Installation of conductor casing engineering essay

After the drilling of a well is accomplished, and if adequate commercial amounts of petroleum presence deposits is proved that can be extracted and taken out, then the next step is well completion which is done in an attempt to make petroleum or natural gas reserves to flow out from the formations and to Bring them above the earth surface. Some of the major stages of this process includes

Casing for well hole strengthen mechanism,

Evaluation of the pressure as well as temperature of the formation,

Installation of equipment which is done for an efficient and effective outflow of reserves

Production process and Completion of a well consists of following steps

Installation of a Well Casing

Completion of a well

Installation of The Wellhead

Installation of a lifting equipment and required Well Treatment

Well Treatment(treating the formation)

1. WELL CASING

The most crucial step of the drilling as well as in processes of completion is the installation of a well casing, which involves installing a number of tubes made of metal into the hole that is drilled recently.

The well hole sides are strengthened By the casing which is the main function of well casing, to prevent seeping of oil or Natural gas out of the hole of well as it is pumped to the surface and it also prevents fluids as well as gases to flow into formation. Therefore proper case installation should Be determined.

Casing that is applied is dependable upon the characteristics related to subsurface features of well

Well diameter (depending on drill bit size)

Pressures and temperatures across the entire well.

TYPES OF CASING

Following are the Five different types of well casing are

Conductor Casing

Surface Casing

Intermediate Casing

Liner String

Production Casing

Conductor Casing

Surface Casing

Initially the installation of Conductor casing occurs even Before the drilling rig is brought. An auger drill small in size that is attached behind the truck is used to drill a hole for conductor casing. Conductor casing, normally ranges in length from 20 to 50 feet and the diameter of onshore conductor casing is about 16-20 inches but the diameter of offshore conductor casing is 30-42 inches. The main purpose of installing Conductor casing is to avoid caving of the above top well portion. It assists in circulating process of drilling and pumping the drilling fluid up.

The second type of casing installed after Conductor Casing is Surface casing. It can range in length from hundreds to about 2, 000 feet. The diameter of surface casing is less than that of conductor casing. After the installation of surface casing, it fits perfectly in the inside top portion of the conductor casing. The main purpose of the surface casing is protection of the deposits of fresh water present close to the surface site of the well from contamination by the hydrocarbons or salt water that are seeping from underground and are located deep. It also provides a conveying tube for the drilling mud that comes back to the surface. It also protects and prevents the drill hole damage during the drilling process. Both Surface casing and conductor casing, are cemented into their own places. Thickness of the cement should Be ensured so that the chances of contamination are less.

Intermediate Casing

Intermediate casing in a well is normally the most largest part . The main function of intermediate casing is the minimization of the hazardous affects

on the well from the formations and materials that arrive from other subsurfaces like underground abnormal zones of pressures, shales, and formations like salt-water deposits preset underground etc. Even if there is No chance or possibility of such unusual hazardous instances and formations, intermediate casing is applied to avoid the possibility of such instances. The areas of intermediate casing are cemented in order to provide extra additional protection.

Liner Strings

IN place of Intermediate casing, Liner strings can be occasionally applied and utilized. These strings normally run from different type of casing bottom to the open area of well, but are normally attached By hangers to the casing that is present previously rather than cementing this casing. Therefore is semi permanent and detachable as compared to intermediate casing.

Production Casing

The casing that is installed at the end of all the casings in a well is the Production casing, also known as ‘ oil string' or 'long string' which is also the part that is most deepest of all.

It forms and provides a sort of conveyor tube that heads and starts from the well surface to the formation down that produces petroleum. Production casing size is dependant upon various factors, It depends upon the lifting equipment that is to be utilized and the total required number of completions needed, and it also depends whether the well Needs to Be deepened at a later stage, if so then the production casing is constructed with enough width so that it may enable that a drill bit can Be passed later in future.

Well casing is the most beneficial section of a well that is completed. As it Not only strengthens the hole of the well But also makes possible the extraction of hydrocarbons along with preventing their mixing with other types of different fluids along with other formations that are found or present underground By serving as a conduit. It is also helpful in avoiding blows, because it seals the formations that are rising from top of the well especially if pressure levels of risky intensities are reached..

Setting or cementing of a casing is followed By the, installation of proper lifting equipment that is responsible for bringing the hydrocarbons present down in ground from the formation up to the earth surface where the well is situated. When the installation of case is complete, it is followed By the insertion of tubing system into casing, from the top opening of well, to underground formations.

