

A

Abandon: To temporarily or permanently cease production from a well or to cease further drilling operations.

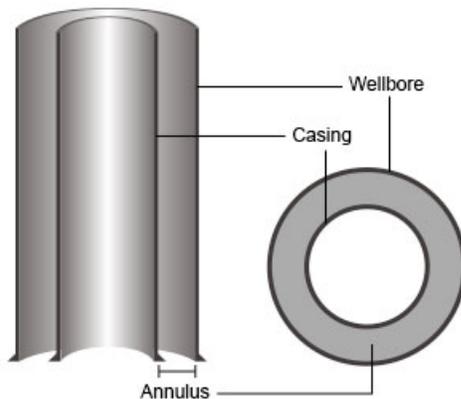
Abnormal Pressure: Pressure outside the normal or expected range.

Ambient: A term generally used to describe surrounding temperatures or environments.

Annular Blowout Preventer (Annular BOP): An annular blowout preventer is a large, specialized valve used to seal, control and monitor oil and gas wells. It is usually installed above the ram preventers that forms a seal in the annular space between the pipe and wellbore or, if no pipe is present, over the wellbore itself.

Annular Pressure: Pressure in an annular space.

Annulus: The annulus is the area between two concentric objects, such as, between the wellbore and casing or between casing and tubing, where fluid can flow.



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Axial Load: A load applied along the axis of a drill string, casing or tubing string.

Azimuth: The compass direction of a directional survey or of the wellbore as planned or measured by a directional survey. The azimuth is usually specified in degree with respect to North Pole. For example, a well that goes east has an azimuth of 90 degrees.

Azimuth Angle: This is the angle between the plane determined by the vertical and true North directions and the plane containing the wellbore direction and the true vertical.

B

Back Off/Backoff: To unscrew one threaded piece, e.g. a section of pipe, from another.

Balanced Cement Plug: Cement plugs for sidetracking wells are frequently set using the balanced cement plug method. This method requires the tubing or drill pipe to be set at the bottom of the plug. Then, cement slurry is pumped up around the pipe, and the pipe is withdrawn to the top of the plug and circulated clean.

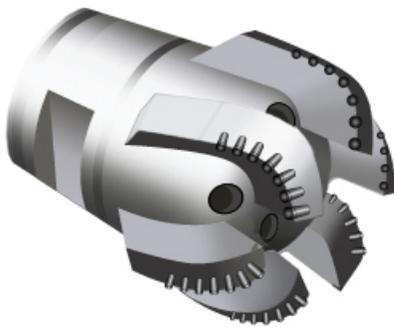
Barite: Barium sulfate, BaSO₄; a mineral frequently used to increase the drilling fluid density. Its specific gravity is 4.2.

Bbl or bbl: An abbreviation for oilfield volume unit of barrel, a volume of 42 US gallons (1 bbl = 0.159 m³).

Bent Sub: A short cylindrical device installed in the drill pipe between the drill collar and a downhole motor.

Bill of Lading (B/L): A legal document attached to the means of shipping of a product (truck, railroad, barge, etc.). The bill of lading is a signed statement that documents what and how much of it is being loaded on the shipment.

Bit Size: Bit is the tool used to crush or cut rock. If a wellbore is essentially the same diameter as the bit that was used to drill it, it is called gauge hole. Therefore, bit size is the same as gauge hole size.



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Blowout: The action of vigorous emptying of the contents of the annulus into the atmosphere above the drilling rig. This usually results in a catastrophic fire following unintentional ignition of the blowout discharge.

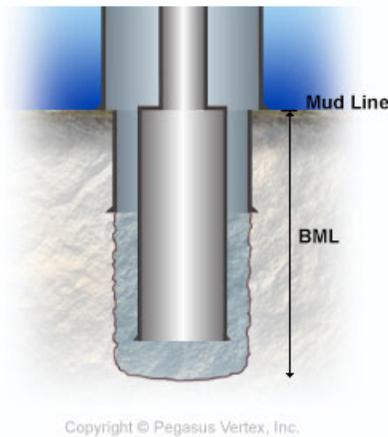
Blowout Preventer Stack: The blowout preventer assembly is mounted on the top of the casing head during drilling operations. Its purpose is to prevent the contents of the annulus from being aggressively emptied into the atmosphere when the bit drills into an unexpectedly high pressure zone. A “blowout” is prevented by closing off the annulus by sealing against the drillpipe.

There are several different elements in the blowout preventer stack. At the top of the stack is the annular preventer. This device maintains a seal against the drillpipe even as the drillstring is passed upward from the borehole.

There are several different elements below the annular in the blowout preventer stack. Four different elements in the blowout preventer stack are:

- Pipe Rams: These units have a semi-circular sealing element that fits around the drill pipe.
- Blind Rams: These units will seal when there is no drill pipe in the borehole.
- Shear Rams: These will cut the drillpipe and then seal the borehole.
- Drilling Spools: These are spacers between pipe rams, which provide access to the wellbore to either add or withdraw fluid.

BML: The distance below the mud line (sea bed).



Bottomhole: The bottom of the wellbore.

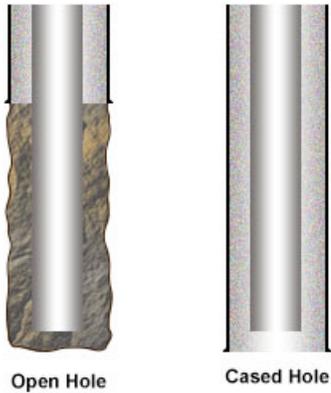
Bottomhole Assembly (BHA): The bottomhole assembly is the portion of the drilling assembly below the drill pipe. It can be as simple as bit and drill collars or it can be very complex and made up of multiple components.

Bottomhole Plug: A bridge or cement plug placed near the bottomhole to shut off a depleted, water-producing, or unproductive zone.

