

Oil and Gas Primer For Investors

Introduction

YOU should have a basic understanding of O&G so you can follow what is talked about in many articles. This brief introduction is a good start, and you can find many outstanding articles or YouTube videos that will quickly extend your understanding. Not only will you find them helpful in building your information base; they are fascinating to watch. Our industry is exciting!

Geology

Do you know what the word “petroleum” means? It means “rock oil”. Petroleum was created millions of years ago by geological processes. As tiny marine organisms settled to the ocean bottoms, they were buried under layers of sediment. Amazing as it seems, over millions of years the quantities were enormous. Time, pressure and temperature converted the mass to oil, and the sediment layers to rock.

Oil reserves are not like a lake buried underground. The oil is stored in the tiny pores (empty spaces sometimes called vugs when the spaces are big) found in the rock. When you drill into the rock, the enormous underground pressure forces the oil out of the rock and into the well bore where it can escape to the surface.

Geologic areas that contain oil are called “basins”. Specific geological structures are required to “capture/concentrate” the oil into possible oil reserves. Who owns this? The surface land owners, who will lease the mineral rights to an oil company. If the oil company “strikes oil”, the land owner gets a 25% royalty payment on the revenue. The company is entitled to the rest.

Here are the types of reserves: unproven; probable; proven undeveloped (PUD); proven developed (PDP). Today most independents and private investors should focus on PUD and PDP because the probability of drilling a commercial well is “high” (90% probability that you will find oil).

Geologists today are much better at finding oil than even 20 years ago. Technological advances in seismology, 3-D subsurface imaging, drilling and testing and well completion etc have contributed greatly to success rates. Horizontal drilling and fracking are often spotlighted.

Petroleum Engineering

Petroleum engineers help plan the drilling, testing and completion activities (DTC) and also manage oil production from the reservoir. They and the geologists read the “logs” gathered as the well is drilled, along with core samples from the bore hole. They estimate how much oil is in the reservoir from the information gathered. Here is a brief explanation how:

- **How do geologists figure out how much oil might be in a reserve? Geologists use modern seismology, chemical and 3-D imaging techniques to estimate the**

VOLUME of underground rock formations that might contain oil. They analyze drilling records from previous producing wells drilled in the area, along with test drilling, to measure POROSITY (how much volume is other than rock), PERMEABILITY (how fast do fluids flow through the rock), CONNATE WATER (what percent of the porous volume is taken by water), RESISTIVITY (higher levels of resistance indicate oil is present). This along with chemical testing on core samples removed by exploratory test drilling gives them enough information to estimate how much oil is still in the reservoir.

Drilling

Spudding a well is when you start to drill. Here are the basic types of drilling programs:

- Exploratory/Testing. Looking for oil in unproven reserves. This is **NOT** for private investors.
- Step-Out. Looking for oil in regions somewhat beyond the probable reserves. **NOT** for private investors.
- In-Fill. Drilling into proven undeveloped reserves.
- Off-set. Drilling “close” to producing wells.
- Workover. Maintenance and reengineering on existing production wells.

Rotary rigs are used to drill the wells. As the well is drilled, casing is cemented in the well bore to insulate from the rock layers. Testing and well logging are done as the well is drilled. When they reach total depth the geologists and petroleum engineers determine if there is enough oil in the ground for a commercial well. If yes, the well is completed by inserting tubing inside the casing and perforating the tubing and casing so oil will flow into the well bore. If not, the well is plugged and abandoned.

Many wells contain both oil and gas. If there is enough gas, it is separated and processed and sent to pipelines for eventual sale. If not, it used to be flared (wastefully burned), and today it is often used to power nearby lift pumps. This saves on electricity used to operate the pumping jacks.

Managing the Reservoir

Petroleum engineers that manage the oil well production are called reservoir engineers. They determine the rate at which to extract the oil, and the spacing of additional wells to maximize the cumulative economic production over the life of the well. Here are some parameters to be aware of:

- One well can drain 40 acres
- One square mile of land is called a section
- One section equals 640 acres
- So 16 wells can drain one square mile
- Production wells in close proximity are sometimes combined via “unitization”

Production declines over time as the underground pressure drops. The reservoir engineers then might do workover (fracking, mechanical or hydraulic lifting/pumping, secondary/chemical recovery, etc) to keep the well productive.

Each well needs to have routine daily/weekly/monthly maintenance to keep the equipment operating efficiently. The costs usually are a small percentage of the total revenue the well produces, but sometimes the well operator (the company that maintains the well) will temporarily shut in the well until more extensive maintenance is completed or prices increase.

And that wraps up our “Oil and Gas Primer”. This is a good start, and you should add to your understanding by searching the Internet for articles and videos that give more detail. Since you are following O&G, you should do so!