

Michael Zoghbi

Pete 4999

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### What is a Petroleum Engineer?

In a world run primarily by hydrocarbons, the producers of such a precious resource are of vast importance. A Petroleum Engineer is an educated problem solver, an explorer of opportunity, a long term planner, and sometimes a risk taker. Petroleum hydrocarbons produce over 1000 different products and are heavily depended on in our daily lives in the form of energy. It is the job of the Petroleum Engineer to discover and produce these hydrocarbons. This resource is then exported and heavily consumed by the many different energy sectors. Therefore, Petroleum Engineers will always be in demand, as long as the demand for hydrocarbons is intact. A Petroleum Engineer's main concern is the production of hydrocarbons; therefore, it is essential to understand the nature of this product.

Petroleum hydrocarbons take many forms. The most common forms that are primarily produced in their most raw state are crude oil and natural gas. Petroleum is the result of the decomposition of organic material over the course of millions of years. This decomposed organic matter in its purest form is nothing more than a combination of hydrogen and carbon. Thus, the name hydrocarbons is often associated with petroleum products. Because these hydrocarbons are understood as originating from such ancient matter, they are also referred to as "fossil fuels."

Although we have sufficient data and reliable technology to produce and consume petroleum hydrocarbons, there are still many scientific mysteries associated with this field. This is primarily due to the fact that what is being produced can never be witnessed in its natural state thousands of feet deep into the earth, and also because the process of million year old decomposition can also never be witnessed. "There is probably no other technical field in which so many major questions remain unanswered and yet which functions as efficiently as the oil industries... In short, we don't know what it

is, how it originates and accumulates, how to find it, or how to get it all out of the ground” (*Petroleum Engineering*, Gatlin, Page 1, Paragraph 1). Although scientific proof and theory can never be fully satisfied with controlled understanding of this process, Petroleum Engineers nevertheless are able to develop technology and methods for efficient and safe extraction. Drilling for petroleum is no easy task, it requires multiple Petroleum engineers all of whom specialize in a separate part of the drilling process.

It is a typical misconception that a Petroleum Engineer is a specialized discipline. Much like a doctor chooses a specialization, a Petroleum Engineer also specializes in one of the many tasks required to complete the project at hand. “It is a common belief that all one has to do is drill a well and then receive dividend checks. This is far from the true condition” (*Oil Field Practice*, Dorsey Hager, Pg. 5, Paragraph 3). It takes the knowledge and expertise of many specialized engineers to cover all aspects of the project. Often there are three main sub disciplines or specialties associated with Petroleum Engineering: reservoir, drilling and production.

As a reservoir engineer focuses on designing the overall plan for efficient extraction. This is done through studying the subsurface conditions, drawing correlations, and understanding the nature of how petroleum behaves under these sub surface conditions. Modern reservoir engineers are also responsible for planning the implementation of various recovery tactics. EOR is the third stage of recovery after primary and secondary recovery techniques have been exhausted. “With much of the easy-to-produce oil already recovered from U.S. oil fields, producers have attempted several tertiary, or enhanced oil recovery (EOR), techniques that offer prospects for ultimately producing 30 to 60 percent, or more, of the reservoir's original oil in place” (*Enhanced oil recovery*, [www.enery.gov](http://www.enery.gov), paragraph 2). This means that the bulk of the oil produced is actually done by artificial stimulation, rather than relying on the natural bottom hole conditions. Once the target zone is located and an overall framework is set in stone, the drilling engineer is then charged with the execution of reaching the target depth.

The drilling engineer is responsible safely reaching the target depth in a cost effective and timely manner. There are many dangers associated with the heavy machinery and strenuous work conditions. The drilling engineer must work hand in hand with the reservoir engineer to understand the nature of the sub surface in order not over balance the pressure distribution and have a blowout. When drilling into permeable formations, failure to maintain sufficient bottom hole pressure in the form of drilling mud is the primary cause of taking a kick. "The drilling engineer has the responsibility to think beyond simply the engineering equations in combating some of these problems. He or she must anticipate drilling problems, devise solutions, think quickly and decisively." (*Drilling Engineering*, Azar, page 4, paragraph 2) Professor Azar of Tulsa University understands the complexity and intuitiveness associated with drilling engineering. With so many unique sub surface conditions, innumerable problems arise with drilling, requiring the engineer to be preventative and expectant of such emergencies.

The production engineer monitors and maintains down hole conditions during drilling and production. The production engineer also efficiently manages the timeliest possible recovery for the life of the well. Barrels of oil are priced by their ability to be produced on time. Therefore it is crucial to the overall economic feasibility to undergo a complete workover on a well, that a production engineer recovers the oil efficiently and quickly. The production engineer also works with downstream refining engineers to appropriately refine and export the hydrocarbons to their respective destinations.

"That the oil and gas industry is profitable is largely due to the emergence of petroleum engineering and the techniques which have been developed for its application" (*Petroleum Engineering: Principles and Practice*, Archer and Wall, Page 10, paragraph 4). Petroleum engineers are critical thinkers, institutive problem solvers, explorers and gamblers, and above all else innovators. Through breakthroughs in technology, the production of hydrocarbons has become incredibly efficient, cost effective and safe for the worker and environment alike. Petroleum Engineers are the fathers of energy in a world that heavily depends on their practice.

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