2. WELL COMPLETION

Well completion is a process of completing a well to prepare it for or natural gas production. Completion process involves deciding upon various characteristics and factors especially for the well intake portion in the hydrocarbon formation that is targeted.

TYPES OF COMPLETION

There are many different types of completions, like:

Open Hole Completion

Conventional Perforated Completion

Sand Exclusion Completion

Permanent Completion

Multiple Zone Completion

Drain hole Completion

The kind of completion to Be used depends on the characteristics as well as the location of the targeted formation of hydrocarbons decided to be mined.

Open Hole Completion

The most common kind of completion is Open hole completions that are most commonly used only in formations that are really extremely competent , whose possibility of caving in are not large. IN Open hole completion casing directly leads into hydrocarbon site, and the other pipe end remains open, lacking other sort of filters that are used for protection. Most commonly, they are utilized where treatment with fracturing process by utilizing hydraulic acid is held.

Conventional Perforated Completion

IN Conventional perforated completions, the sides of the casing have tiny holes as perforations on the sides that are facing and are in direct contact to the formations that enables the flow of hydrocarbons and the production casing is extending across formations. It serves for the provision of support and protection for the hole of the well.

A special equipment is actually used for making perforations or tiny holes either in the casing, cemented area, any barrier if that is present. Bullet perforators were employed in the past . They were small guns that were inclined into the well. When shooted from surface, small bullets coming out

penetrates and enters into the casing and as well as cement. Nowadays jet perforating is applied.

Charges that can Be ignited Electrically are emitted By these jet perforators to create holes.

Sand Exclusion Completion

For productions in Areas possessing great quantities of sand , sand exclusion completions are used, that are modeled in a way that the natural gas , oil Naturally flows towards well, without letting sand to enter. Some of the problems caused if sand is present are casing and machinery erosion.

Screening and systems of filtering are the most common method to prevent entrance of sand into well By installing screens or filters. Some filters can Be simply held inside casing, or gravel of special size are added outside of casing for filtration purpose. These two common types of barriers for sand can be applied in Both open hole as well as for completions with perforations.

Permanent Completion

IN Permanent completions installation and assembling of well completion, and wellhead, take place just once. Tools of very small diameter are used for Installation of casing, cementation, perforation, and other completion work to ensure that the completion is permanent.

Multiple Zone Completion

Multiple zone completion is used when there is a Need to produce hydrocarbons from more than two formations at the same time, avoiding

their intermingling. A well can Be drilled that can pass across various formations. Multiple completions are separated very often By a Barrier or By using hard rubber ‘ packing’ to avoid mixing of fluids from the different formations. Sometimes if different fluids that are drilled are very close or similar in nature, mixing of fluids is allowed.

Drainhole Completion

Drainhole completions are either a horizontal or a drilling that is slaNt. IN this completion drilling occurs horizontally from a well that is vertical, that provides a drain for flowing. Drain hole completion sometimes enables extracting hydrocarbons more efficiently and in a more Balanced way. They are e oftenly used for oil wells with natural gas reserves.

3. INSTALLATION OF THE WELLHEAD

The wellhead is present at the opening of the well that contains specialized instrument along equipment used for monitoring and regulating the hydrocarbons extraction from Beneath deep of the earth surface. It is responsible for avoiding leakage and the blowouts caused By formations that are under pressure that is high.

Therefore wellheads are capable of standing an pressure that has an upward force of up to 20, 000 psi from gases and liquids escaping from high pressure Formations that are under high pressure

COMPONENTS OF THE WELLHEAD

The wellhead comprises of following three components:

The casing head contains fittings that are very heavy and serves the purpose of sealing in between the casing and surface, supporting the length of casing leading down the well. The casing has a mechanism that is gripping in Nature for ensuring that the seal present in Between the head and casing is tight.

The tubing head has similar function the provision of a seal that is present in between the tubing (installed inside casing) and the surface. It supports and run along the length of casing, along with providing attachments and connections site at the surface for controlling fluids flow that comes out of well .

The equipment Christmas treat have a tree like shape present above the heads of casing and tubing are fitted completely at top . Valves and tubes are present for controlling the flowing hydrocarbons and fluids coming out of the well. It is the visible most section and monitors and regulates hydrocarbon production

4. Installation of a lifting equipment and required Well Treatment

Completion of well may lead to the production of oil and natural gas. Sometimes, the pressurized hydrocarbons rise up naturally and comes out of the well to the surface, which is very common especially if lighter than air, therefore opening of conduit leads to the rise of pressurized gas to without any problem, most commonly for formations that contains only natural gas or a light condensate. Installation of a Christmas tree leads the flow to come out of the surface By its own.

