In concentrated suspensions, such as drilling fluids, flocculation results in gelation. In some drilling fluids, flocculation may be followed by irreversible precipitation of colloids and certain other substances from the fluid, e.g., red beds.

Floccs—See Flocculates.

Fluid—A fluid is a substance readily assuming the shape of the container in which it is placed. The term includes both liquids and gases. It is a substance in which the application of every system of stresses (other than hydrostatic pressure) will produce a continuously increasing deformation without any relation between time rate of deformation at any instant and the magnitude of stresses at that instant. Drilling fluids are usually Newtonian and plastic, seldom pseudoplastic, and rarely dilatant fluids.

Fluid Flow—The state of fluid dynamics of a fluid in motion is determined by the type of fluid (e.g., Newtonian, plastic, pseudoplastic, dilatant), the properties of the fluid such as viscosity and density, the geometry of the system, and the velocity. Thus, under a given set of conditions and fluid properties, the fluid flow can be described as plug flow, laminar (called also Newtonian, streamline, parallel, or viscous) flow, or turbulent flow. See above terms and Reynolds number.

Fluidity—The reciprocal of viscosity. The measure of rate with which a fluid is continuously deformed by a shearing stress. Ease of flowing.

Fluid Loss—Measure of the relative amount of fluid lost (filtrate) through permeable formations or membranes when the drilling fluid is subjected to a pressure differential. For standard API filtration-test procedure, see API RP 15B.

Fluorescence—Instantaneous re-emission of light of a greater wave length than that light originally absorbed.

Foam—A foam is a two-phase system, similar to an emulsion, where the dispersed phase is a gas or air.

Foaming Agent—A substance that produces fairly stable bubbles at the air-liquid interface due to agitation, aeration, or ebullition. In air or gas drilling, foaming agents are added to turn water influx into aerated foam. This is commonly called "mist drilling".

Formation Damage—Damage to the productivity of a well resulting from invasion into the formation by mud particles or mud filtrates. Asphalt from crude oil will also damage some formations. See Mudding Off.

Formation Sensitivity—The tendency of certain producing formations to adversely react with invading mud filtrates.

Functions of Drilling Fluids—The most important function of drilling fluids in rotary drilling is to bring cuttings from the bottom of the hole to the surface. Some other important functions are: control subsurface pressures, cool and lubricate the bit and drill string, deposition of an impermeable wall, etc.

Funnel Viscosity—See Marsh Funnel Viscosity.

G—

Galena—Lead sulfide (PbS). Technical grades (specific gravity about 7) are used for increasing the density of drilling fluids to points impractical or impossible with barite.

Gas Cut—Gas entrained by a drilling fluid. See Air Cutting.

Gel—A state of a colloidal suspension in which shearing stresses below a certain finite value fail to produce permanent deformation. The minimum shearing stress that will produce permanent deformation is known as the shear or gel strength of the gel. Gels commonly occur when the dispersed colloidal particles have a great affinity for the dispersing medium, i.e., are lyophilic. Thus gels commonly occur with bentonite in water. For their measurement, see Gel Strength, Initial and 10-min.

Gel—A term used to designate highly colloidal, high yielding, viscosity-building commercial clays, such as bentonite and attapulgite clays.

Gelation—Association of particles to form a continuous structure.

Gel Cement—Cement having a small to moderate percentage of bentonite added as a filler and/or to reduce the slurry weight. See Gunk Plug.

Gelled Up—Oil-field jargon usually referring to any fluid with high gel strength and/or highly viscous properties. Often a state of severe flocculation.
GEL STRENGTH—The ability or the measure of the ability of a colloid to form gels. Gel strength is a pressure unit usually reported in lb/100 sq ft. It is a measure of the same interparticle forces of a fluid as determined by the yield point except that gel strength is measured under static conditions, yield point under dynamic conditions. The common gel-strength measurements are initial and the 10-min gels (which see). See also Shear and Thixotropy.

GEL STRENGTH, INITIAL—The measured initial gel strength of a fluid is the maximum reading (deflection) taken from a direct-reading viscometer after the fluid has been quiescent for 10 sec. It is reported in lb/100 sq ft. See API RP 13B for details of test procedure.

GEL STRENGTH, 10-MIN—The measured 10-min gel strength of a fluid is the maximum reading (deflection) taken from a direct-reading viscometer after the fluid has been quiescent for 10 min. The reading is reported in lb/100 sq ft. See API RP 13B for details of test procedure.

GPG or GRAINS PER GALLON—Ppm (which see) equals gpg × 17.1.

GRAVITY, SPECIFIC—The weight of a particular volume of any substance compared to the weight of an equal volume of water at a reference temperature. For gases, air is usually taken as the reference substance, although hydrogen is sometimes used.

GREENING OUT—Certain organic substances, usually fatty-acid derivatives, which are added to drilling fluids as emulsifiers, e.g., lubricants, etc., may react with such ions as calcium and magnesium that are in or will subsequently come into the system. An essentially water-insoluble greasy material separates out.

GUM—Any hydrophilic plant polysaccharides or their derivatives which, when dispersed in water, swell to produce a viscous dispersion or solution. Unlike resins, they are soluble in water and insoluble in alcohol.

GUMBO—Any relatively sticky formation, such as clay, encountered in drilling.

GUAR GUM—A naturally occurring hydrophilic polysaccharide derived from the seed of the guar plant. The gum is chemically classified as a galactomannan. Guar gum slurries made up in clear fresh or brine water possess pseudoplastic flow properties.

GUNK PLUG—A slurry in crude or diesel oil containing any of the following materials or combinations: bentonite, cement, atapulgite, and guar gum (never with cement). Used primarily in combatting lost circulation. The plug may or may not be squeezed.

GUNNING THE PITS—Mechanical agitation of the drilling fluid in a pit by means of a mud gun, electric mixer, or agitator.

GYPSUM (or GYP) SEE Gypsum Sulfate. Gypsum is often encountered while drilling. It may occur as thin stringers or massive formations.

HARDNESS (of WATER)—The hardness of water is due principally to the calcium and magnesium ions present in the water and is independent of the accompanying acid ions. The total hardness is measured in terms of parts per million of calcium carbonate or calcium and sometimes equivalents per million of calcium. For hardness tests, see API RP 13B.

HEAVING—The partial or complete collapse of the walls of a hole resulting from internal pressures due primarily to swelling from hydration or formation gas pressures. See Sloughing.

HETEROGENEOUS—A substance that consists of more than one phase and is not uniform, such as colloids, emulsions, etc. It has different properties in different parts.

