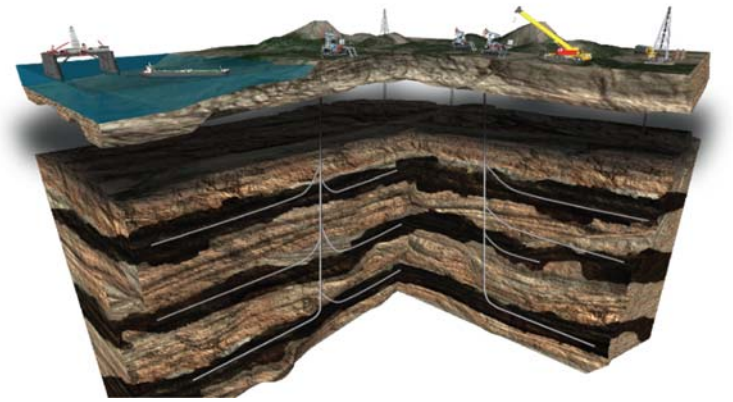
TITAN
Oil Recovery, Inc.

Oil Industry Basics: In Non-Technical Language

- The oil production industry is basically divided into three parts: Exploration, Production and Managing Oil Fields. This takes place onshore and offshore. There are approximately 70,000 oil fields in the world and 6,500 offshore platforms.
- Oil production is the largest industry in the world. Just producing the oil is $3 trillion annually. Every day the world consumes 100 million barrels for transportation and energy.
- Over 500,000 products cannot be made without oil as a component or in manufacturing. Your cell phone has over 50 parts that cannot be made without oil.
- Exploration has some risk and is expensive. Some offshore deep North Atlantic exploration wells can cost over $1 billion each. Horizontal wells in shale (also referred to as tight oil) can cost $5-10 million each. Wells on conventional oil fields can cost anywhere from $300,000 for shallow reservoirs to over $1 million depending on depth and other factors. New seismic technology has made drilling a lot less risky. This is good for Titan as todays discovery wells will be eligible for the Titan Process in a few years.
- Production Drilling and Completion (making drill holes into producing oil wells) is capital intensive and scheduled after an economic amount of oil is discovered. Dozens to hundreds of new wells can be scheduled to be completed after an oil reservoir discovery. This is called developing the field.
- Managing oil fields is low risk and if done right becomes a mundane and long-lasting aspect of the industry. 90% of the work on these fields on a daily basis is done by workers who are not engineers. These are called pumpers. They are field hands. They are important people. Field engineers do the office work, planning and do get their hands dirty sometimes but most of the running of the field is very basic. The oil wells need to be cared for, but it is not rocket science, but diligence and good field management is very important. These wells must be cared for and watched on a daily basis.
- The low risk side of the industry is managing mature oil fields with established production and known proven reserves. Approximately 85% of the world's oil comes from mature fields.
- The initial production from a field is called Primary Production. This is the most profitable production as Mother Nature forces oil to the surface. Primary Production usually recovers only 15% of the oil in the reservoir. Oil operators now have to do something to recover more oil.

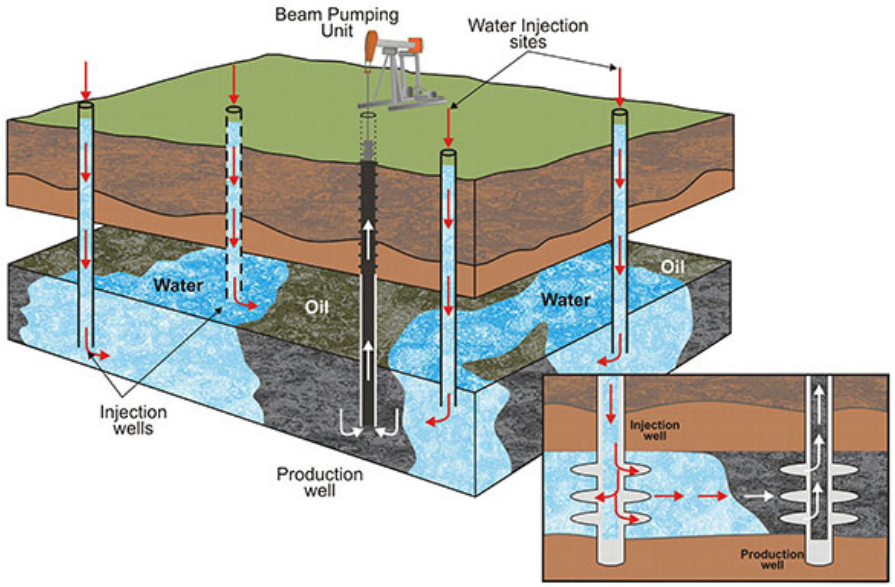


- The picture above shows where oil is located in several rock strata's. Don't be confused by the black sections. The oil there is in dense rock.

