PETROLEUM AND NATURAL GAS ENGINEERING - WHAT IS IT?

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Petroleum and natural gas engineering deals with discovery, production and transportation of oil and natural gas. Consequently, the engineer must be thoroughly familiar with the principles of geology as related to occurence, discovery and production of natural gas and petroleum. This knowledge is obtain by study of geology as well as by the study of geological principles that related to oil development and production. In addition, the engineer must be well grounded in principles of drilling and oil/gas production, as well as in the technology of transportation.

To get a clear picture of the scope of petroleum engineering, it is easier by understanding/knowing the processes or operations that involve starting from locating the oil reservoir, drilling the exploration well, evaluating the formation, developing the field, producing the oil and transportating the oil.

Oil and gas are hydrocarbons, they are made up primarily of only two elements; hydrogen and carbon. Oil and gas are found in pores of buried layers of rock. The rock in which oil and gas may be present are usually

sedimentary. Sandstone and limestone are two common type of sedimentary rocks in which hydrocarbon occur. Oil and gas are highly believed formed from the remains of microscopic plants and animals that were buried below the surface in the distant past. Once form, the hydrocarbon were force out of their place of origin and migrated upward. In some cases, they were trapped in underground formations. Many different types of traps exist. In general, traps are caused by folding, faulting, uncomformities, domes, changes in permeability, and combinations of two or more of these.

The study to find a site on which to drill an exploratory well, surveys of various kinds are used. Gravity surveys measure and record the density of underlying rocks. Positive and negative gravity anomalies may indicate the presence of folds and domes that could act as hydrocarbon traps.

The magnetic surveys involve the use of magnetometer that measures the magnetic forces in the earth's curst. By measuring and recording magnetic anomalies, we can find arches and fold that might serve as hydrocarbon trap.

Another survey which is the most important survey among them is a seismic surveys. It measures and record the time takes for loud, low frequency sound, which bounces

off subsurface rock layers, to reach the surface. A seismic section is a cross-sectional view of rock layers under investigation. A geologic structure favourable to accumulations of hydrocarbons can be found from seismic section.

This stage of operation mostly involve geologist and geophysicist. Even though surveys help pin point the possible existence of hydrocarbon traps, the only sure way to confirm their presence is to drill a well.

The primary job of any drilling unit is to put a drill bit into the ground and rotate it. To accomplish the task, drilling fluid must be circulated so that the cutting are cleaned from the bottom of the hole and are carried up the hole for disposal. In addition to a circulating system, a rotating system is needed to turn the drill stem and the bit.

Since most of a rig's equipment requires a source of power to operate, several diesel engines are used to provide power. The engines turn generators to generate the electric power. Cables from the generators carry electricity to motors that are mounted on or near the equipment to be powered.

The hoisting system consists of the drawworks, crown block, travelling block, and drilling line. The hoisting

system suspends the drill stem and bit in the hole and makes it possible to trip the drill stem and bit in and out of the hole.

From the exploration well, the reservoir formations are evaluated. Evaluation involves measuring certain properties of a potential reservoir rock and obtaining samples of the rock and any fluids that may be in it. There are three popular methods of evaluating the formation. They are well logging, coring and drill stem testing.

Formation evaluation is used to determine whether sufficient amount of hydrocarbons exist in the reservoir. Whether or not the first wild cat well yields hydrocarbons, it is usually, but not always, plugged and abandoned. If tests on the exploratory well prove favorable, additional wells are usually drilled and evaluated. These additional wells are appraisal well. They are drilled to confirm further that the reservoir contain enough hydrocarbons to justify the enormous expense of developing it. If the appraisal wells reveals that the reservoir does contain enough hydrocarbon, then development drilling may occur.

Development drilling is the drilling of several wells into the reservoir in order to produced the hydrocarbon

discovered by exploratory well and confirmed by appraisal wells. The number of wells drilled depended on the size of the reservoir. The wells drilled for the purpose have to be completed. Well completion usually involves perforating the well to make perforation or hole in casing and cement. The perforations provide a way for reservoir fluid to enter the well. Usually, tubing with a packer is place in the well, and reservoir fluid flow up the well through the tubing.

Natural energy is usually present with hydrocarbon in the reservoir. The natural energy is often associate with gas and water that exist with oil. Gas, water or both drive oil into wells that are drilled into the reservoir. As hydrocarbons are produced, natural pressure dwindles to a point that it no longer able to lift oil to the surface. Some pressure is left, but it just not enough to do the job. Since the pressure is frequently exhausted long before all the hydrocarbons are extracted from the reservoir, artificial lift is often used to produce at least some of the remaining hydrocarbons. Artificial lift is a technique in which some form of external energy is applied to the well. The applied energy must reduce pressure inside the well so that the reservoir is sufficient to lift additional reservoir to the surface. There are several methods of aftificial lift including gas lift and a few kind of pumping systems.

Oil and gas seldom reside in the reservoir by themselves; water and other impurities like sediment usually coexist with them. As hydrocarbons are produced, those impurities come to the surface with them, and once on the surface, impurities must be separated and removed from the oil and gas. The oil and gas must also be separated from each other before they can be transported from refining and processing.