HIGH-PH MUD—A drilling fluid with a pH range above 10.5. A high-alkalinity mud.

HIGH-YIELD DRILLING CLAY—A classification given to a group of commercial drilling-clay preparations having a yield of 35 to 50 bbl/ton and intermediate between bentonite and low-yield clays. High-yield drilling clays are usually prepared by peptizing low-yield calcium montmorillonite clays or, in a few cases, by blending some bentonite with the peptized low-yield clay.

HOMOGENEOUS—Of uniform or similar nature throughout; or a substance or fluid that has at all points the same property or composition.

HOPPER, JET—See Mud-mixing Devices. A device to hold or feed drilling-mud additives.

HUMIC ACID—Organic acids of indefinite composition in naturally occurring leonardite lignite. The humic acids are the most valuable constituent. See Lignin.

HYDRATE—A substance containing water combined in the molecular form (such as CaSO4·2H2O). A crystalline substance containing water of crystallization.

HYDRAZINATION—The act of a substance to take up water by means of absorption and/or adsorption.

HYDROGEN ION CONCENTRATION—A measure of the acidity or alkalinity of a solution, normally expressed as pH. See pH.

HYDROLYSIS—Hydrolysis is the reaction of a salt with water to form an acid and base. For example, soda ash (Na2CO3) hydrates basically, and hydrolysis is responsible for the increase in the pH of water when soda ash is added.

HYDROMETER—A floating instrument for determining the specific gravity or density of liquids, solutions, and slurries. A common example is the Mudwate hydrometer used to determine the density of mud.

HYDROPHILE—A substance usually in the colloidal state or an emulsion, which is wetted by water; i.e., it attracts water or water adheres to it.

HYDROPHILIC—A property of a substance having an affinity for water or one that is wetted by water.

HYDROPHILIC-LIPIDIC BALANCE (HLB)—The hydrophilic-lipophilic balance (HLB) is one of the most important properties of emulsifiers. It is an expression of the relative attraction of an emulsifier for water and oil, determined largely by the chemical composition and ionization characteristics of a given emulsifier. The HLB of an emulsifier is not directly related to solubility, but it determines the type of an emulsion that tends to be formed. It is an indication of the behavior characteristics and not an indication of emulsifier efficiency.
**HYDROPHOBIC**—A substance, usually in the colloidal state, not wetted by water.

**HYDROPHOBIC**—Descriptive of a substance which repels water.

**HYDROSTATIC HEAD**—The pressure exerted by a column of fluid, usually expressed in pounds per square inch. To determine the hydrostatic head at a given depth in psi, multiply the depth in feet by the density in pounds per gallon by 0.002.

**HYDROXIDE**—A designation that is given for basic compounds containing the OH- radical. When these substances are dissolved in water, they increase the pH of the solution. See Base.

**HYDROSCOPIC**—The property of a substance enabling it to absorb water from the air.

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**INDICATOR**—Substances in acid-base titrations which, in solution, change color or become colorless as the hydrogen ion concentration reaches a definite value, these values varying with the indicator. In other titrations such as chloride, hardness, and other determinations, these substances change color at the end of the reaction. Common indicators are phenolphthalein, potassium chromate, etc.

**INHIBITED MUD**—A drilling fluid having an aqueous phase with a chemical composition that tends to retard and even prevent (inhibit) appreciable hydration (swelling) or dispersion of formation clays and shales through chemical and/or physical means. See Inhibitor (Mud).

**INHIBITOR (CORROSION)**—Any agent which, when added to a system, slows down or prevents a chemical reaction or corrosion. Corrosion inhibitors are used widely in drilling and producing operations to prevent corrosion of metal equipment exposed to hydrogen sulfide, carbon dioxide, oxygen, salt water, etc. Common inhibitors added to drilling fluids are filming amines, chromates, and lime.

**INHIBITOR (MUD)**—Substances generally regarded as drilling-mud contaminant issues, such as salt and calcium sulfate, are called inhibitors when purposely added to mud so that the filtrate from the drilling fluid will prevent or retard the hydration of formation clays and shales.

**INITIAL GEL**—See Gel Strength, Initial.

**INTERFACIAL TENSION**—The force required to break the surface between two immiscible liquids. The lower the interfacial tension between the two phases of an emulsion, the greater the ease of emulsification. When the values approach zero, emulsion formation is spontaneous. See Surface Tension.

**INTERSTITIAL WATER**—Water contained in the interstices or voids of formations.

**INVERT OIL-EMULSION MUD**—An invert emulsion is a water-in-oil emulsion where fresh or salt water is the dispersed phase and diesel, crude, or some other oil is the continuous phase. Water increases the viscosity and oil reduces the viscosity.

**IODINE NUMBER**—The number indicating the amount of iodine absorbed by oils, fats, and waxes, giving a measure of the unsaturated linkages present. Generally, the higher the iodine number, the more severe the action of the oil on rubber.

**ION**—Acids, bases, and salts (electrolytes) when dissolved in certain solvents, especially water, are more or less dissociated into electrically charged ions or parts of the molecules, due to loss or gain of one or more electrons. Loss of electrons results in positive charges producing a cation. A gain of electrons results in the formation of an anion with negative charges. The valence of an ion is equal to the number of charges borne by it.

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**JETTING**—The process of periodically removing a portion of, or all of, the water, solids, and/or solids, from the pits, usually by means of pumping through a jet nozzle arrangement.

**JONES EFFECT**—The net surface tension of salt solutions first decreases with an increase of concentration, passes through a minimum, and then increases as the concentration is raised.

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**KELLY OR KELLY JOINT**—A heavy square pipe or other configuration that works through a like hole in the rotary table and rotates the drill stem.

**KEY SEAT**—That section of a hole, usually of abnormal deviation and relatively soft formation, which has been eroded or worn by drill pipe to a size smaller than the tool joints or collars. This keyhole type configuration will not allow these members to pass when pulling out of the hole.

**KILLING A WELL**—Bringing a well under control that is blowing out. Also the procedure of circulating water and mud into a completed well before starting well-service operations.

**KILL LINE**—A line connected to the annulus below the blowout preventers for the purpose of pumping into the annulus while the preventers are closed.

**KINEMATIC VISCOSITY**—The kinematic viscosity of a fluid is the ratio of the viscosity (e.g., cp in g/cm·sec) to the density (e.g., g/cc) using consistent units. In several common commercial viscometers the kinematic viscosity is measured in terms of the time of efflux (in seconds) of a fixed volume of liquid through a standard capillary tube or orifice. See Marsh Funnel Viscosity.

