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Importance of Well Completion Methods and Enhanced Oil Recovery Techniques in Oil and Gas Industry Operations

Syed Abdul Jilani,
Dept. of Chemical Technology, Jntu Hyderabad

Abstract: Completion, in petroleum production, is the process of making a well ready for production (or injection). This principally involves preparing the bottom of the hole to the required specifications, running in the production tubing and its associated down hole tools as well as perforating and stimulating as required. Sometimes, the process of running in and cementing the casing is also included. Enhanced oil recovery (abbreviated EOR) is the implementation of various techniques for increasing the amount of crude oil that can be extracted from an oil field. Enhanced oil recovery is also called tertiary recovery (as opposed to primary and secondary recovery). According to the US Department of Energy, there are three primary techniques for EOR: thermal recovery, gas injection, and chemical injection.[1] Sometimes the term quaternary recovery is used to refer to more advanced, speculative, EOR techniques.[2] [3] [4] [5] Using EOR, 30 to 60 percent, or more, of the reservoir's original oil can be extracted,[1] compared with 20 to 40 percent using primary and secondary recovery

I. INTRODUCTION

Once a well has been penetrated, the choice must be made: Will this well turn into a maker or be stopped and surrendered as a dry gap? Should the administrator choose to push ahead with building up the well, consummation operations must be undertaken. Well culmination consolidates the means taken to change a bored well into a delivering one. These means incorporate packaging, solidifying, puncturing, rock pressing and introducing a generation tree.

The initial phase in finishing a well is to case the opening. After a well has been penetrated, should the boring liquids be expelled, the well would in the end shut in upon itself. Packaging guarantees that this won't occur while additionally shielding the well stream from outside officeholders, similar to water or sand. Consisting of steel pipe that is consolidated to make a constant empty tube, packaging is keep running into the well. The distinctive levels of the well characterize what measurement of packaging will be introduced. Alluded to as a packaging program, the diverse levels incorporate creation packaging, halfway packaging, surface packaging and conductor casing. Additionally, there are two sorts of packaging that can be keep running on a well. One sort of packaging comprises of a strong string of steel pipe. Strong packaging is keep running on the well if the development is firm and will remain that path amid the life of the well. Should the well contain free sand that may penetrate the well stream, the packaging is introduced with a wire screen liner that will obstruct the sand from entering the wellbore.

The subsequent stage in well finishing includes establishing the well. This incorporates pumping bond slurry into the well to uproot the current penetrating liquids and fill in the space between the packaging and the genuine sides of the bored well.

Comprising of an uncommon blend of added substances and concrete, the slurry is left to solidify, fixing the well from non-hydrocarbons that may attempt to enter the well stream, and for all time situating the packaging into put.

A. Open-Hole Completions

At the repository level, there are two sorts of consummation techniques utilized on wells: open gap or cased-gap fulfillments. An open-gap finish alludes to a well that is penetrated to the highest point of the hydrocarbon store. The well is then cased at this level, and left open at the base. Otherwise called top sets and shoeless fruitions, open-gap fulfillments are utilized to lessen the cost of packaging where the store is strong and surely understood.

B. Aperture

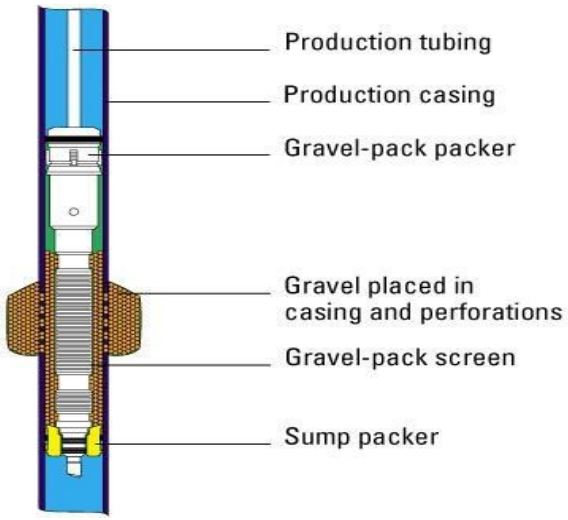
Cased-opening culminations expect packaging to be keep running into the supply. With a specific end goal to accomplish generation, the packaging and concrete are punctured to enable the hydrocarbons to enter the well stream

This procedure includes running an aperture firearm and a repository finding gadget into the wellbore, commonly through a wireline, slickline or curled tubing. Once the repository level has been achieved, the firearm at that point shoots openings in the sides of the well to enable the hydrocarbons to enter the wellstream. The holes can either be expert by means of shooting shots into the sides of the packaging or by releasing planes, or formed charges, into the packaging.