Bottomhole Pressure (BHP): The pressure at the bottomhole. For non-flowing conditions, it is caused by the hydrostatic pressure of the wellbore fluid and by any backpressure held at the surface, if any. When wellbore fluid is being circulated, bottomhole pressure is the hydrostatic pressure plus the friction pressure drop in the annulus.

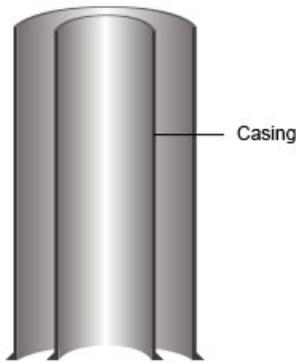
C

Cased Hole: The section of a wellbore that has had metal casing placed and cemented.



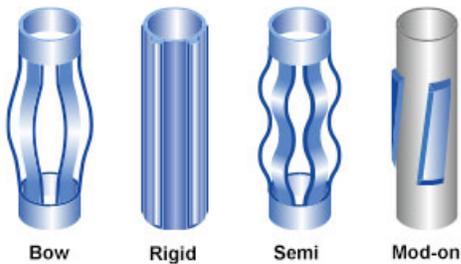
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Casing: Large-diameter pipe lowered into an openhole and cemented in place. Casing is run to protect the wellbore from fluids, pressures, wellbore stability problems, etc.



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Casing Centralizer: A device secured around the casing at various locations to center casing in the hole. The distance between centralizers is called spacing.



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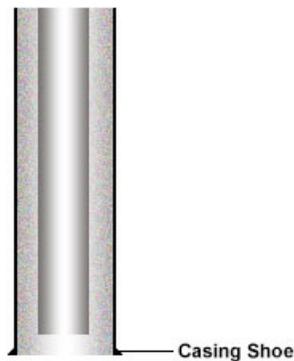
Casing Coupling (collar): A tubular section of pipe that is threaded inside and used to connect two joints of casing.

Casing Hanger: A circular device with a frictional gripping arrangement of slips and packing rings used to suspend casing from a casing head in a well.

Casing Point: The depth in a well at which casing is set.

Casing Pressure: The pressure in a well that exists between the casing and the tubing or the casing and the drill pipe.

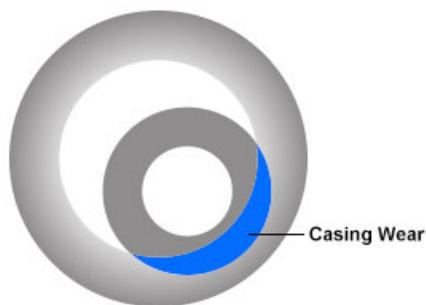
Casing Shoe: The bottom of the casing string, or the equipment at the bottom of the casing.



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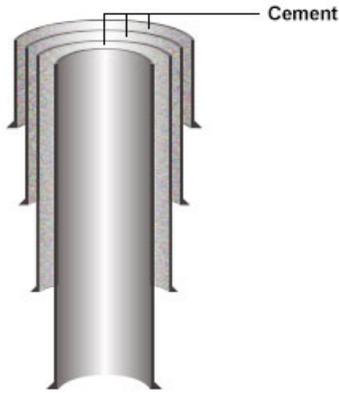
Casing String: A long section of casing. The casing string joints are typically approximately 40 ft. (12 m) in length.

Casing Wear: Prolonged, repeated axial and rotational movement within casing will wear casing interior, potentially leading to blowouts, production loss, and other hazardous and expensive problems.



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Cement: A powder consisting of alumina, silica, lime, and other substances that hardens when mixed with water. It is used extensively to bond casing to the walls of the wellbore.



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Cement Additive: Chemicals and materials added to a cement slurry to modify the characteristics of the slurry or set cement.

Cement Bond: The adherence of casing to cement and cement to formation.

Cement Bond Survey: An acoustic survey or sonic-logging method that records the quality or hardness of the cement.

Cementing: A well completion operation where cement slurry is pumped down through the casing and back up between the casing and the wellbore. The cement secures the casing's position after it has been cured.

Cementing Pump: A high-pressure pump used to force cement slurry down the casing and into the annulus.

Choke: A device with an orifice installed in a line to restrict the flow of fluids.

Choke Line: A line, or pipe, that runs from the blowout preventer stack to the choke manifold through which fluid from the hole is flowed when the well is shut in with the blowout preventer.

Coiled Tubing (CT): A continuous string of flexible steel tubing, often hundreds or thousands of feet long, that is wound into a drum, often dozens of feet in diameter.

Collapse Pressure: Externally applied pressure expected to cause permanent deformation in the casing or tubing.

Completion: Used in the petroleum industry, completion is the process of preparing a well for production. This process includes casing, cementing, perforating, gravel packing and installing a production tree.

Completion Fluid: Completion fluid is used in the process of preparing a well for production. It is normally a solid-free liquid, which minimizes formation damage. Completion fluids are typically clear brines (chlorides, bromides and formates).

Concentration: Concentration for cement or spacer additives. There are only 2 kinds of additives: liquid or solid.

Cement additives:

For liquid, there are 2 units:

1. (gps) - gallon per sack of cement
2. (gphs) - gallon per hundred sacks of cement

For solid, there are 4 units:

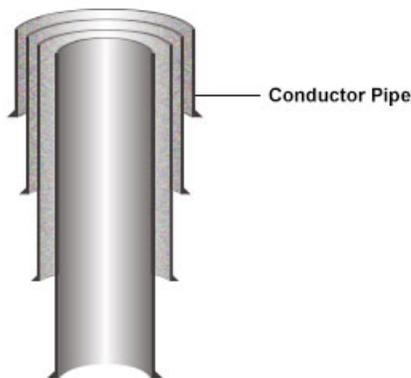
1. (% bwoc) - weight percent (by the weight of cement)
2. (lb/sk) - pound per sack of cement
3. (lb/gal) - pound per gallon of water in the mixture, not the cement slurry
4. (% bwow) - weight percent (by the weight of water)

Spacer additives:

1. For liquid, there is 1 unit: (gpb) - gallon per barrel
2. For solid, there is 1 unit: (ppb) - pound per barrel

Conductivity: Conductivity is the ability of material to transmit or convey heat or electricity.

