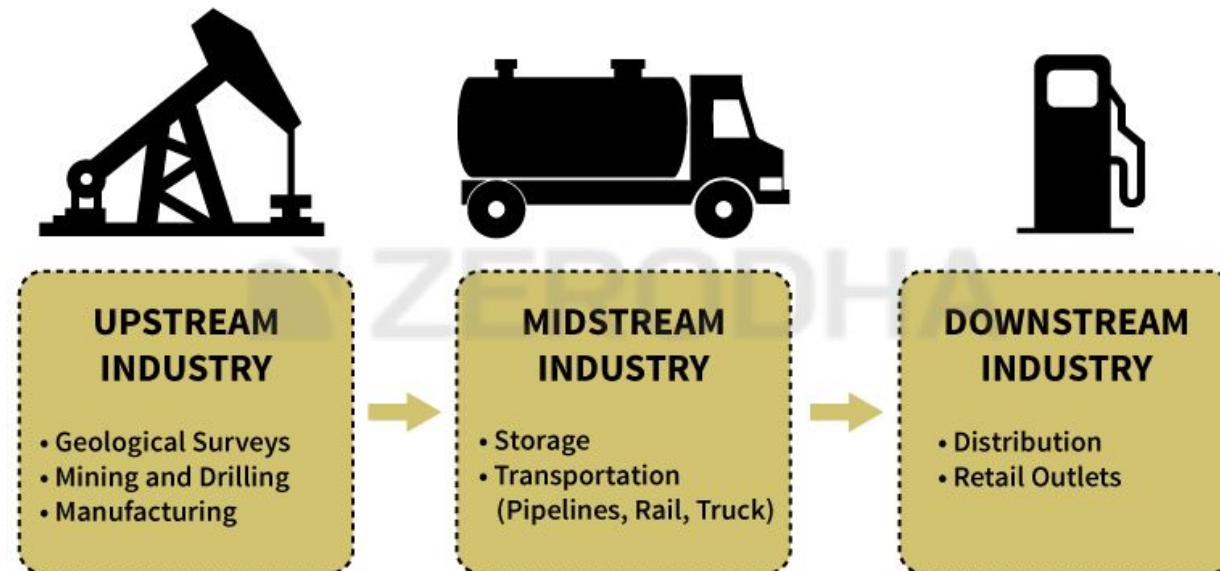




Petroleum engineering

Petroleum engineering

Petroleum engineering is involved in the exploration and production activities of petroleum as an **upstream** end of the energy sector. **Upstream** refers to the process of finding and extracting oil, which is usually buried deep beneath the earth's surface, to provide a continuous **supply** to consumers "**downstream**". Petroleum engineering covers a wide range of topics, including economics, geology, geochemistry, geomechanics, geophysics, oil drilling, geopolitics, knowledge management, seismology, tectonics, thermodynamics, well logging, well completion, oil and gas production, reservoir development, and pipelines.

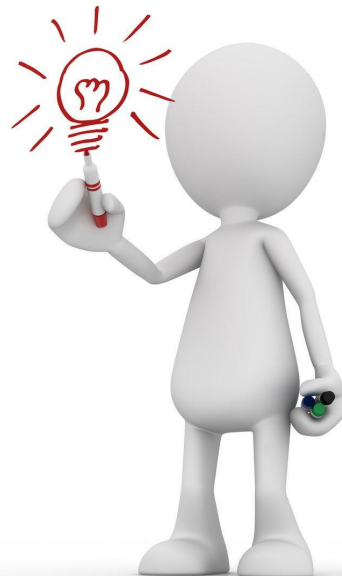


Petroleum engineering has become a technical profession that involves extracting oil in increasingly difficult situations as the "low hanging fruit" of the world's oil fields are found and depleted. Improvements in computer modeling, materials and the application of statistics, **probability analysis**, and new technologies like horizontal drilling and **enhanced oil recovery**, have drastically improved the **toolbox** of the petroleum engineer in recent decades.



Petroleum engineers

- As mistakes may be measured in millions of dollars, petroleum engineers are held to a high standard. Deepwater operations can be compared to space travel in terms of technical challenges. Arctic conditions and conditions of extreme heat have to be contended with. High Temperature and High Pressure (HTHP) environments that have become increasingly commonplace in today's operations require the petroleum engineer to be **savvy** in topics as wide ranging as thermohydraulics, geomechanics, and intelligent systems.



- Petroleum engineers must **implement** high technology plans with the use of manpower, highly coordinated and often in dangerous conditions. The drilling rig crew and machines they use becomes the remote partner of the petroleum engineer in implementing every drilling program. Petroleum engineering has historically been one of the highest paid engineering disciplines; this is **offset** by a tendency for mass **layoffs** when oil prices decline. According to a survey published in Dec 2006 the average income was \$116,834.