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**LAMINAR FLOW**—Fluid elements flowing along fixed streamlines which are parallel to the walls of the channel of flow. In laminar flow, the fluid moves in planes or sections with a differential velocity across the front which varies from zero at the wall to a maximum toward the center of flow. Laminar flow is the first stage of flow in a Newtonian fluid; it is the second stage in a Bingham plastic fluid. This type of motion is also called parallel, streamline, or viscous flow. See Plug and Turbulent Flow.

**LEONARDITE**—A naturally occurring oxidized lignite. See Lignins.

**LIGNINS, MINED OR HUMIC ACIDS**—Mined lignins are naturally occurring special lignite, e.g., leonardite, that are produced by strip mining from special lignite deposits. The active ingredient is the humic acids. Mined lignins are used primarily as thinners, which may or may not be chemically modified. However, they are also widely used as emulsifiers.
LIGNOSULFONATES—Organic drilling-fluid additives derived from by-products of sulfite paper manufacturing process from coniferous woods. Some of the common salts, such as the ferrochrome, chrome, calcium, and sodium, are used as universal dispersants while others are used selectively for calcium-treated systems. In large quantities, the ferrochrome and chrome salts are used for fluid-loss control and shale inhibition.

LIME—Commercial form of calcium hydroxide.

LIME-TREATED MUDS—Commonly referred to as "lime-base" muds. These high-pH systems contain most of the conventional fresh-water additives to which slaked lime has been added to impart special properties. The alkalinites and lime contents vary from low to high.

LIMESTONE—See Calcium Carbonate.

LIPophile—A substance usually colloidal and easily wetted by oil.

LIPophilic—Having an affinity for oil.

LIVE OIL—Crude oil that contains gas and has not been stabilized or weathered. This oil can cause gas cutting when added to mud and is a potential fire hazard.

LOGGING—See Mud Logging and Electric Logging.

LOSS OF CIRCULATION—See Circulation, Loss of.

LOSS OF HEAD OR FRICTION LOSS—See Pressure-drop Loss.

LST-CIRCULATION ADDITIVES—Materials added to the mud to control or prevent lost circulation. These materials are added in varying amounts and are classified as fiber, flake, or granular.

LST RETURNS—See Circulation, Loss of.

LOW-SOLIDS MUDS—A designation given to any type of mud where high performing additives, e.g., CMC, have been partially or wholly substituted for commercial or natural clays. For comparable viscosity and densities (weighted with barite), a low-solids mud will have a lower volume-percent solids content.

LOW-YIELD CLAYS—Commercial clays chiefly of the calcium montmorillonite type having a yield of approximately 15 to 30 bbl/ton.

LYPHILIC—Having an affinity for the suspending medium, such as bentonite in water.

LYPHILIC COLLOID—A colloid that is not easily precipitated from a solution and is readily dispersible after precipitation by an addition of the solvent.

LYPHOBIC COLLOID—A colloid that is readily precipitated from a solution and cannot be redispersed by an addition of the solution.

MARSH FUNKNEL—An instrument used in determining the Marsh funnel viscosity. The Marsh funnel is a container with a fixed orifice at the bottom so that when filled with 1,500 cc fresh water, 1 qt (946 ml) will flow out in 26 ± 0.5 sec. For 1,000 cc out, the efflux time for water is 27.5 ± 0.5 sec. See API RP 13B for specifications.

MARSH FUNNEL VISCOSITY—Commonly called the funnel viscosity. The Marsh funnel viscosity is reported as the number of seconds required for a given fluid to flow 1 qt through the Marsh funnel. In some areas, the efflux quantity is 1,000 cc. See API RP 13B for instructions. See also Kinematic Viscosity.

MENISCUS—The curved upper surface of a liquid column, concave when the containing walls are wetted by the liquid and convex when not.

MESH—A measure of fineness of a woven material, screen, or sieve; e.g., a 200-mesh sieve has 200 openings per linear inch. A 200-mesh screen with a wire diameter of 0.0021 in. (0.0523 mm) has an opening of 0.074 mm, or will pass a particle of 74 microns. See Micron.

M—The methyl orange alkalinity of the filtrate, reported as the number of milliliters of 0.02 Normal (N/50) acid required per milliliter of filtrate to reach the methyl orange end point (pH 4.3).

MICA—A naturally occurring flake material of varying size used in combating lost circulation. Chemically, an alkali aluminum silicate.

MICELLES—Organic and inorganic molecular aggregates occurring in colloidal solutions. Long chains of individual structural units chemically linked to one another and laid side by side to form bundles. When bentonite hydrates, certain sodium or other metallic ions go into solution, the clay particle plus its atmosphere of ions is technically known as a micelle.

MICRON μ = ML—A unit of length equal to one millionth of a meter, or one thousandth part of a millimeter.

MILK EMULSION—See Oil-emulsion Water.

MILLIDARCY—1/1000 darcy. See Darcy.

MIST DRILLING—A method of rotary drilling whereby water and/or oil is dispersed in air and/or gas as the drilling fluid.

ML OR MILLILITER—A metric system unit for the measure of volume. Literally 1/1000th of a liter. In drilling-mud analysis work, this term is used interchangeably with cubic centimeter (cc). One quart is about equal to 946 ml.

MOLECULAR WEIGHT—The sum of the atomic weights of all the constituent atoms in the molecule of an element or compound.

MOLECULE—When atoms combine they form a molecule. In the case of an element or a compound, a molecule is the smallest unit which chemically still retains the properties of the substance in mass.

MONTMORILLONITE—A clay mineral commonly used as an additive to drilling muds. Sodium montmorillonite is the main constituent in bentonite. The structure of montmorillonite is characterized by a form which consists of a thin platey-type sheet with the width and breadth indefinite, and thickness that of the molecule. The unit thickness of the molecule consists of three layers. Attached to the surface are ions that are replaceable. Calcium montmorillonite is the main constituent in low-yield clays.

MUD—A water- or oil-base drilling fluid whose properties have been altered by solids, commercial and/or native, dissolved and/or suspended. Used for circulating out cuttings and many other functions while drilling a well. Mud is the term most commonly given to drilling fluids (which see).

MUD ADDITIVE—Any material added to a drilling fluid to achieve a particular purpose.

MUDGING OFF—Commonly thought of as reduced productivity caused by the penetrating, sealing, or plastering effect of a drilling fluid.