Conductor Pipe: The conductor pipe is usually the first and shortest casing string placed into the well. Its purpose is to protect shallow sands from being contaminated by drilling fluids, and to help prevent washouts (which can easily occur near the surface due to loose and unconsolidated top soils, gravel beds, etc.).



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Crooked Hole: A wellbore that has been drilled in a direction other than vertical.

Crossover Sub: A sub that allows different sizes and types of drill pipes or other components to be joined.

Crude Oil: Unrefined liquid petroleum. It ranges in gravity from 9°API to 55°API and in color from yellow to black.

Cuttings: The fragments of rock dislodged by the bit and brought to the surface in the drilling mud. Cuttings samples can be analyzed by geologists to obtain information about the formations drilled. One of the functions of drilling mud is to carry cuttings out of the hole.

D

Daily Drilling Report: A record made each day of the operations on a working drilling rig. It is traditionally phoned, faxed, emailed, or radioed in to the office of the drilling company and possibly the operator every morning.



The image shows a sample Daily Drilling Report (DDR) form. It is a complex grid with multiple columns and rows, designed for recording drilling data. The form includes sections for well information, drilling parameters, and operational details. The data is organized into several distinct areas, each with its own set of columns and rows. The form is filled with text, likely representing a specific drilling operation.

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Density Hierarchy: During multi-fluid displacement operations such as cementing jobs, the density of displacing fluid is generally greater than that of the fluid being displaced to achieve better displacement efficiency. For example, the comparative densities of mud, spacer and cement should follow:

$P_{\text{mud}} < P_{\text{spacer}} < P_{\text{cement}}$

A rule of thumb is that the displacing fluid is at least 10% heavier than the displaced one.

Diamond Bit: A drill bit with small industrial diamonds embedded in its cutting surface.

Differential Pressure: The difference between pressures outside and inside a casing string. This is normally referred to at the casing shoe. The maximum pressure differential during a cementing job occurs just before the lead cement slurry turns the corner. Since the hydrostatic pressure in the annulus is greater than the hydrostatic pressure inside the casing, the maximum pressure differential is negative. The differential pressure after placement is the hydrostatic pressure in the annulus minus that of the inside casing after the cementing slurries are in place.

Differential Survey: A series of measurements made at locations spaced at regular intervals along the wellpath. At each station, the measured depth, the azimuth and inclination of the wellpath direction at that station are determined.

Directional Drilling: An intentional deviation of a wellbore from the vertical. It is sometimes necessary or advantageous to drill a well with intentional deviation from the vertical.

Directional Drilling Software: Directional drilling is the practice of deviating a well path to a target located at a given lateral distance and direction away from the vertical. The practice requires trajectory control and precise well placement using many advanced tools and equipment that includes rotary steerable systems, mud motors, LWD and MWD, etc.

Directional drilling software refers to the engineering computer programs. These programs normally belong to 2 groups: tubular mechanics and hydraulics. Tubular mechanics models calculate the torque and drag, buckling, hook load, etc. Hydraulics models involve drilling fluid, pressure drop, cutting carrying capacity, etc.

These software packages streamline time-critical decisions to accurately drill extended-reach, horizontal, vertical, and complex directional wells and sidetracks.

Displacement Fluid: During a well cementing job, the fluid, usually drilling mud which is pumped into the well after the cement is pumped into it to force the cement out of the casing and into the annulus is the displacement fluid.

Dog House/Doghouse: A small house used for keeping lease records, changing clothes, or any other use around a lease.

Dog Leg/Dogleg: Curved section of the wellpath. It is normally expressed in terms of degree per 100 feet (deg/30m) of wellbore length.

Dogleg Severity (DLS): This is a measure of the rate of change of direction of the wellpath. Usually this is measured in (1) degrees per 100 feet; (2) degrees per 30 meters; (3) degrees per 30 feet; and/or (4) degrees per 10 meters. The interval usually reflects the spacing in a directional survey station.

Donkey Pump: Any little pump; used for many kinds of small temporary pumping operations.

Doughnut: A ring of wedges that supports a string of pipe or a threaded, tapered ring used for the same purpose.

Downhole Motor: Multistage turbine driven by the mud flowing through the drillstring. This unit, which powers the rotary drill bit, is usually located immediately above the bit.

Draw Works: Installation that contains the reel on which the fast drill line is wound, the transmission which transfers power from the rig power source to the draw works shaft, the dynamic brake assembly, and the cathead, which is a specialized power take out (PTO). This installation is adjacent to the driller's console.

Drill Collars: A heavy, thick-walled tube, usually steel, used between the drill pipe and the bit in the drill stem used to stiffen the drilling assembly and put weight on the bit (WOB).

Drill Collar Sub: A sub made up between the drill string and the drill collars used to ensure that the drill pipe and the collar can be joined properly.

Drilling Engineering Design: It is a goal of operators, service companies and drilling contractors to design and drill oil and gas wells safely and economically. Drilling engineers have the responsibility of planning and drilling the wells. Their design responsibilities include:

1. Well path (directional drilling plans) according to the reservoir and targets
2. Well programs (e.g., casing sizes and setting depths)
3. Casing strings and cementing plans
4. Drilling fluid, drill string and bit programs
5. Equipment requirements
6. Cost estimates and analysis

Nowadays, many of these responsibilities are carried out by using one or more software packages.

Drilling Fluid: Circulating fluid, one function of which is to lift cuttings out of the wellbore. It also serves to cool the bit and to counteract downhole formation pressure. This is also called drilling mud.

Drill Pipe/Drillpipe: The heavy seamless tubing normally made of steel used to rotate the bit and circulate the drilling fluid. Joints of pipes, generally approximately 30 feet long, are coupled together by means of tool joints.