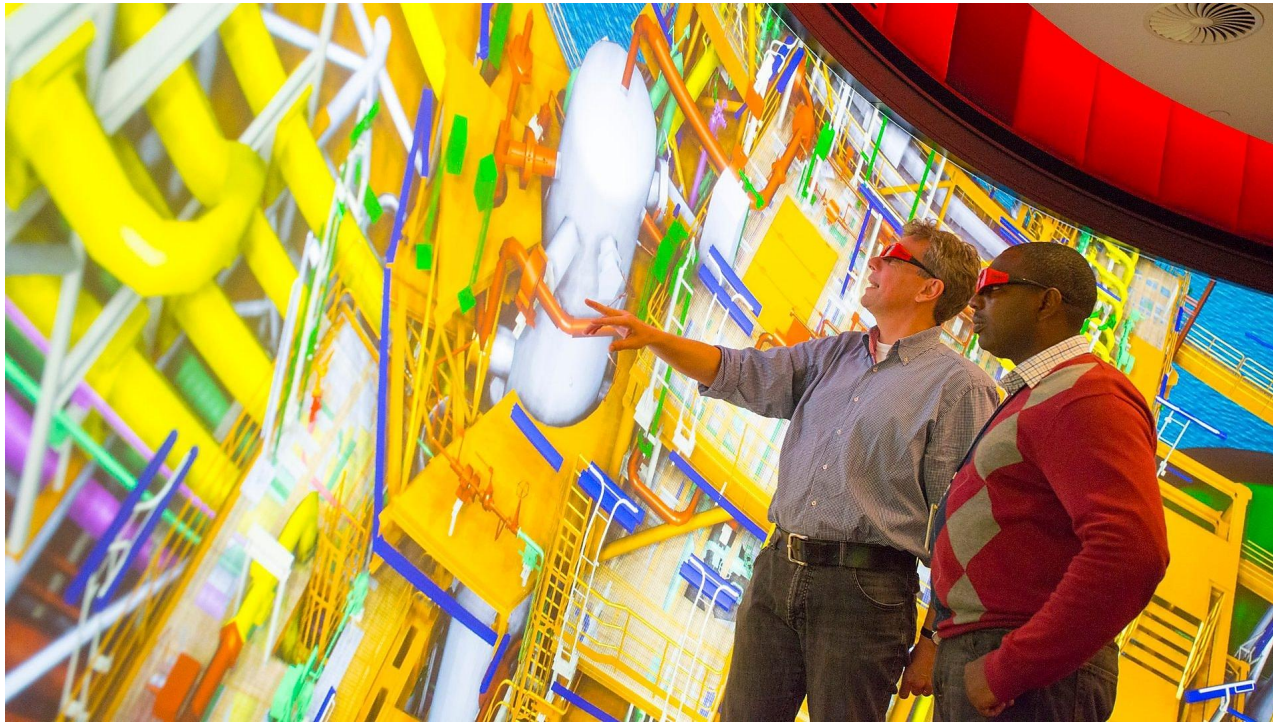
Types of petroleum engineers

- Petroleum engineers divide themselves into several types:
 - Reservoir engineers work to optimize production of oil and gas via proper well placement, production levels, and enhanced oil recovery techniques.
 - Drilling engineers manage the technical aspects of drilling both production and injection wells.
 - Production engineers (also known as completion or subsurface engineers) manage the interface between the reservoir and the well, including perforations, sand control, artificial lift, downhole flow control, and downhole monitoring equipment.



Reservoir engineering

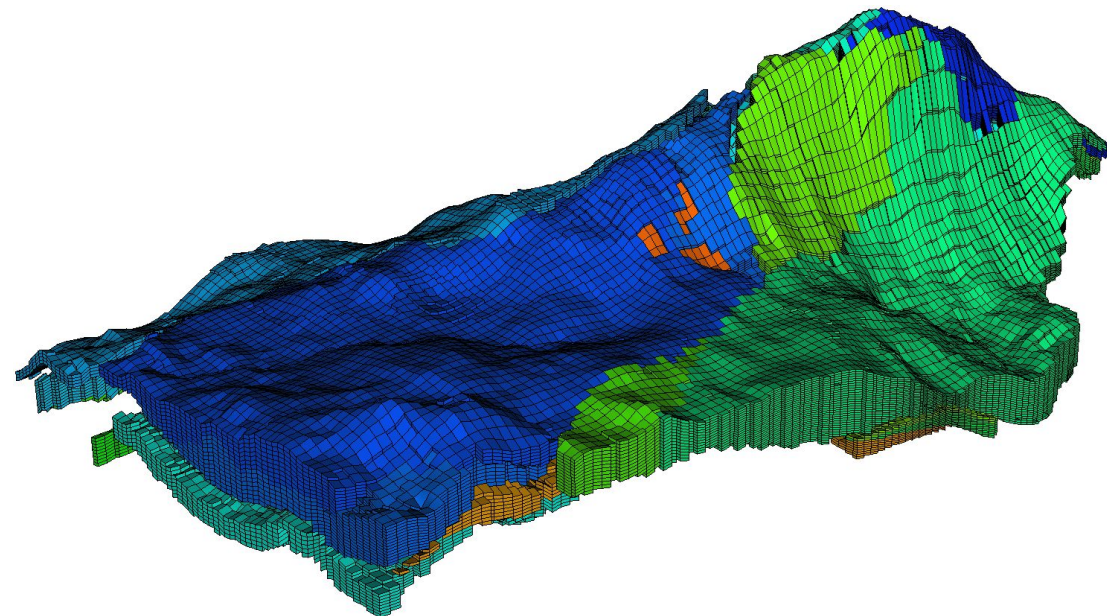
- **Reservoir engineering** is a branch of petroleum engineering, typically concerned with maximizing the economic recovery of hydrocarbons from the subsurface.
- Of particular interest to reservoir engineers is generating accurate reserves estimates for use in financial reporting to the SEC (U.S. Securities and Exchange Commission) and other **regulatory bodies**. Other job responsibilities include numerical reservoir modeling, production forecasting, well testing, well drilling and **workover** planning, economic modeling, and PVT analysis of reservoir fluids.