MUDGING UP—Process of mixing mud additives to achieve some desired purpose not possible with the former fluid, which usually has been water, air, or gas.

MUD HOUSE—A structure at the rig to store and shelter sacked materials used in drilling fluids.

MUD LOGGING—A method of determining the presence or absence of oil or gas in the various formations penetrated by the drill bit. The drilling fluid and the cuttings are continuously tested on their return to the surface, and the results of these tests are correlated with the depth or origin.

MUD-MIXING DEVICES—The most common device for adding solids to the mud is by means of the jet hopper. Some other devices for mixing are: eductors, paddle mixers, electric stirrers, mud guns, chemical barrels, etc.

MUD PIT—Earthen or steel storage facilities for the surface mud system. Mud pits which vary in volume and number are of two types: circulating and reserve. Mud testing and conditioning is normally done in the circulating pit system.

MUD PROGRAM—A proposed or followed plan or procedure for the type(s) and properties of drilling fluid(s) used in drilling a well with respect to depth. Some factors that influence the mud program are the casing program and such formation characteristics as type, competence, solubility, temperature, pressure, etc.

MUD PUMPS—Pumps at the rig used to circulate drilling fluids.

MUD SCALES—See Balance, Mud.

MUD STILL—An instrument used to distill oil, water, and other volatile material in a mud to determine oil, water, and total solids contents in volume-percnet.

N—

NATURAL CLAYS—Natural clays, as opposed to commercial clays, are clays that are encountered when drilling various formations. The yield of these clays varies greatly, and they may or may not be purposely incorporated into the mud system.

NEAT CEMENT—A slurry composed of portland cement and water.

NEUTRALIZATION—A reaction in which the hydrogen ion of an acid and the hydroxyl ion of a base unite to form water, the other ionic product being a salt.

NEWTONIAN FLOW—See Newtonian Fluid.

NEWTONIAN FLUID—The basic and simplest fluids from the standpoint of viscosity consideration in which the shear force is directly proportional to the shear rate. These fluids will immediately begin to move when a pressure or force in excess of zero is applied. Examples of Newtonian fluids are water, diesel oil, and glycerine. The yield point as determined by direct-indicating viscometer is zero.

NON-CONDUCTIVE MUD—Any drilling fluid, usually oil-base or invert-emulsion muds, whose continuous phase does not conduct electricity, e.g., oil. The spontaneous potential (SP) and normal resistivity cannot be logged, although such other logs as the induction, acoustic velocity, etc., can be run.

NORMAL SOLUTION—A solution of such a concentration that it contains 1 gram-equivalent of a substance per liter of solution.

O—

OIL-BASE MUD—The term “oil-base mud” is applied to a special type drilling fluid where oil is the continuous phase and water the dispersed phase. Oil-base mud contains blown asphalt and usually 1 to 5 percent water emulsified into the system with caustic soda or quick lime and an organic acid. Silicate, salt, and phosphate may also be present. Oil-base muds are differentiated from invert-emulsion muds (both water-in-oil emulsions) by the amounts of water used, method of controlling viscosity and thixotropic properties, wall-building materials, and fluid loss.

OIL CONTENT—The oil content of any drilling fluid is the amount of oil in volume-percent.

OIL-EMULSION WATER (MILK EMULSION)—A drilling fluid in which the oil content is usually kept between 3 to 7 percent and seldom over 10 percent (it can be considerably higher). The oil is emulsified into fresh or salt water with a chemical emulsifier. Sometimes CMC, starch, or gum may be added to the fresh- and salt-water systems.

OIL-IN-WATER EMULSION MUD—Commonly called “emulsion mud”. Any conventional or special water-base mud to which oil has been added. The oil becomes the dispersed phase and may be emulsified into the mud either mechanically or chemically.

P—

PACKER FLUID—Any fluid placed in the annulus between the tubing and casing above a packer. Along with other functions, the hydrostatic pressure of the packer fluid is utilized to reduce the pressure differentials between the formation and the inside of the casing and across the packer itself.

PARTICLE—A minute unit of matter, usually a single crystal, or of regular shape with a specific gravity approximating that of a single crystal.

PARTS PER MILLION—See Ppm.

PARALLEL FLOW—See Laminar Flow.

PAY ZONE OR PAY FORMATION—The formation drilled into that contains oil and/or gas in commercial quantities.

PENETRATION, RATE OF—The rate in feet per hour at which the drill proceeds to deepen the well bore.

PEPTIZATION—An increased dispersion due to the addition of electrolytes or other chemical substances. See Deflocculation and Dispersion.
Peptized Clay—A clay to which an agent has been added to increase its initial yield. For example, soda ash is frequently added to calcium montmorillonite clay.

Percent—For weight-percent, see Ppm. Volume-percent is the number of volumetric parts of any liquid or solid constituent per 100 like volumetric parts of the whole. Volume-percent is the most common method of reporting solids, oil, and water contents of drilling fluids.

Permeability—Normal permeability is a measure of ability of a rock to transmit a one-phase fluid under conditions of laminar flow. Unit of permeability is the darcy.

P.—The phenolphthalein alkalinity of the filtrate, reported as the number of milliliters of 0.02 Normal (N/50) acid required per milliliter of filtrate to reach the phenolphthalein end point.

pH—An abbreviation for potential hydrogen ion. The pH numbers range from 0 to 14, 7 being neutral, and are indices of the acidity (below 7) or alkalinity (above 7) of the fluid. The numbers are a function of the hydrogen ion concentration in gram ionic weights per liter which, in turn, is a function of the dissociation of water as given by the following expression:

\[
\frac{(H)(OH)}{(H_2O)} = K_{H_2O} = 1 \times 10^{-14}
\]

The pH may be expressed as the logarithm (base 10) of the reciprocal (or the negative logarithm) of the hydrogen ion concentration. The pH of a solution offers valuable information as to the immediate acidity or alkalinity, as contrasted to the total acidity or alkalinity (which may be titrated).

Phosphate—Certain complex phosphates, usually sodium tetraphosphate (Na₄P₂O₇) and sodium acid pyrophosphate (SAPP, Na₂H₂P₂O₇), are used either as mud thinners or for treatment of various forms of calcium and magnesium contamination.

Pilot testing—A method of predicting behavior of mud systems by mixing small quantities of mud and mud additives, then testing the results.

Plastic Flow—See Plastic fluid.

Plastic Fluid—A complex, non-Newtonian fluid in which the shear force is not proportional to the shear rate. A definite pressure is required to start and maintain movement of the fluid. Plug flow is the initial type of flow and only occurs in plastic fluids. Most drilling muds are plastic fluids. The yield point as determined by direct-indicating viscometer is in excess of zero.