Drill Stem/Drillstem: All members in the assembly used for rotary drilling from the swivel to the bit. This includes the kelly, the drill pipe and tool joints, the drill collars, the stabilizers, and various specialty items.

Drill String/Drillstring: The string of the drill pipe with attached tool joints that transmits fluid and rotational power from the kelly to the drill collars and the bit. The term is also loosely applied to both drill pipe and drill collars.

Dry Hole: Any well that does not produce oil or gas in large enough quantities for commercial purpose.

Dutchman: A piece of pipe that has been twisted off inside a female connection; or a short section of material, such as belting or pipe, used to lengthen existing equipment.

E

Equivalent Hole ID: The effective hole size that takes into account the gauge hole ID and open hole excess.

Excess - Cement Slurry: Because of the open hole irregularity or enlargement, the volume of slurry required to affect a successful cementing job is often difficult to estimate. In most cases, an excess allowance is made since a shortage of slurry would result in failure of the operation. The cement slurry excess is applied to the required cement volume calculated using gauge hole ID.

Note that the cement slurry excess may not be the same as the open hole excess, though in many cases they are the same.

Excess - Open Hole: If a wellbore has the same diameter as the drilling bit, then it is a gauge hole. However, it is common for the hole to slowly enlarge with the passing of time, for example in clay formation. The open hole excess takes into the account of hole enlargement.

Expandable Casing: With the expandable casing, an operator runs a section of pipe into the well and then drops the expansion cone, which is moved by hydraulic fluid run through a smaller line that is connected to the cone. As the cone is pulled back through the pipe with hydraulic and mechanical pressure, the pipe is cold-formed and expanded to its new diameter. Normally, expandable casing only refers to liner.

F

Fish: An object that is left in the wellbore during drilling or workover operations and that must be recovered before work can proceed. It can be anything from a piece of scrap metal to a part of the drill stem.

Fishing: The procedure of recovering lost or stuck equipment in the wellbore.

Float Collar: A special coupling device inserted one or two joints above the bottom of the casing string that contains a check valve to permit fluid to pass downward but not upward through the casing. The float collar prevents drilling mud from entering the casing while it is being lowered, allowing the casing to float during its descent and thus decreasing the load on the derrick or mast.

Float Shoe: A short, heavy, cylindrical steel section with a rounded bottom that is attached to the bottom of the casing string. It contains a check valve and functions similarly to the float collar but also serves as a guide shoe for the casing.

Fracture Gradient: The wellbore pressure required inducing fractures in formation at a given depth. This is the formation property.

Fracture Pressure: The pressure at which a formation will break down, or fracture.

Friction: Resistance to movement created when two surfaces are in contact. The friction factor, sometimes called friction coefficient, is a dimensionless scalar value that describes the ratio of the force of friction between two bodies and the force pressing them together. The coefficient of friction depends on the materials used; for example, ice on steel has a low coefficient of friction, while rubber on pavement has a high coefficient of friction. Coefficients of friction range from near zero to greater than one – under good conditions, a tire on concrete may have a coefficient of friction of 1.7.

Friction Factor (F.F.): The representation of the friction between the wellbore/casing and the work string. The friction factor is dependent on mud type, pipe and wellbore and cutting concentration. Higher cutting concentration leads to a higher friction factor.

G

Gas Cut Mud: A drilling mud that contains entrained formation gas, giving the mud a characteristically fluffy texture. Gas cut mud may unintentionally lower the fluid density.

Gauge Hole: A wellbore that has the same diameter as the drilling bit.

H

Hardbanding: Hardbanding is the process of applying hardfacing alloys onto the drill pipe tool joint, drill collars, and heavy weight drill pipe to increase tubular durability in drilling applications.

Helical Buckling: A more extreme form of buckling that occurs when compressive forces pass through sinusoidal buckling and exceed the helical buckling limit. Helical buckling causes contact between the pipe and the wellbore, exerting force on the wall of the hole. Both drill string fatigue and interference with weight transfer to the bit occur. Helical buckling should be avoided.



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Helical Lockup: Helical lockup occurs when compressive forces on a string in helical buckling prevent axial movement. Forces at surface are not transmitted to the bit.

Hook: A large, hook-shaped device from which the elevator bails or the swivel is suspended.

Hook Load/Hookload: The weight of the drill stem (and associated components) that are suspended from the hook. It is important to predict the hook load and compare the predicted value with field measured hook load. One of the goals of drilling software is to predict the hook load from drilling parameters.

Horizontal Drilling: Deviation of the borehole from vertical so that the borehole penetrates a productive formation in a manner parallel to the formation.

Hydrostatic Pressure: The force per unit area exerted by a static column of fluid. In US oilfield units, it is calculated using the equation: $P \text{ (psi)} = \text{Density} \times \text{TVD} \times 0.052$, where Density is the fluid density in pounds per gallon (ppg), TVD is the true vertical depth in feet (ft.), and 0.052 is a conversion factor.

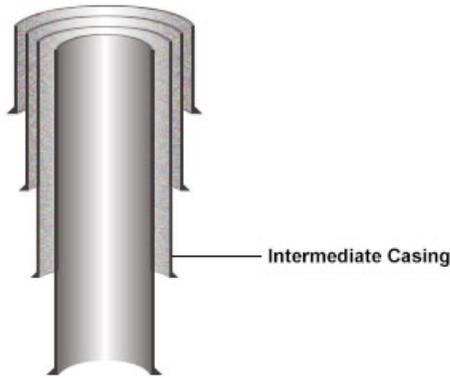
I

Inclination: The deviation angle measured from vertical direction, expressed in degrees. It is normally part of the survey data.

Inclination Angle: This is the angle between the direction of the wellbore and the true vertical.

Inner String: A drill pipe used to run and cement liners provides for protection of the liner's inner face from cement during the installation of a wellbore liner. Since the inner string volume is more consistent than the total liner volume, the volume of cement can be accurately calculated to ensure that the shoe track is not over displaced.