- The rocks that contain oil are mostly sandstone and carbonate rocks like limestone.
- The next phase is called Secondary Production. This is where water or gas is injected into reservoirs to keep up the pressure, so oil can come to the surface. It is explained below.
- All oil fields 2-3 years after completion start losing pressure and oil production starts to decline. This is one of the biggest problems facing oil producers. It's called the Decline Curve. It means every year you get less oil from your wells and field. The global average is 6.5% decline each year for the industry. Many fields that are more mature are declining at 10-20% annually. The Titan Process has altered decline curves and can reverse the decline to an upward trend for a period of time and in some reported cases for multiple years.

- An oil reservoir is not a lake or a pool or river. An oil reservoir is solid rock (sandstone for instance) that is denser than the walls in your home or office. The oil is found in between the microscopic grains of sandstone or carbonate rocks. These tiny spaces between the sand grains are called Pore Spaces. The oil is found in these pore spaces. Water is also in the pore spaces as well.
- The oil reservoir is a specific layer(s) of rock saturated with oil. Think of a chocolate layer cake with ten layers and the 4th layer is saturated with rum. These layers of rock from geological time are found beneath the surface of an oil field and some of the layers of rocks are saturated with oil and gas.
- These million-year old layers of material can go down for miles. There could be hundreds of different layers with various rock types. Certain layers or strata contain oil and that is what is called an oil reservoir. The oil was formed about 300 million years ago from plant matter, algae/plankton, and other living microorganisms.
- If you took a steel bucket and filled it with crushed beach sand and then poured olive oil in the bucket, the oil in the spaces between the sand particles would be a good picture of where oil is in old reservoirs. These spaces with oil are the pore spaces already mentioned.
- The sand or rock particles in reservoirs can be crushed and ground to microscopic sizes.
- The entire oil industry is focused on getting the oil out of these microscopic pore spaces to come to the surface. *It is, in essence, a microscopic focused industry.*
- How microscopic? If you took some sandstone from an oil reservoir that was the size of a basketball, there would be more than 200 million spaces between the sand grains. In those spaces would be oil.
- One of the most important concerns for oil operators (besides the risk of exploration) is tackling what is called Permeability. A word that means how does a liquid flow through a solid. If one can increase this flow aspect or change the permeability of the oil to rock for the better, then more oil will come to the surface. This is where Titan comes in. Getting a golf ball out of a Coke bottle is impossible. Getting an oil globule stuck inside a tiny pore space is also tough going and next to impossible until now. But if you could convert the golf ball to tiny BB's they would be able to flow out of the Coke bottle. The Titan Process creating micro-oil droplets also has the same effect and the micro-oil droplets can now flow through the tiny pore spaces in a reservoir more easily to the production well and be recovered.
- After Primary production where an operator recovers 15% of the oil, comes the next step in oil recovery. This is called Secondary Production. An oil operator must now try to put pressure back into the oil reservoir in an attempt to recover more oil. One method is to use water or gas injection. This method pushes these liquids into the oil bearing strata creating artificial pressure to force more oil to the surface.

- This new production phase is accomplished by taking some of the production wells and reversing the flow and injecting water or gas back into the reservoir. The most common method is pushing water down some wells towards the production wells nearby. These wells are now called Injection Wells.
- Injection Wells push water back into the reservoir and force oil to be pushed up at surrounding production wells. This is called Waterflooding.



- The photo above shows how this could look with 4 injectors and one producer. Waterflood patterns vary widely with how many Injectors are used to service how many producers. Large mature fields can have 300 production wells and 300-800 injection wells pushing water into the reservoir.
- The most common form of Secondary Production is Waterflooding.
- 50% of the world's oil fields become waterflooded fields. The Titan Process works best on waterflooded fields. The Titan Process simply adds the special nutrient formulas to the water and this food when it is distributed into the reservoir feeds trillions of colonies of microbes who then help create micro oil droplets.
- The Titan Process can also work on single wells that do not have water injection systems but rely on the small pressure still in the reservoir to help lift oil. These wells are sometimes called stripper wells and try to artificially pump up oil by the action of what are called sucker rod pumps. As the name implies the mechanism sucks up oil slowly from a well by a pump at the bottom of the tubing.
- On large fields under waterflood, every day millions of barrels of water are pumped into the pipes which take the water down to the reservoir (rock strata with the oil) and push the water through the rock towards the producer wells. The water can be production water that originally was produced with the oil. Offshore sea water is used.
- The water pushes some oil that is in between the minute rock particles (pore spaces) towards the production wells
- The water comes up the production wells with oil.