Types of reservoir engineers

Reservoir engineers also play a central role in field development planning, recommending appropriate and cost effective reservoir **depletion** schemes such as **waterflooding** or gas injection to maximize **hydrocarbon recovery**. Reservoir engineers often specialize in two areas:

- **Surveillance** (or production) engineering, i.e. monitoring of existing fields and optimization of production and injection rates. Surveillance engineers typically use analytical and empirical techniques to perform their work, including decline curve analysis, **material balance modeling**, and **inflow/outflow** analysis.
- **Simulation modeling**, i.e. the conduct of reservoir simulation studies to determine optimal development plans for oil and gas reservoirs.



Drilling engineering

- **Drilling engineering** is a subset of petroleum engineering, involved in the design and drilling of production and injection wells. The planning phases of drilling an oil well typically involve estimating the value of sought reserves, estimating the costs to access reserves, acquiring property by a mineral lease, a geologic survey, a wellbore plan, and a layout of the type of equipment depth of the well.



Types of drilling engineers

Drilling engineers are engineers in charge of the process of planning and drilling oil wells. Their responsibilities include:

- Designing casing strings in conjunction with drilling fluid plans to prevent blowouts (uncontrolled **hydrocarbon release**) and **formation breakdown**.
- Designing or contributing to the design of drill strings, cement plans, directional plans, and **bit programs**.
- Specifying equipment, material and ratings and grades to be used in the drilling process.
- Providing technical support and audit during the drilling process.
- Performing cost estimates and analysis.
- Developing contracts with **vendors**.

It is their responsibility to ensure that the well is drilled in a safe, cost-effective and effective manner.

Terms and vocabulary

upstream	разведка и добыча / Блок Разведки и Добычи (Апстрим)	well completion depletion implement artificial lift downhole flow control workover waterflooding vendor reserves lease bit program probability analysis enhanced oil recovery	заканчивание скважины истощение, выработка внедрять, вводить в действие механизированная добыча регулирование дебита скважины капитальный ремонт (КРС) Заводнение Поставщик экономические запасы контракт на аренду нефтеносного участка программа использования буровых долот анализ вероятности добыча нефти с искусственным поддержанием энергии пласта
downstream	переработка и сбыт / Блок Переработки и Сбыта (Даунстрим)	(well) placement interface	размещение (скважин) поверхность раздела (двух фаз или слоёв жидкости)
supply	поставка, снабжение	regulatory body hydrocarbon recovery	контролирующий орган добыча, отбор (нефти, газа из коллектора); отдача (коллектора)
layout	план, схема	surveillance	осмотр; обследование; технический надзор; контроль
(hydrocarbon) release	Выделение	material balance (modeling)	материальный баланс
formation breakdown	разрыв пласта	inflow\outflow simulation modeling offset (v)	приток\выход (имитационное) моделирование уравновешивать, нивелировать, сводить на нет
via	посредством чего-л.	become commonplace in	стать привычным делом, обычным явлениям
toolbox	инструментарий	be concerned with	иметь дело, рассматривать, иметь отношение
layoff	приостановка	be of particular interest to	представлять особый интерес для к.-л.
be savvy in	быть осведомленным, разбираться (в к.-л. вопросах)	play a (central) role in	играть, выполнять роль
involve	вовлекать, быть связанным	specialize in	Специализироваться
refer to	относиться, отсылать; обращаться	be in charge of (N)	быть ответственным за, отвечать
hold (held) to a high standard	предъявлять высокие требования	measure (v)	измерять, замерять
compare to	сравнивать; сопоставлять	in conjunction with	в соединении; в связи; вместе
contend with	бороться; справляться, противостоять	cover a wide range of	охватывать широкий диапазон (круг)



Thanks for your attention!