Intermediate Casing: A casing string is often necessary to maintain the wellbore integrity as greater drilling depths are encountered. It is generally set in place after the surface casing and before the production casing, and it is often the longest section of casing in a well.



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J

Jar: A percussion tool operated manually or hydraulically to deliver a heavy upward or downward blow to fish stuck in the wellbore.

Joint of Pipe: A length of drill pipe or casing. Both come in various lengths.

K

Kelly: The heavy square or hexagonal steel member suspended from the swivel through the rotary table and connected to the drill pipe to turn the drill stem as the rotary table turns.

Keyseat: An undergauge channel or groove cut in the side of the borehole and parallel to the axis of the hole. A keyseat results from the rotation of pipe on a sharp bend in the hole.

Kick: An influx of water, gas, oil, or other formation fluid into the wellbore during drilling. It occurs because the downhole pressure exerted by drilling fluid is not great enough to overcome the pressure exerted by the fluids in the formation. If prompt action is not taken to control the kick, or kill the well, a blowout may occur.

Kickoff Point (KOP): The depth in a vertical hole at which a deviated hole is started.

Kill: In drilling operation, this refers controlling a kick by taking suitable preventive measures (for example, to shut in the well with the blowout preventers, circulate the kick out, and increase the weight of the drilling mud).

L

Lead Cement: A cement slurry used to provide zonal isolation. This is the first cement slurry pumped during a cementing job. It covers the upper sections of the well, and is typically lighter than the tail slurry that follows it.

Liner: A liner is a casing string that does not extend all the way to the top of the surface, but is hung from inside of the previous casing shoe.

Liner Hanger: A slip device that attaches the liner to the casing.

Log (Casing Wear): Measurement of the geometry of the inner wall of the casing as a function of measured depth. The logging tool uses either acoustic or multi-finger technology to make these measurements.

Log (Well Log): Measurement of a formation structure or fluid content and property presented as a function of measured depth. In general, a logging tool that measures these properties have an energy source (electric, atomic or acoustic) at the bottom end of the tool, with receivers spaced along the length of the tool.

Lost Circulation: The complete or partial failure of the mud to return to the surface as it is being circulated in the hole.

M

Magnetometer: This term has a dual meaning: (1) An instrument that will measure the X, Y, and Z components of the earth's magnetic field relative to the orientation and direction of the tool: (2) An instrument capable of measuring both the components of the earth's magnetic field and the components of the earth's gravitational field relative to the orientation of the instrument. With these two sets of measurements, the azimuth and inclination of the instrument, the wellpath can be determined.

Make Up

1. To assemble and join parts to form a complete unit (for example, to make up a string of drill pipe).
2. To screw together two threaded pieces. Compare break out.
3. To mix or prepare (for example, to make up a tank of mud).
4. To compensate for (for example, to make up for lost time).

Make Up a Joint: To screw a length of pipe into another length of pipe.

Make Up Torque: The rotational force used to make up a connection in the string. Drill pipe failure may occur when the make-up torque of a connection is exceeded.

Marsh Viscosity: Convenient means to obtain a value (marsh seconds) related to the mud viscosity. This value is obtained by adding one LITER of mud to the marsh funnel, and then measuring the time, in seconds, required to drain one quart from the funnel. The logic of this is that the only specialized piece of equipment required is the marsh funnel. You can always find a quart milk bottle on a drilling rig. This method will alert you when the mud changes the flow properties, but there is no mathematical relation between marsh seconds and the plastic viscosity of the mud.

MD: Measured Depth of a survey station is the distance from the wellhead to that station, measured along the wellpath.

Mechanical Jar: A percussion tool operated mechanically to give an upward thrust to a fish by the sudden release of a tripping device inside the tool.

MSL: Abbreviation for mean sea level.

Micro-annulus: During cementing job, if the displacing fluid (cement slurry) fails to completely remove mud and/or spacer, a small layer of the mud and/or spacer remains on the walls of the annulus or the formation. Once the cement sets, the space occupied by the small layer of mud and/or spacer can lead to the creation of a "micro-annulus". It normally occurs on the narrow side of the annulus.

Mouse Hole: Cased opening located on the side of the rig floor opposite to the drillers' station. This cased hole extends downward from the rig floor. This is used to store a joint of drillpipe after it has been picked up from the pipe rack so that it is ready to be picked up and added to the drillstring in the hole.

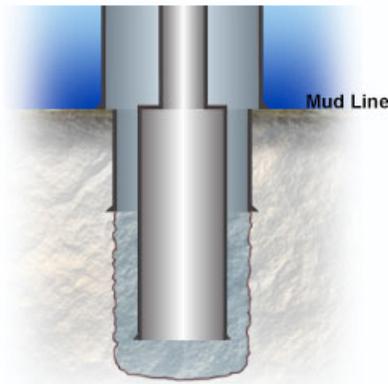
Mud: The complex fluid circulates through the drillpipe, out through the "eyes" of the bit, and then returns to the surface through the annulus between the drillpipe and casing's inner wall, or borehole wall. It has two purposes: (1) control hydrostatic pressure in the annulus to prevent inflow from the exposed formation or outflow into these formations; and (2) carry drill cuttings from the bottom of the hole to the surface.

Mud Cake: The sheath of mud solids that forms on the wall of the hole when liquid from mud filters into the formation. Also called filter cake or wall cake.

Mud Ditch: The trough in which the mud flows into after passing through the shale shaker on its way to the collection tank.

Mud Engineer: A mud engineer (correctly called a Drilling Fluids Engineer, but most often referred to as the "Mud Man") works on an oil well or gas well drilling rig and is responsible for ensuring the properties of the drilling fluid, also known as drilling mud, are within designed specifications.

Mud Line: The mud line is the seabed.



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Mud Magnet: Large linear magnet that is placed in the return mud flow (usually in the mud ditch). This device is approximately a 2 feet section of a 4X4 lumber. This magnet collects steel filings from the mud return flow. It is usually cleaned once every 24 hours and the steel filings collected from the magnet are weighed. The weight of these cuttings is a qualitative indication of the casing wear, which take place during the 24 hours. Sudden increase in the filings collected is a good indication of a problem with casing wear. Although there is no known way to determine a quantitative relation between collection rate and total casing wear, increases in collection rate changes have proven to be a warning worth heeding.