Plasticity—The property possessed by some solids, particularly clays and clay slurries, of changing shape or flowing under applied stress without developing shear planes or fractures. Such bodies have yield points, and stress must be applied before movement begins. Beyond the yield point, the rate of movement is proportional to the stress applied, but ceases when the stress is removed. See Fluid.

Plastic Viscosity—the plastic viscosity is a measure of the internal resistance to fluid flow attrib-utable to the amount, type, and size of solids present in a given fluid. It is expressed as the number of dynes per sq cm of tangential shearing force in excess of the Bingham yield value that will induce a unit rate of shear. This value, expressed in centipoises, is proportional to the slope of the consistency curve determined in the region of laminar flow for materials obeying Bingham's Law of Plastic Flow. When using the direct-indicating viscometer, the plastic viscosity is found by subtracting the 300-rpm reading from the 600-rpm reading.

Plug Flow—The movement of a material as a unit without shearing within the mass. Plug flow is the first type of flow exhibited by a plastic fluid after overcoming the initial force required to produce flow.

Pm.—The phenolphthalein alkalinity of the mud reported as the number of milliliters of 0.02 Normal (N/50) acid required per milliliter of mud.

Polymery—A substance formed by the union of two or more molecules of the same kind linked end to end into another compound having the same elements in the same proportion but a higher molecular weight and different physical properties, e.g., paraformaldehyde. See Copolymer.

Porosity—The amount of void space in a formation or rock, usually expressed as percent voids per bulk volume. Absolute porosity refers to the total amount of pore space in a rock, regardless of whether or not that space is accessible to fluid penetration. Effective porosity refers to the amount of connected pore spaces, i.e., the space available to fluid penetration. See Permeability.

Potassium—One of the alkali metal elements with a valence of 1 and an atomic weight of about 39. Potassium compounds, most commonly potassium hydroxide (KOH) are sometimes added to drilling fluids to impart special properties, usually inhibition.

Pound Equivalent—A laboratory unit used in pilot testing. One gram or pound equivalent, when added to 350 ml of fluid, is equivalent to 1 lb/bbl.

Ppm or Parts Per Million—Unit weight of solution or per million weight units of solution (solute plus solvent), corresponding to weight-percent except that the basis is one million instead of one hundred. The results of standard API titrations of chloride hardness, etc. are correctly expressed in milligrams (mg) of unknown per liter but not in ppm. At low concentrations, mg/l is about numerically equal to ppm. A correction for the solution specific gravity or density in g/ml must be made as follows:

\[
ppm = \frac{mg/l}{\text{soln den, g/ml}} \\
% by wt. = \frac{mg/l}{(10,000) \text{ (soln den, g/ml)}} = \frac{ppm}{10,000}
\]

Thus, 316,000 mg/l salt is commonly called 316,000 ppm or 31.6 percent, which correctly should be 264,000 ppm and 26.4 percent, respectively.

Precipitate—Material that separates out of solution or slurry as a solid. Precipitation of solids in a drilling fluid may follow flocculation or coagulation, such as the dispersed red-bed clays upon addition of a flocculation agent to the fluid.
PRESSURIZED—Usually paraformaldehyde. Any material used to prevent starch or any other substance from fermenting through bacterial action.

PRESSURE-LOSS—The pressure lost in a pipeline or annulus due to the velocity of the liquid in the pipeline, the properties of the fluid, the condition of the pipe wall, and the alignment of the pipe. In certain mud-mixing systems, the loss of head can be substantial.

PRESSURE SURGE—A sudden, usually short-duration increase in pressure. When pipe or casing is run into a hole too rapidly, an increase in the hydrostatic pressure results, which may be great enough to create lost circulation.

PSEUDOPOLYMER FLUID—A complex non-Newtonian fluid that does not possess thixotropy. A pressure or force in excess of zero will start fluid flow. The apparent viscosity or consistency decreases instantaneously with increasing rate of shear until at a given point the viscosity becomes constant. The yield point as determined by direct-indicating viscometer is positive, the same as in Bingham plastic fluids; however, the true yield point is zero. An example of a pseudoplastic fluid is guar gum in fresh or salt water.

QUEBRACHO—A drilling-fluid additive used extensively for thinning or dispersing to control viscosity and thixotropy. It is a crystalline extract of the quebracho tree consisting essentially of tannic acid.

QUICKLIME—Calcium oxide, CaO. Used in certain oil-base muds to neutralize the organic acid.

QUELSCIENCE—The state of being quiet or at rest (being still). Static.

RADICAL—Two or more atoms behaving as a single chemical unit, i.e., as an atom; e.g., sulfate, phosphate, nitrate.

RATE OF SHEAR—The rate at which an action, resulting from applied forces, causes or tends to cause two adjacent parts of a body to slide relatively to each other in a direction parallel to their plane of contact. Commonly given in rpm.

RED MUD—A clay, water-base drilling fluid containing sufficient amounts of caustic soda and tannates to give a pronounced red appearance. Normally a high-pH mud.

RED-LINE MUD—A red mud which has been converted to a lime-treated mud. The pH is usually 12.0 to 13.0.

RESIN—Semisolid or solid complex, amorphous mixture of organic compounds having no definite melting point nor tendency to crystallize. Resins may be a component of compounded materials that can be added to drilling fluids to impart special properties to the system, wall cake, etc.

RESISTIVITY—The electrical resistance offered to the passage of a current, expressed in ohm-meters; the reciprocal of conductivity. Fresh-water muds are usually characterized by high resistivity, salt-water muds by a low resistivity.

RESISTIVITY METER—An instrument for measuring the resistivity of drilling fluids and their cakes.

REVERSE CIRCULATE—The method by which the normal flow of a drilling fluid is reversed by circulating down the annulus and up and out the drill string.

REYNOLDS NUMBER—A dimensionless number, Re, that occurs in the theory of fluid dynamics. The diameter, velocity, density and viscosity (consistent units) for a fluid flowing through a cylindrical conductor are related as follows:

\[ Re = \frac{\text{diameter} \times \text{velocity} \times \text{density}}{\text{viscosity}} \]

or \[ Re = \frac{D \times V}{\mu} \]

The number is important in fluid hydraulics calculations for determining the type of fluid flow, i.e., whether laminar or turbulent. The transitional range occurs approximately from 2,000 to 3,000; below 2,000 the flow is laminar, above 3,000 the flow is turbulent.