While the puncturing areas have been already characterized by penetrating logs, those interims can't be effortlessly situated through the packaging and bond. To conquer this test, a gamma beam neckline connection log is ordinarily executed to correspond with the underlying log keep running on the well and characterize the areas where aperture is required.

C. Gravell Pack

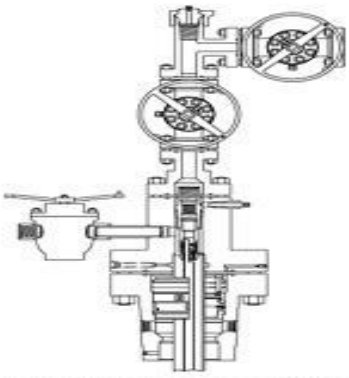
A few wells require filtration frameworks with a specific end goal to keep the wellstream clear of sand. Notwithstanding running a packaging with a liner, rock pressing is utilized to keep sand from entering the wellstream.



More entangled than establishing a well, rock pressing requires a slurry of properly estimated bits of coarse sand - or rock - to be drawn into the well between the opened liner of the packaging and the sides of the wellbore. The wire screens of the liner and the rock pack cooperate to sift through the sand that may have generally entered the wellstream with the hydrocarbons.

D. Production Tree

The last advance in finishing a well, a wellhead is introduced at the surface of the well. Ordinarily called a generation tree or Christmas tree, the wellhead gadget incorporates casing heads and a tubing head joined to give surface control of the subsurface states of the well.



Coil Tubing Wellhead and Christmas Tree Assembly

While both inland and seaward wells are finished by generation trees, seaward wells can be finished by two unique sorts of trees: dry and wet trees. Like inland generation trees, dry trees are introduced over the water's surface on the deck of a stage or office and are connected to the well beneath the water. Wet trees, then again, are introduced on the seabed and encased in a strong steel box to shield the valves and gages from the components. The subsea wet tree is then associated by means of electronic or pressure driven settings that can be controlled from the surface or through ROVs.

Also, wells may have creation spilling out of numerous supply levels. These wells require numerous culminations, which keep the creation particular. Twofold wing trees are introduced on different repository levels.

Moreover, consummations have advanced to consolidate down hole sensors that measure stream properties, for example, rate, weight and gas-to-oil proportion. Known as astute wells or brilliant wells, these consummations help to accomplish ideal creation rates

E. Crude Oil And Gas Production And Conservation

Creating oil is fundamentally a matter of relocation by either water or gas. At the season of starting penetrating, all unrefined petroleum is under weight. This characteristic weight diminishes as oil and gas is expelled from the store, amid the three periods of a repository's life. Amid the primary stage, flush creation, the stream is administered by the characteristic weight in the store which originates from broke down gas in the oil, gas caught underweight over the oil and water powered weight from water caught under the oil. Manufactured lift, the second stage, includes pumping pressurized gas into the store when the common weight is used. Stage three, stripper or negligible generation, happens when wells just deliver irregularly.

Initially there was small comprehension of the powers which influenced oil and gas generation. The investigation of oil and gas repository conduct started toward the start of the twentieth century, when it was found that drawing water into a store expanded creation. Around then, the industry was recouping in the vicinity of 10 and 20% of supply limit, when contrasted with late recuperation rates of more than 60% preceding wells end up plainly useless. The idea of control is that a quicker rate of creation all the more rapidly scatters the weight in the supply, in this manner decreasing the aggregate sum of oil which can be in the long run recouped. Two measures used to ration oil repositories are unitization and well separating.

Unitization is the operation of a field as one unit so as to apply optional recuperation strategies and look after weight, even through various diverse administrators might be included. The aggregate generation is designated on an impartial premise among the administrators.

• Well dividing is the restricting and appropriate area of wells in order to accomplish greatest generation without disseminating a field due to over boring.

II. METHODS OF RECOVERING ADDITIONAL PRODUCT

Profitability of oil and gas repositories is enhanced by an assortment of recuperation techniques. One strategy is either to synthetically or physically open entries in the strata to enable oil and gas to move all the more unreservedly through repositories to the well. Water and gas are infused into stores to keep up working weight by characteristic uprooting. Optional recuperation strategies, including relocation by weight, simulated lift and flooding, enhance and reestablish store weight. Upgraded recuperation is the utilization of different optional recuperation techniques in various and distinctive mixes. Upgraded recuperation likewise incorporates further developed techniques for acquiring extra item from drained supplies, for example, warm recuperation, which utilizes warm rather than water or gas to constrain more unrefined petroleum out of repositories.