- The oil is separated in tanks and sold
- The water is sent back down the injection wells and the process is repeated over and over again. This can go on for 10-30 years or more. This is a 24/7 continuous operation.
- With Secondary Recovery the oil industry only recovers another 15-20% of the oil in the reservoir.
- The global recovery rate for all the world's oil fields is 35% mostly from Primary and Secondary Production. 65% of the oil cannot be produced. It is trapped. The oil is like a golf ball stuck inside a coke bottle – it can't get out.
- Only 35% of the oil on average ever gets to the surface.
- Currently there is 6 trillion (T) barrels of oil trapped in existing world oil fields.
- This unrecoverable oil is trapped in the pore spaces between the sand grains. It cannot escape.
- Until the Titan Process there has been no technology that could economically and efficiently recover this trapped oil at a low cost and with no capital expense.
- After Secondary Production described above comes what is called Tertiary or Enhanced Oil Recovery. In this phase the aim is to recover another 1-2% of the original oil in place.
- Titan is an advanced form of Enhanced Oil Recovery (EOR as it is commonly called).
- Other forms of EOR are very expensive, require years of lab work and sometimes billions of dollars of infrastructure, usually a factory on the field has to be built or expensive equipment and housing for the equipment is needed. Offshore there is not enough deck space for EOR. Few platforms have any kind of EOR. The Titan Process has a huge advantage offshore as it requires little deck space and no equipment.
- *Oil and Gas Journal* reported that of the 70,000 oil fields in the world only 300 reported EOR projects are in place globally. This statistic shows that the EOR industry was ripe for a new technology like the Titan Process that can recover trapped oil. The Titan Process gets the golf ball out of the Coke bottle.
- Currently the EOR industry is estimated at $125 billion annually from these other very expensive other technologies. See Page 5.
- The Titan Process could dominate the EOR marketplace because it's faster, cheaper, requires no capital expense, has much better results and is biodegradable.
- The Titan Process has not been tried on Shale (tight oil) but that is possible in the future as the Shale Oil recovery factor is only 9%. 91% of the oil in shale does not get to the surface.

Notes:

For simplicity sake I have used the sandstone reservoirs for illustrative purposes.

Until now, there has never been a technology that could create micro oil droplets and allow oil to escape from the microscopic pore spaces in an oil reservoir.

The Titan Process creates micro droplets with biodegradable nutrients added to an oil reservoir that make simple yet ecologically elegant changes in the environments that exists in these oil fields. It is a breakthrough science and technology, commercially proven on 48 global oil fields.

Kenneth J. Gerbino

Founder and Chairman

Titan Oil Recovery Inc.

Capital Equipment and Expense for Competitive Enhanced Oil Recovery Methods vs. the Titan Process

CO2 Enhanced Oil Production

Shown: A CO2 Enhanced Oil Recovery plant on site at an oil field.

This does not include the pipeline to transport the C02 which costs an average of $450,000 per mile to construct

Just ***transporting*** the CO2 from the CO2 source costs an average of $4.50 per bbl. of incremental oil produced.

Cost: $20-70 per incremental bbl including capital. Time Required for Implementation: 2-3 years.

ASP Enhanced Oil Production

ASP stands for Alkaline Surfactant Polymer. An ASP Flood injects chemicals into a reservoir to "loosen up" stranded oil.

This is what a small ASP operation looks like on the surface and the plant equipment needed for the operation.

The Alkali reacts with the oil to create a surfactant (a substance that acts somewhat like soap) and reduces the surface tension between the oil and other surfaces in the reservoir allowing the oil to flow more easily. Then more Surfactants are added followed by Polymers (an additive to water that makes it more viscous)

Implementing an ASP project would take 2-3 years, including 5 months of lab study, 12 months of construction and 6 months of well workovers.

Cost: $30-80 per incremental bbl including capital. Time Required for Implementation: 2-3 years.

Note: Both CO2 and ASP projects create corrosion problems to the production facilities of an oil field.

Titan Process Equipment Needed at Site

A temporary water and pumping truck are all the equipment the Titan Process requires to service oil fields. The trucks are rented and standard oil industry equipment. The nutrients are shipped to the site, mixed with water and injected into the existing water system at the field. The Process is applied every 3-4 months.

Cost: $6-15 per incremental bbl including lab work. Time required for Implementation: 60 - 120 days.

Source: U.S. Department of Energy: Carbon Dioxide Enhanced Oil Recovery , Zargon Oil & Gas Ltd. ASP Tertiary Oil Recovery (Sept 2011), International Energy Agency; Resources to Reserves 2010, Titan Oil Recovery Inc.