RHEOLOGY—The science that deals with deformation and flow of water.

ROTARY DRILLING—The method of drilling wells that depends on the rotation of a column of drill pipe to the bottom of which is attached a bit. A fluid is circulated to remove the cuttings.

SALT—In mud terminology, the term salt is applied to sodium chloride, NaCl. Chemically, the term salt is also applied to any one of a class of similar compounds formed when the acid hydrogen of an acid is partly or wholly replaced by a metal or a metallic radical. Salts are formed by the action of acids on metals, or oxides and hydroxides, directly with ammonia, and in other ways.

SALT-WATER CLAY—See Attapulgite Clay.

SALT-WATER MUDS—A drilling fluid containing dissolved salt (brackish to saturated). These fluids may also include native solids, oil, and/or such commercial additives as clays, starch, etc.

SAMPLE MUD—A drilling fluid possessing properties to bring up suitable samples.

SAMPLES—Cuttings obtained for geological information from the drilling fluid as it emerges from the hole. They are washed, dried, and labeled as to the depth.

SAND—A loose granular material resulting from the disintegration of rocks, most often silica.

SAND CONTENT—The sand content of a drilling fluid is the insoluble abrasive solids content rejected by a 200-mesh screen. It is usually expressed as the percentage bulk volume of sand in a drilling fluid. This test is an elementary test in that the retained solids are not necessarily silica nor may not be altogether abrasive. For additional information concerning the kinds of solids retained on the 200-mesh screen, more specific tests would be required. See Mesh.

SATURATED SOLUTION—A solution is saturated if it contains at a given temperature as much of a solute as it can dissolve. At 68°F it takes 126.5 lb/lb'l salt to saturate 1 bbl of fresh water. See Supersaturated.
SCREEN ANALYSIS—Determination of the relative percentages of substances, e.g., the suspended solids of a drilling fluid, passing through or retained on a sequence of screens of decreasing mesh size. Analysis may be by wet or dry methods. Referred to also as "sieve analysis". See Mesh.

SEALING AGENTS—Any of many materials added to drilling fluids to restore circulation.

SEA-WATER MUDS—A special class of salt-water muds where sea water is used as the fluid phase.

SECONDS API—A unit of viscosity as measured with a Marsh funnel according to API procedure. See API RP 13B and Marsh Funnel Viscosity.

SEQUESTRATION—The formation of stable calcium, magnesium, iron complex by treating water or mud with certain complex phosphates.

SET CASING—The installation of pipe or casing in a well bore. Usually requires mudding up, reconditioning or at least checking the drilling-fluid properties.

SHALE—Fine-grained clay rock with slate-like cleavage, sometimes containing an organic oil-yielding substance.

SHALE SHAKER—Any of several mechanical devices for removing cuttings and other large solids from the mud. Common examples are vibrating screen, rotating cylindrical screen, etc.

SHEAR (SHEARING STRESS)—An action, resulting from applied forces, which causes or tends to cause two contiguous parts of a body to slide relatively to each other in a direction parallel to their plane of contact.

SHEAROMETER—A device used as an alternative method for measuring gel strengths. See API RP 13B for specifications and procedure.

SHEAR STRENGTH—A measure of the shear value of the fluid. The minimum shearing stress that will produce permanent deformation. See Gel Strength.

SIDE TRACKING—See Whipstock.

SIEVE ANALYSIS—See Screen Analysis.

SILICA GEL—A porous substance consisting of SiO2. Used on occasion as a dehydrating agent in air or gas drilling where small amount of water is encountered.

SILT—Materials that exhibit little or no swelling whose particle size generally falls between 2 microns and API sand size, or 14 microns (200-mesh). A certain portion of dispersed clays and barite for the most part also fall into this same particle-size range.

SKID—Moving a rig from one location to another, usually on tracks where little dismantling is required.

SLIP VELOCITY—The difference between the annular velocity of the fluid and the rate at which a cutting is removed from the hole.

SLOUGHING—The partial or complete collapse of the walls of a hole resulting from incompetent, unconsolidated formations, high angle or reponse, and wetting along internal bedding planes. See Heaving and Cave-in.

SLUG THE PIPE—A procedure before pulling the drill pipe whereby a small quantity of heavy mud is pumped into the top section to cause an unbalanced column. As the pipe is pulled, the heavier column in the drill pipe will fall, thus keeping the inside of the drill pipe dry at the surface when the connection is unscrewed.

SOAP—The sodium or potassium salt of a high-molecular-weight fatty acid. When containing some metal other than sodium or potassium, they are called "metallic" soaps. Soaps are commonly used in drilling fluids to improve lubrication, emulsification, sample size, defoaming, etc.

SODA ASH—See Sodium Carbonate.

SODIUM—One of the alkali metal elements with a valence of 1 and an atomic weight of about 23. Numerous sodium compounds (all of which see) are used as additives to drilling fluids.

SODIUM BICARBONATE—NaHCO3. A material used extensively for treating cement contamination and occasionally other calcium contamination in drilling fluids. It is the half-neutralized sodium salt of carbonic acid.

SODIUM BICHROMATE—Na2Cr2O7. Also correctly called "sodium dichromate". See Chromate.

SODIUM CARBONATE—Na2CO3. A material used extensively for treating out various types of calcium contamination. It is commonly called "soda ash". When sodium carbonate is added to a fluid, it increases the pH of the fluid by hydrolysis. Sodium carbonate can be added to salt (NaCl) water to increase the density of the fluid phase.

SODIUM CARBOXYMETHYLCELLULOSE—Commonly called CMC. Available in various viscosity grades and purity. An organic material used to control filtration, suspend weighting material, and build viscosity in drilling fluids. Used in conjunction with bentonite where low-solids muds are desired.

SODIUM CHLORIDE—NaCl. Commonly known as salt. Salt may be present in the mud as a contaminant or may be added for any of several reasons. See Salt.

SODIUM CHROMATE—Na2Cr2O7. See Chromate.

SODIUM HYDROXIDE—NaOH. Commonly referred to as "caustic" or "caustic soda". A chemical used primarily to impart a higher pH.

SODIUM POLYACRYLATE—A synthetic high-molecular-weight polymer of acrylic acid used primarily as a fluid-loss-control agent.

SODIUM SILICATE MUDS—Special class of inhibited chemical muds using as their bases sodium silicate, salt, water, and clay.