Mud Pump: A large reciprocating pump which picks up mud from the output tank and discharges into the drillstring by means of the output manifold, goose neck, and the bell nipple.

Mud Report: The report sheets filled out by the mud engineer at the well site on a daily basis. The mud report records test results, product usage, inventory, recommendations and other pertinent information. Today, mud reports are more likely generated by software and transmitted electronically.

A screenshot of a mud report form. The form is a complex grid with many columns and rows, containing various data points and text. It includes a header section with logos and a main body of data.

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Mud Tanks: A series of large open tanks through which returning mud flows. The output tank is where the mud is treated to return desired flow properties before being picked up by the pump input.

Mud Weight: Mud weight is expressed in pounds per gallon (ppg). Water weighs 7.48 ppg. Mud can weigh up to 22 or 23 ppg. (pounds per gallon)

N

Natural Gas: Natural gas is a gas consisting primarily of methane, typically with 0-20% higher hydrocarbons (primarily ethane). It is found associated with other fossil fuels, in coal beds, as methane clathrates, and is an important fuel source and a major feedstock for fertilizers.

Nominal: A term used to express the theoretical diameter or wall thickness of a pipe. The actual diameter or wall thickness will vary within accepted limits from the nominal value.

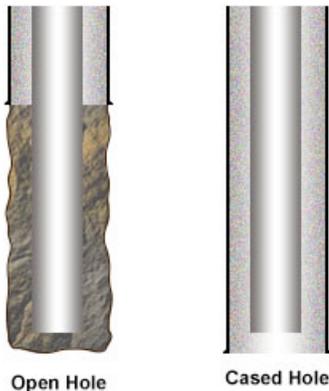
Nozzle: A passageway through bits that causes the drilling fluid to be ejected from the bit at high velocity to create jet impact force and bit hydraulic horsepower.

O

Oil and Gas Software: Technically speaking, any software related to oil and gas can be categorized into Oil and Gas Software, including accounting, engineering, science, data management, etc. If we look into this group, we can find the following sub-groups: geology, geophysics & petrophysics, reservoir, drilling software, production software, economics, risk analysis, etc.

Oil Based Mud: A drilling or workover fluid in which oil is the continuous phase and which contains a few percent water.

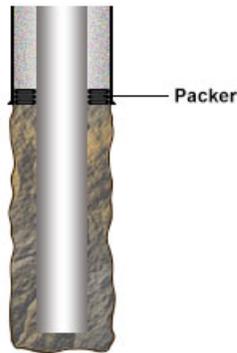
Open Hole: The uncased portion of a well that is exposed to rock formation.



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P

Packer: The instrument used in the sealing of a well in order to force oil and/or gas through the tubing.



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PDC Bit: Compared with roller cones bit, this is a different drilling bit that shears the rock using polycrystalline diamond compact (PDC) cutters to create the hole.

Pick Up: The action of lifting the pipe in hole.

Pig: A scraping tool forced through a flow line or pipeline to clean out wax or other deposits.

Pigging: A process used in pipelines to perform duties such as cleansing, identifying holes, and checking weld integrity by driving a “pig” along the inside of the pipeline.

Pore Pressure: The pressure of fluids within the pores of a reservoir. This is the property of formation.

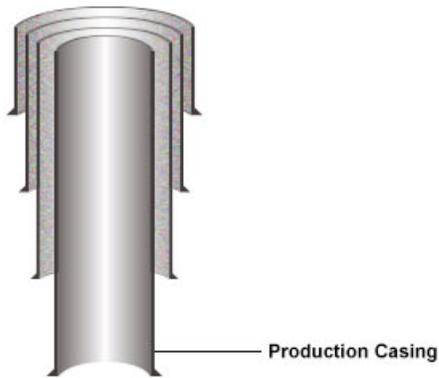
Possum Belly: Settling pool into which drilling mud flows from the outlet pipe which connects to the wellhead. Outflow from the possum belly flows over the shale shaker to the mud ditch.

Ppb: Abbreviation for concentration unit, pounds-per-barrel (lbm/bbl).

Ppg: Abbreviation for density unit, pounds-per-gallon (lbm/gal). For example, the density of water is 8.33 ppg at 60°F (16°C).

Primary Cement Job: The primary cement job is the process of displacing drilling fluid with cement slurries in the annulus between the casing and the formation. The cement sheath provides a hydraulic seal and zonal isolation, which prevents the migration of formation fluids and gases into the wellbore annulus.

Production Casing: A casing string that serves to isolate the reservoir from undesired fluids in the producing formation, and from other zones penetrated by the wellbore.



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Pulsation Dampener: Pneumatic device built into the outflow line of each UUD pump to dampen the pressure fluctuations resulting from the action of the pump. Although presented as a surge tank, this device is really a device that can be tuned to greatly diminish the output pulsations transmitted downstream from the mud pump. Unfortunately, the effectiveness of the pulsation dampener is a function of both output pump pressure and frequency of the pump pulsations.

Pumping Schedule Table: A table prepared to list the sequence, volume of fluids and pressure to be pumped during a cementing job.

R

Rabbit: A small plug that is run through a flow line by pressure to clean the line or test for obstructions.

Rate of Penetration: A measure of the drilling speed, commonly referred as ROP, usually expressed in feet (meters) per hour.

Rathole: Extra hole drilled at the bottom of the hole. It is the distance between the bottom of the hole and casing shoe.

Ream: To enlarge the wellbore by drilling it again with a special bit.

Reciprocating: Repeated up-and-down movement.

Riser: Pipe connecting offshore installation to a sub sea wellhead or pipeline for drilling or production purposes.