A. Acidizing

Acidizing is a strategy for expanding the yield of a well by pumping corrosive specifically into a delivering store to open stream channels through the response of chemicals and minerals. Hydrochloric (or general) corrosive, was first used to break down limestone developments. It is still most normally utilized; be that as it may, different chemicals are currently added to the hydrochloric corrosive to control its response and to anticipate erosion and arrangement of emulsions.

B. Breaking

Breaking depicts the strategy used to expand the stream of oil or gas through a store and into wells by power or weight. Creation may diminish in light of the fact that the repository arrangement isn't sufficiently porous to enable the oil to stream openly toward the well. Breaking powers open underground channels by pumping a liquid treated with uncommon propping operators (counting sand, metal, concoction pellets and shells) into the supply under high strain to open crevices. Nitrogen might be added to the

liquid to invigorate development. At the point when the weight is discharged, the liquid pulls back and the propping specialists stay set up, holding the gaps open with the goal that oil can stream all the more unreservedly. Enormous cracking includes directing a lot of liquid into wells to powerfully make gaps which are a great many feet long. Monstrous cracking is ordinarily used to open gas wells where the repository arrangements are dense to the point that even gas can't go through them.

C. Pressure Maintenance

Two basic weight upkeep methods are the infusion of water and gas (air, nitrogen, carbon dioxide and flammable gas) into stores where characteristic weights are diminished or deficient for generation. The two strategies require boring assistant infusion wells at assigned areas to accomplish the best outcomes. The infusion of water or gas to keep up the working weight of the well is called regular dislodging. The utilization of pressurized gas to expand the weight in the supply is called fake (gas) lift.

D. Water flooding

The most usually utilized auxiliary improved recuperation strategy is drawing water into an oil store to push item toward delivering wells. In five-spot water flooding, four infusion wells are penetrated to shape a square with the delivering great at the inside. The infusion is controlled to keep up an even progress of the water front through the store toward the creating admirably. A portion of the water utilized is salt water, acquired from the raw petroleum. In low-pressure water flooding, a surfactant is added to the water to help the stream of oil through the supply by lessening its grip to shake.

E. Miscible flooding:

Miscible liquid and miscible polymer flooding are upgraded recuperation techniques used to enhance water infusion by decreasing the surface pressure of raw petroleum. A liquid miscible (one that can be broken down in the unrefined) is infused into a store. This is trailed by an infusion of another liquid which pushes the unrefined and miscible liquid blend toward the delivering great.

F. Fire Flooding

Fire flooding, or in situ (set up) burning, is a costly warm recuperation strategy wherein substantial amounts of air or oxygen-containing gas are infused into the store and a part of the raw petroleum is lighted. The warmth from the fire diminishes the thickness of the substantial unrefined petroleum so it streams all the more effectively. Hot gasses, delivered by the fire, increment the weight in the supply and make a restricted consuming front which pushes the more slender rough from the infusion well to the creating admirably

G. Steam Injection

Steam infusion, or steam flooding, is a warm recuperation technique which warms substantial raw petroleum and brings down its thickness by infusing super-hot steam into the most reduced stratum of moderately shallow supply. The steam is infused over a time of 10 to 14 days, and the well is closed for one more week or so to enable the steam to completely warm the repository. In the meantime the expanded warmth grows supply gasses, consequently expanding the weight in the store. The well is then revived and the warmed, less gooey unrefined streams up into the well.

H. Economic Costs And Benefits

Adding oil recovery methods adds to the cost of oil —in the case of CO2 typically between 0.5-8.0 US$ per tonne of CO2. The increased extraction of oil on the other hand, is an economic benefit with the revenue depending on prevailing oil prices. Onshore EOR has paid in the range of a net 10-16 US$ per tonne of CO2 injected for oil prices of 15-20 US$/barrel. Prevailing prices depend on many factors but can determine the economic suitability of any procedure, with more procedures and more expensive procedures being economically viable at higher prices. Example: With oil prices at around 90 US$/barrel, the economic benefit is about 70 US$ per tonne CO2. The U.S. Department of Energy estimates that 20 billion tons of captured CO2 could produce 67 billion barrels of economically recoverable oil. It is believed that the use of captured, anthropogenic carbon dioxide, derived from the exploitation of lignite coal reserves, to drive electric power generation and support EOR from existing and future oil and gas wells offers a multifaceted solution to U.S. energy, environmental, and economic challenges. There is no doubt that coal and oil resources are finite. The U.S. is in a strong position to leverage such traditional energy sources to supply future power needs while other sources are being explored and developed. For the coal industry, CO2 EOR creates a market for coal gasification byproducts and reduces the costs associated with carbon sequestration and storage.