SOLIDS CONCENTRATION OR CONTENT—The total amount of solids in a drilling fluid as determined by distillation includes both the dissolved and the suspended or undissolved solids. The suspended-solids content may be a combination of high and low specific gravity solids and native or commercial solids. Examples of dissolved solids are the soluble salts of sodium, calcium, and magnesium. Suspended solids make up the wall cake; dissolved solids remain in the filtrate. The total suspended and dissolved solids contents are commonly expressed as percent by volume, and less commonly as percent by weight.

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SOL—A general term for colloidal dispersions, as distinguished from true solutions.

SOLUBILITY—The degree to which a substance will dissolve in a particular solvent.

SOLUTE—A substance which is dissolved in another (the solvent).

SOLUTION—A mixture of two or more components that form a homogeneous single phase. Example solutions are solids dissolved in liquid, liquid in liquid, gas in liquid.

SOLVENT—Liquid used to dissolve a substance (the solute).

SOURING—A term commonly used to mean fermentation (which see).

SPECIFIC GRAVITY—See Gravity, Specific.

SPECIFIC HEAT—The number of calories required to raise 1 g of a substance 1 deg Centigrade. The specific heat of a drilling fluid gives an indication of the fluid's ability to keep the bit cool for a given circulation rate.

SPeeding In—The starting of the drilling operations of a new hole.

SPUD MUD—The fluid used when starting at the surface, often a thick bentonite-lime slurry.

SPURT LOSS—See Surge Loss.

SQUEEZE—A procedure whereby slurries of cement, mud, gunk plug, etc. are forced into the formation by pumping into the hole while maintaining a back pressure, usually by closing the rams.

STABILITY METER—An instrument to measure the breakdown voltage of invert emulsions.

STACKING A RIG—Storing a drilling rig upon completion of a job when the rig is to be withdrawn from operation for a period of time.

STARCH—A group of carbohydrates occurring in many plant cells. Starch is specially processed (pregelatinized) for use in muds to reduce filtration rate and occasionally to increase the viscosity. Without proper protection, starch can ferment.

STATIC—Opposite of dynamic. See Quiescence.

STREAMING POTENTIAL—The electrokinetic portion of the SP (spontaneous potential) electric-log curve which can be significantly influenced by the characteristics of the filtrate and mud cake of the drilling fluid that was used to drill the well.

STREAMLINE FLOW—See Laminar Flow.

STEARATE—Salt of stearic acid, which is a saturated, 18-carbon fatty acid. Certain compounds, such as aluminum stearate, calcium stearate, zinc stearate, have been used in drilling fluids for one or more of the following purposes: defoamer, lubrication, air drilling in which a small amount of water is encountered, etc.

STUCK—A condition whereby the drill pipe, casing, or other devices inadvertently become lodged in the hole. May occur while drilling is in progress, while casing is being run in the hole, or while the drill pipe is being hoisted. Frequently a fishing job results.

SUPERSATURATION—If a solution contains a higher concentration of a solute in a solvent that would normally correspond to its solubility at a given temperature, this constitutes supersaturation. This is an unstable condition, as the excess solute separates when the solution is seeded by introducing a crystal of the solute. The term "supersaturation" is frequently used erroneously for hot salt muds.

SURFACE-ACTIVE MATERIALS—See Surfactant.

SURFACTANT—A material which tends to concentrate at an interface. Used in drilling fluids to control the degree of emulsification, aggregation, dispersion, interfacial tension, foaming, defoaming, wetting, etc.

SURFACTANT MUD—A drilling fluid which contains a surfactant. Usually refers to a drilling fluid containing surfactant material to effect control over degree of aggregation and dispersion or emulsification.

SURFACE TENSION—Generally, the force acting within the interface between a liquid and its own vapor which tends to maintain the area of the surface at a minimum and is expressed in dynes per centimeter. Since the surface tension of a liquid is approximately equal to the interfacial tension between the liquid and air, it is common practice to refer to values measured against air as surface tension, and to use the term "interfacial tension" for measurements at an interface between two liquids, or a liquid and a solid.

SURGE LOSS—The flux of fluids and solids which occurs in the initial stages of any filtration before pore openings are bridged and a filter cake is formed. Also called "spurt loss".

SUSPENSION—A mixture consisting of finely divided colloidal particles floating in a liquid. The particles are so small that they do not settle but are kept in motion by the moving molecules of the liquid (Brownian movement).

SWABBING—When pipe is withdrawn from the hole in a viscous mud or if the bit is balled, a suction is created.

SWELLING—See Hydration.

SYNERGISM, SYNERGISTIC PROPERTIES—Term describing an effect obtained when two or more products are used simultaneously to obtain a certain result. Rather than the results of each product being additive to the other, the result is a multiple of the effects.

T

TANNIC ACID—Tannic acid is the active ingredient of quebracho and other quebracho substitutes such as mangrove bark, chestnut extract, hemlock, etc.

TEMPERATURE SURVEY—An operation to determine temperatures at various depths in the hole. This survey is used to find the location of inflows of water into the hole, where doubt exists as to proper cementing of the casing and for other reasons.

TEN-MINUTE GEL—See Gel Strength, 10-min.

THERMAL DECOMPOSITION—The chemical breakdown of a compound or substance by temperature into simple substances or into its constituent elements. Starch thermally decomposes in drilling fluids as the temperature approaches 900 F.
THINNER—Any of various organic agents (tannins, lignins, lignosulfonates, etc.) and inorganic agents (pyrophosphates, tetraphosphates, etc.) that are added to a drilling fluid to reduce the viscosity and/or thixotropic properties.

THIXOTROPY — The ability of fluid to develop gel strength with time. That property of a fluid which causes it to build up a rigid or semirigid gel structure if allowed to stand at rest, yet can be returned to a fluid state by mechanical agitation. This change is reversible.

TIGHTEN UP EMULSION OR MUD—Drilling-fluid jar- gon to describe condition in some systems to which oil has been added and the oil breaks out and rises to the surface. Any chemical or mechanical means which will emulsify the free oil is known as “tightening up”.

TITRATION — A method, or the process of using a standard solution for the determination of the amount of some substance in another solution. The known solution is usually added in a definite quantity to the unknown until a reaction is complete.

TOOL JOINT—A drill-pipe coupler consisting of a pin and box of various designs and sizes. The internal design of tool joints has an important effect on mud hydrology.

TORQUE — A measure of the force or effort applied to a shaft causing it to rotate. On a rotary rig this applies especially to the rotation of the drill stem in its action against the bore of the hole. Torque reduction can usually be accomplished by the addition of various drilling-fluid additives.