Rotary Kelly Bushing (RKB): Rotary kelly bushing - an adapter that serves to connect the rotary table to the Kelly, which turns the entire drillstring. Depth measurements are commonly referenced to the RKB, such as 10,000 ft. RKB, meaning 10,000 feet below the rotary kelly bushing.

Rotating Off Bottom (ROffB): Pipe rotates without any axial movement, such as rate of penetration or tripping. There is no weight on bit (WOB) or torque on bit (TOB) because the bit is not engaged with formation.

Rotating On Bottom (ROnB): Pipe rotates without any axial movement, such as rate of penetration or tripping. However, weight on bit (WOB) and torque on bit (TOB) are present because bit is engaged with formation.

Rotational Viscometer: Instrument that measures the shear stress between concentric cylinders immersed in the liquid. As the outer cylinder is rotated, the shear stress trying to rotate the inner cylinder is measured. This is done at two speeds (300 and 600 RPM). From these two measures, the yield point and plastic viscosity of the liquid can be determined.

S

Shoe Track (ST): The space between the float or guide shoe and the landing or float collar.

The purpose of a “shoe track” is to keep the trailing edge of cement, which can become contaminated with drilling fluid while pumping down inside a pipe, from being displaced out the end of the casing and resulting in a wet shoe. Use of wiper plugs and drill pipe darts are most important to preventing contamination of the cement slurry, but contamination can still occur especially with large diameter or long lengths of casing and drill pipe. Rules of thumb for shoe track have and can be used but apply mostly to ‘average’ type well designs and so the following equations were developed to better determine the optimum shoe track length for more challenging or critical situations.

Rule of thumb to estimate the shoe track length in feet:

1. Required Length of Shoe Track (ft.) = 'Total' displacement volume (bbls) x 0.01315 ÷ casing capacity (bbls/ft.)
2. 'Total' displacement value is used to account for contamination in drill pipe.
3. Casing capacity is used to account for the fact that contamination increases with cross section and surface area.

Examples:

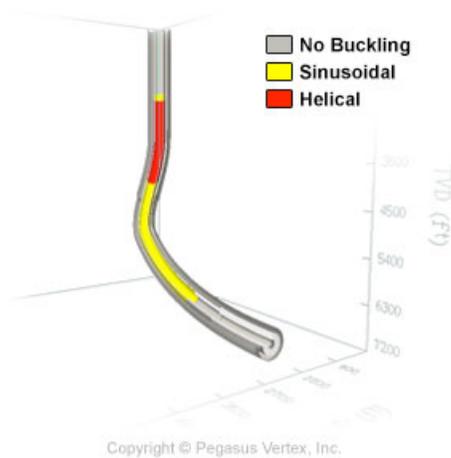
1. 13-5/8 casing with total displacement volume of 1803 bbls(1673 bbls casing + 130 bbls DP)
Required Length of Shoe Track (ft.) = 1803 bbls x 0.01315 ÷ 0.1487 (bbls/ft.) = 159 ft.
2. 9-3/8 liner with total displacement volume of 581 bbls (314 bbls liner + 267 bbls DP) Required Length of Shoe Track (ft.) = 581 bbls x 0.01315 ÷ 0.0714 (bbls/ft.) = 107 ft.

Based on local experience, wiper plug systems and other conditions, the user should evaluate the calculated requirement and round up or down the number of joints as is appropriate.

Shut-in Bottomhole Pressure (SIBHP): The pressure at the bottom of a well when the surface valves on the well are completely closed.

Single Slurry: Normally, there are 2 cement slurries (lead and tail cement slurries) involved. Sometimes, people use only single cement slurry.

Sinusoidal Buckling: Sinusoidal buckling occurs when compressive forces on the string become too high, resulting in a snake-like bending in the string. Note that in this mode, the pipe deforms, but still in a 2D plan.



SK: Abbreviation for sack of cement.

Slips: A three section, hinged device that is “slipped” into the space between the drillstring and the rotary table. This device supports the drillstring while a stand of pipe is either removed or added to the drillstring. It usually requires two rig hands to handle the weight of this device.

Slurry: Slurry is often referred as cement slurry to describe a mixture of suspended solids and liquids.

Slurry Yield: The volume of slurry produced when one sack of cement is mixed with the desired amount of water and other additives, usually expressed in units of m³/kg or ft³/sk (sack). This value is then used to calculate the number of sacks required to achieve the desired fill-up in the annulus.

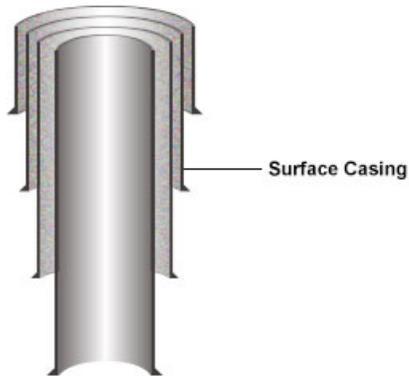
Snubbing: The process of running and pulling tubing, drillpipe, or casing while surface pressure is present on the wellhead.

Spacer: A viscous fluid used to remove drilling fluids ahead of cement slurry. The spacer is prepared with specific fluid characteristics, such as viscosity and density that are designed to prevent the interaction between the mud and cement slurry.

Spaghetti: Very small tubing or pipe.

Stand (Of Pipe): A “stand” of drillpipe consists of either three or four joints of pipe and is considered as a unit. The number of drillpipe elements in a joint depends on (1) the length of a joint of pipe and (2) the height of the derrick.

Surface Casing: A large-diameter, relatively low-pressure pipe string set in shallow yet competent formations to protect fresh-water aquifers onshore. Second, the surface casing provides minimal pressure integrity, and thus enables a diverter or perhaps even a blowout preventer (BOP) to be attached to the top of the surface casing string after it is successfully cemented in place. Third, the surface casing provides structural strength so that the remaining casing strings may be suspended at the top and inside of the surface casing.



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Survey: Survey is a set of data of measurement of the measured depth, inclination and azimuth of a location in a well. This defines the wellbore trajectory.