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III. CONCLUSION

Completion has, on the whole, a permanent nature, which means that planning parameters must be carefully evaluated, and possible solutions must undergo technical and economical optimisation. Completion planning involves choosing and organizing the equipment to be used, selecting materials, establishing production line tubing dimensions, stipulating production intervals, and finally defining the mode of formation fluid production. This evaluation must take into account the evolution of the productive characteristics of the well, according to the production forecast.

In fact, the production characteristics of each well depend on the interaction between the reservoir, the completion, and the surface equipment. These macro-elements, in their interaction, set the conditions for production in relation to the flowing pressure and the flowing rate at the wellhead

Among the many EOR methods tested, only a few have been commercially successful. – Steam injection based recovery methods, such as CSS and steam flooding have been highly successful for heavy oils and tar sands. – Miscible CO2 flooding has had considerable success for light oils, although economics are not clear at this stage. – Chemical methods such as micellar flooding and ASP hold promise for the recovery of some of the 2 × 1012 barrels left in the reservoirs worldwide.

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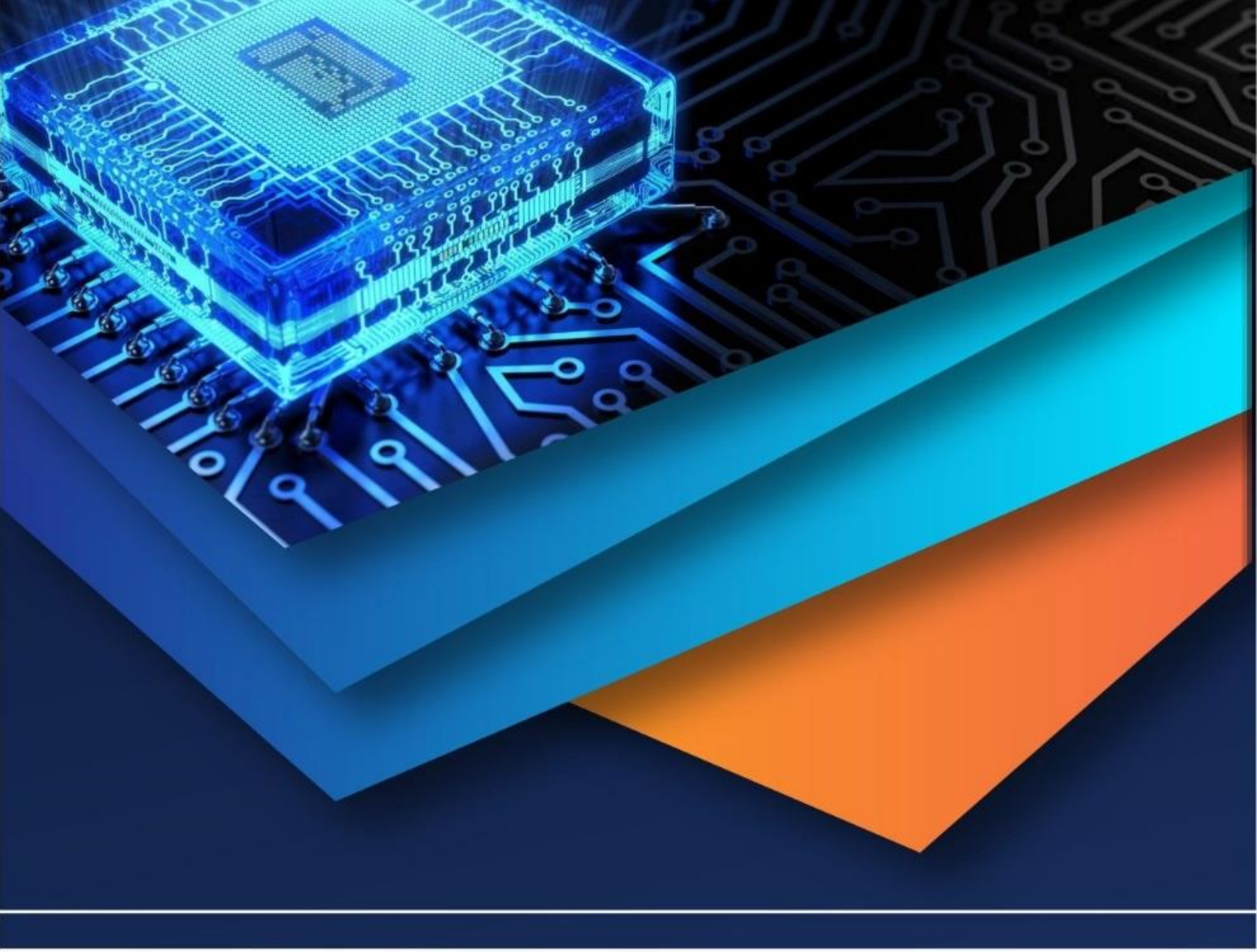

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