TOTAL DEPTH (or TD) — The greatest depth reached by the drill bit.

TOTAL HARDNESS—See Hardness of Water.

TOUR—A person’s turn in an orderly schedule. The word, which designates the shift of a drilling crew, is pronounced as if it were spelled t-o-w-e-r.

TURBULENT FLOW—Fluid flow in which the velocity at a given point changes constantly in magnitude and the direction of flow; pursues erratic and continually varying courses. Turbulent flow is the second and final stage of flow in a Newtonian fluid; it is the third and final stage in a Bingham plastic fluid. See Critical Velocity and Reynolds Number.

TWIST-OFF—The severing in two of a joint of drill pipe by excessive force applied by the rotary table.

U—

ULTRAVIOLET LIGHT—Light waves shorter than the visible blue-violet waves of the spectrum. Crude oil, colored distillates, residuum, a few drilling-fluid additives, and certain minerals and chemicals fluoresce in the presence of ultraviolet light. These substances, when present in mud, may cause the mud to fluoresce.

UNIVALENT—Monovalent. See Valence.

V—

VALENCE or VALENCY—The valence is a number representing the combining power of an atom, i.e., the number of electrons lost, gained, or shared by an atom in a compound. It is also a measure of the number of hydrogen atoms with which an atom will combine or replace, e.g., an oxygen atom combines with two hydrogens, hence has a valence of 2. Thus, there are mono-, tri-, etc. valent ions.

VALENCE EFFECT—In general, the higher the valence of an ion, the greater the loss of stability to emulsions, colloidal suspensions, etc. these polyvalent ions will impart.

VELOCITY—Time rate of motion in a given direction and sense. It is a measure of the fluid flow and may be expressed in terms of linear velocity, mass velocity, volumetric velocity, etc. Velocity is one of the factors which contribute to the carrying capacity of a drilling fluid.

VELOCITY, CRITICAL—That velocity at the transitional point between laminar and turbulent types of fluid flow. This point occurs in the transitional range of Reynolds numbers of approximately 2,000 to 3,000.

V-G METER OR VISCOITY-GRAVITY VISCOMETER—The name commonly used for the direct-indicating viscometer (which see).

VIBRATING SCREEN—See Shake Shaker.

VISCOMETER (VISCOMETER)—An apparatus to determine the viscosity of a fluid or suspension. Viscometers vary considerably in design and methods of testing.

VISCOMETER, DIRECT-INDICATING—Commonly called a “V-G meter”. The instrument is a rotational-type device powered by means of an electric motor or handcrank, and is used to determine the apparent viscosity, plastic viscosity, yield point, and gel strengths (all of which see) of drilling fluids. The usual speeds are 600 and 300 rpm. See API RP 13B for operational procedures.

VISCOMETER, STORMER—A rotational shear viscometer used for measuring the viscosity and gel strength of drilling fluids. This instrument has been largely superseded by the direct-indicating viscometer (which see).

VISCOSIMETER—See Viscometer.

VISCOSITY—The internal resistance offered by a fluid to flow. This phenomenon is attributable to the attractions between molecules of a liquid, and is a measure of the combined effects of adhesion and cohesion to the effects of suspended particles, and to the liquid environment. The greater this resistance, the greater the viscosity. See Apparent and Plastic Viscosity.

VISCOSITY, FUNNEL—See Funnel Viscosity.

VISCOUS FLOW—See Laminar Flow.

VOLATILE MATTER—Normally gaseous products, except moisture, given off by a substance, such as gas breaking out of live crude oil that has been added to a mud. In distillation of drilling fluids, the volatile matter is the water, oil, gas, etc., that are vaporized, leaving behind the total solids which can consist of both dissolved and suspended solids.

W—

WALL CAKE—The solid material deposited along the wall of the hole resulting from filtration of the fluid part of the mud into the formation.

WALL STICKING—See Differential-pressure Sticking.
WATER-BASE MUD — Common conventional drilling fluids. Water is the suspending medium for solids and is the continuous phase, whether or not oil is present.

WATER BLOCK — Reduction of the permeability of a formation caused by the invasion of water into the pores (capillaries). The decrease in permeability can be caused by swelling of clays, thereby shutting off the pores, or in some cases by a capillary block of the pores due to surface tension phenomena.

WATER-IN-OIL EMULSION — See Invert Oil-emulsion Mud.

WATER LOSS — See Fluid Loss.

WEIGHT — In mud terminology, this refers to the density of a drilling fluid. This is normally expressed in either lb/gal, lb/cu ft, psi hydrostatic pressure per 1,000 ft of depth.

WEIGHT MATERIAL — Any of the high specific gravity materials used to increase the density of drilling fluids. This material is most commonly barite but can be galena, etc. In special applications limestone is also called a weight material.

WELL LOGGING — See Electric Logging and Mud Logging.

WETTING — The adhesion of a liquid to the surface of a solid.

WETTING AGENT — A substance or composition which, when added to a liquid, increases the spreading of the liquid on a surface or the penetration of the liquid into a material.

WHIPSTOCK — A device inserted in a well bore used for deflecting or for directional drilling.

WILDCAT — A well in unproved territory.

WORKOVER FLUID — Any type of fluid used in the workover operation of a well.

YIELD — A term used to define the quality of a clay by describing the number of barrels of a given centipoise slurry that can be made from a ton of the clay. Based on the yield, clays are classified as bentonite, high-yield, low-yield, etc., types of clays. Not related to yield value below. See API RP 13B for procedures.

YIELD POINT — In drilling-fluid terminology, yield point means yield value (which see). Of the two terms, yield point is by far the most commonly used expression.

YIELD VALUE — The yield value (commonly called "yield point") is the resistance to initial flow, or represents the stress required to start fluid movement. This resistance is due to electrical charges located on or near the surfaces of the particles. The values of the yield point and thixotropy, respectively, are measurements of the same fluid properties under dynamic and static states. The Bingham yield value, reported in lb/100 sq ft, is determined by the direct-indicating viscometer by subtracting the plastic viscosity from the 300-rpm reading.

ZERO-ZERO GEL — A condition wherein the drilling fluid fails to form measurable gels during a quiescent time interval (usually 10 min).

ZETA POTENTIAL — Electrokinetic potential of a particle as determined by its electrophoretic mobility. This electric potential causes colloidal particles to repel each other and stay in suspension.

ZINC CHLORIDE — ZnCl₂. A very soluble salt used to increase the density of water to points more than double that of water. Normally added to a system first saturated with calcium chloride.