In order to understand the well, engineers employ potential tests especially in initial production days. This test is performed By the well engineers which helps them in the determination of maximum amount of natural gas or petroleum that can Be produced from a well in 24 hour time.

This, knowledge also helps the engineers in estimating what the MER, or 'most efficient recovery rate is, the rate at which the greatest amount of extraction of products can be carried out without providing any harm to formation. It also helps to determine the decline rate of producing wells Because the instant a well is drilled, the under pressure formation is producing petro-products at a rate which is very high, decline rate is a phenomena when petroleum extraction or production rate from the formation, of the well decreases. Production rate of a well can Be increased By some techniques like lifting equipment and well stimulation.

Sometimes it is difficult to ensure efficient extraction, production and flow of hydrocarbons from oil wells. There is a possibility that the underground formation is very tight, that can lead to a very slow petroleum movement up the well thus making the process less efficient. Therefore lifting equipment or well treatments In such instances are important.

Lifting equipment assists lifting of petroleum from formation and is made up of a lot of equipments that are specialized used for extraction of oil. Coaxing is Necessary for the extraction of viscous liquids from underground which is provided By this equipment.

There are different types of lifting equipment available, but rod pumping is the most common method. Surface pump powers the Rod pumping which

causes a cable to move and a rod is moved up and down in well that in turns provides a lifting pressure that brings the oil above the surface.

Horse head or conventional beam pump is the most common kind of cable rod lifting equipment, which can Be easily recognized as it possesses a distinct shape especially a cable feeding fixture, similar to horse.

5. WELL TREATMENT

One more method that can make sure the efficient hydrocarbons outflow is Well treatment. This is a kind of Well stimulation which involves injection of acid, water, or gases into the well which simulates the contents of formation and petroleum to flow out with ease.

A well can be acidized by a process called Acidizing that assists in opening and widening the spaces already present by dissolving rock portions of limestone or carbonate formations means of an injection into a well mainly by injecting hydrochloric acid to ease flow of hydrocarbons.

A well can be injected by a fluid which exerts pressure on already existing cracks present in formations causing them to further widen and open by a Fracturing . Along with fluid , propping agents like sand, glass beads, epoxy or silica sand can also be injected causing further opening of currently produced fissures that are widened.

In Hydraulic fracturing water is injected in the formations while in CO2 fracturing carbon dioxide in gaseous form are injected.

Fracturing, acidizing, and lifting equipment may all be used on the same well to increase permeability.

These techniques have remarkable performance in enhancing the rate of extraction from the wells, probably due to the fact that it exists as a gas as a low density when under pressure.

Hydraulic fracturing

Acidizing techniques

http://www. naturalgas. org/naturalgas/well_completion. asp

Porosity and Permeability

Two of the most important intrinsic characteristic factors that is responsible for the storage and as well as the movement of fluids in rocks and sediments are Porosity and permeability upon which the exploitation of natural resources partly dependant.

Porosity is the ratio of the volume of openings (voids) to the total volume of material which are the spaces between the grains of the rock or stone that makes up the material, while Porosity represents the storage capacity of the geologic material.

The primary porosity of a sediment or rock consists of the spaces between the grains that make up that material. If the grains are very tightly packed, it will have low porosity. It is determined by the shape of the grains of the unconsolidated sediments and the range of sizes of the grain present. Sediments which are very poorly sorted, will have a large range of grain sizes, therefore the space which is present in between larger grains is tend to be filled with the finer grains which results in low porosity. Primary porosity can range from less than one percent in to over 55%.

However porosity of some rocks can be increased by fracturing or by using the or solution of the material itself . Therefore the resulting porosity is called secondary porosity.

The measurement of the extent of ease to which the fluids can flow though a porous rock, sediment, or soil is known as permeability. It is also determined by factors such as packing, the shape, and the kind of sorting present in granular materials.

Even if a rock is very highly porous, there is a possibility that the fluid will not move if the voids are not interconnected that is they will be impermeable due to poor interconnection between voids.

The extent of interconnection of the pores in a material is called effective porosity. The value ranges in which permeability in geologic materials can exist are extremely large.

Very often Permeability is directional in nature. It depends upon the interstices characteristics of certain materials which can cause significant permeability depending upon direction and very often in one direction. Factors like viscosity and pressure of the fluid along with the material characteristics also affect the rate at which the fluid flows. Features of secondary porosity like fractures very often greatly affects permeability.