T

Tail Cement: The last cement slurry pumped during a cementing job. The tail cement covers the lower sections of the well and shoe track, and is typically denser than the lead slurry that precedes it.

Tension Limit: The tension limit of a material is based on its yield strength, which is measured in psi. When the minimum yield strength is exceeded, the pipe will plastically deform. Plastic deformation occurs when the pipe that has stretched does not return to its original shape.

Tie-Back Liner: Tie-back is a string to connect a liner back to well head. It is fairly common for oil and gas wells and they almost always run for geothermal with sometimes 2 on one well. Tie-backs can be installed for both land or offshore wells. Depending on where the wellhead is, the liner can be tied back to rig floor (platform) or seabed.

Ton-Mile: Measurement of the accumulated stress on the drillstring cable. After a predetermined stress value, the cable is “slipped” and a predetermined portion is cut from the cable. The purpose of this is to avoid excessive accumulation of stress, which occurs at the points where the cable passes around the sheaves (pulleys). The length of cable to be cut from the cable is determined by S-N analysis of the cable material.

TOC: Abbreviation for top of cement. This is usually measured from RKB.

TOL: Abbreviation for top of liner. This is usually measured from RKB.

Torque: Torque on the drillstring can be measured by inserting a meter for that purpose in the drive train between the drive engine and the rotary table. When the drillstring locks up downhole, the torque on the

string shows a steady increase, giving the driller time to stop rotation before reaching a torque value, which will twist off the drillstring. A quick rule of thumb is that each 1,000 feet of drillpipe can be twisted through 3 complete revolutions before reaching critical torque value.

Torque and Drag: Drag is the frictional force generated when the pipe is moving or tends to move in the wellbore. The term “torque and drag” commonly refers to torque, axial force, buckling calculation along the pipe during drilling or casing running operations.

Total Depth (TD): The total depth of a well.

Traveling Block: A traveling block is the freely moving section of a block and tackle that contains a set of pulleys or sheaves through which the drill line (wire rope) is threaded or reeved and is opposite (and under) the crown block (the stationary section). The combination of the traveling block, crown block and wire rope drill line gives the ability to lift weights in the hundreds of thousands of pounds. On larger drilling rigs, when raising and lowering the derrick, line tensions over a million pounds are not unusual.

Trip In: Move the pipe into the wellbore. Sometimes, it is called slack off.

Trip Out: Move the pipe out of the wellbore. Sometimes, it is called pick up.

True Vertical Depth (TVD): This is the vertical distance from the wellhead to a point in the wellpath. This quantity is calculated from the directional survey data. Note that a measured depth, due to the wellbore curvature, is always greater than the corresponding true vertical depth. It is commonly referred as TVD.

Tungsten Carbide: Tungsten carbide (WC) is an inorganic chemical compound containing equal parts of tungsten and carbon atoms. In its most basic form, it is a fine gray powder, but it can be pressed and formed into shapes for use in industrial machinery, tools, abrasives, as well as jewelry. Tungsten carbide is approximately three times stiffer than steel, with a Young's modulus of approximately 550 GPa, and is much denser than steel or titanium.

U

Underbalanced Drilling: Underbalanced drilling, or UBD, is a procedure used to drill oil and gas wells where the pressure in the wellbore is kept lower than the formation pore pressure. As the well is being drilled, formation fluid flows into the wellbore and up to the surface. The circulating fluid for underbalanced drilling can be lower density mud, air, nitrogen, mist, foam, etc.

Unloading: To initiate flow from a reservoir by removing fluid from the tubing in a well, often by means of a swab, to lower the bottomhole pressure in the wellbore.

V

Vertical Section: The vertical section is the horizontal distance from the centerline of a wellbore to a certain point on a well trajectory, measured along a pre-defined azimuth in horizontal plan.

Viscosity: Frictional resistance for a fluid to flow. There are two models of this parameter that are commonly used. They are (1) the Newtonian model where resistance is proportional to flow rate and (2) Bingham Plastic where flow resistance is linear after an initial shear is exceeded. This model is almost universally used to characterize drilling fluid. The initial shear associated with zero flow rate assists with the suspension of drill cuttings during trips.

W

Waiting on Cement (WOC): WOC refers to the time when drilling or completion operations are suspended so that the cement in the casing annulus can harden sufficiently.

Water Table: Structure at the top of the derrick, which supports the crown block, catwalk, and lifeline.

Weight Indicator: An instrument on a drilling rig that shows both the weight of the drill string that is hanging from the hook (hook load) and the weight that is placed on the bottom of the hole (weight on bit).

Weight on Bit (WOB): Weight on bit is the amount of downward force exerted on the drill bit.

Well Planning: Well planning is a series of steps from the well's initial drilling to its plug and abandonment. Many of these steps are interconnected. Many considerations, ranging from reservoir conditions to the rate of fluid production, determine the well planning. For drilling operations, well planning refers to the preparation of physical drilling operation parameters, equipment, tools, etc. Drilling engineering and drilling software are often part of the well planning. For example, torque and drag software in the well planning process helps the drilling engineer select a drill pipe capable of withstanding the torque and drag encountered during extended reach well drilling.

Wellbore: A wellbore is any hole drilled by the bit for water, gas or oil.

Wellpath Map: The wellpath is mapped by connecting the directional survey stations with circular arcs. The length of each arc is the measured distance from one station to the next. The directions measured at adjacent directional stations determine the directions of the endpoints of each circular arc (a bit of analytic geometry here).

Worm or Weavel: New and/or untrained member of the crew. During trips, the worm stands across the rig floor from the driller and watches (to learn) the tripping procedure so that some day he can safely participate.

Z

Zonal Isolation: Zonal isolation prevents the fluids such as water or gas in one zone from mixing with oil in another zone. This is achieved through the creation of a hydraulic barrier between the casing, cement and formation.

Zone: The term "zone" as applied to reservoirs, is used to describe an interval, which has one or more distinguishing characteristics, such as lithology, porosity, saturation, etc.

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