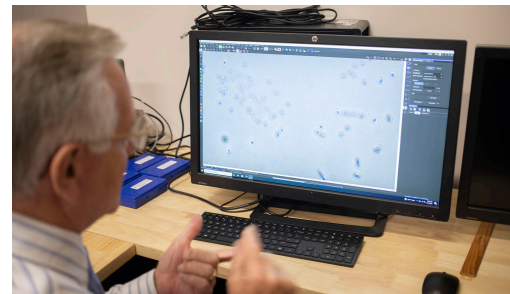


Technology In-Depth

1. Samples are taken of oil reservoir fluids.



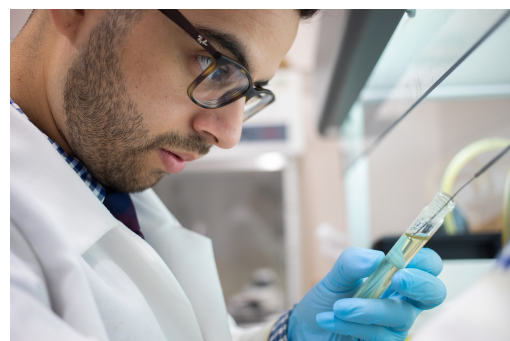
2. Microbes within the oil reservoir are studied and analyzed.



3. Highly specialized medical-grade nutrients are formulated, and lab tested on specific species of microbes from the water samples. In one 500 ml bottle could be 100-500 species of microbes. Titan only selects certain species to work with depending on the ecology of the reservoir.



4. Highly specialized medical-grade nutrients are lab tested and then injected into the reservoir to stimulate only certain microbial species to have a cellular surface change and to then be active within the oil/water/rock interface.



An Overview of Titan's Organic Oil Recovery Process:

Phase 1: Specialty biodegradable nutrients are introduced into the reservoir.

Phase 2: Certain microbial species consume the nutrients and multiply dramatically

Phase 3: These specific species now become oil active and their actions break up oil globules and change the interfacial tension between water/rock/oil by projecting themselves between the surfaces.

Phase 4: Micro-oil droplets are formed and can now flow more easily through the pore spaces and rock matrix.

After Primary Production

Approximately 50% or more of global oil fields go to waterflooding as a secondary production method. Titan's Organic Oil Recovery process works best with waterflooded fields.

After successful pilot tests on individual production wells the next step is to apply the Titan nutrients into injection wells and a much larger area of the reservoir, saturating hundreds of times more of the rock matrix where trapped oil and microbes are located.

Injection well applications should only take one to two days and then be repeated three times within a year. As success is seen, then an entire field implementation is planned and executed.

Micro-Oil Droplets

Specialized nutrients feed only certain existing microbes in the reservoir which multiply by millions of times after consuming the nutrients. These nutrients cause the microbes to seek out and attach themselves to trapped oil globules, distorting the oil as well as dislodging the oil from the rock matrix. In certain cases, some of the oil, water and microbes can form a mild viscous emulsion when traveling through the high permeability thief zones.

This mild emulsion also helps to block off some of the thief zones that are causing high water production. Some injection water is then diverted to travel through other untapped areas of the reservoir, thereby increasing more oil production. The primary oil

production increases are coming from the micro-oil-droplet effect. Water cut decreases are commonly observed.

5. Trillions of subterranean microbes which inhabit the rock face and water of the pore spaces, feed on the nutrients. Microbes are so small that a teaspoon of garden soil has one billion microbes. The nutrients create a dramatic response in the selected microbe colonies.

6. The nutrients make the population of microbes multiply by 10,000 – 1,000,000 times or more. Each individual microbe first grows larger then shrinks dramatically. During this process a physiological change occurs created by the nutrients which change the skin characteristics of the microbes that causes them to migrate away from the water and rock and towards the oil, a condition known as hydrophobic.

7. Trillions of microbes now attach and surround oil droplets that were “trapped” inside pore spaces and deform the oil into micro-droplets.

8. The microbe activity agitates, separates from the rock face, and uniquely breaks up oil droplets into smaller droplets which can pass through pore throats and be released into the reservoir’s mobile fluid system.

9. This oil is now for the first time recoverable by conventional means.

10. In waterflooded fields some released oil that is attached to water and microbes travels through the oil formation towards the production wells. This “attached” combination of oil, microbes and water as it travels through high-permeability sections of the oil field is agitated and rapidly mixed and forms under this stress a natural mild emulsion that can block off these highly permeable sections of the oil field that have created thief zones and channeling.

11. As a result of this process: 1) Large amounts of trapped, normally unrecoverable oil within the pore spaces is released by the creation of micro-droplets. 2) Some thief zones are temporarily blocked allowing for new areas of the reservoir oil to be contacted by injected water with nutrients and 3) well bore

clean up takes place as some organic fines and accumulations are ingested and or dislodged by the microbes.

Titan Technology Description

The Titan Process is Organic Oil Recovery (OOR) and is a sub-set of the more general category of Enhanced Oil Recovery (EOR) techniques designed to mobilize oil in mature wells.

Titan's OOR represents an advance on previous microbial approaches: first, for its un-matched and thoroughly documented success in increasing rates of production in suitable wells and, second, because it operates using microbes that are already present in (not artificially introduced to) the subject oil reservoirs.

Applied through existing water-flood operations, Titan's Organic Oil Recovery process works entirely within the natural ecology of the oil reservoir by selectively stimulating particular species of the formation's resident microbes with custom formulated, biodegradable and organic nutrients. The targeted microbes proliferate as a result of these specialized nutrients and interact with immobile, trapped oil, affecting the surface tension and reducing the globules to microscopic droplets (micro-droplets) and altering the interfacial tension between oil/water/rock to allow oil to flow more freely through the reservoir to the producing wells.

Titan's OOR has generated significant increases in the rate of production in 98% of injector applications on fields. Further, Titan's OOR has never in any way damaged a reservoir or a well.

Flow Improvement

Fluid flow within oil reservoirs under reservoir conditions is generally governed by Darcy's Law of radial flow in porous media. Any improvement in flow characteristics must positively impact at least some of the components of this flow equation. The Titan Process releases oil and changes the relative concentration of oil and water within the pore space of the rock formation.

The "oil-release" mechanism results from biological changes in the naturally occurring microbes as a result of increased availability of Titan nutrient materials. Nutrient availability acts like a biological "catalyst" that causes the microbial

population to grow rapidly and proceed through its natural life cycle in an accelerated way.

This interaction of the microbes creates something akin to a physical (rather than chemical) effect allowing the oil to flow more freely. All of this interaction occurs at the micron-level within the oil reservoir.

The process does not introduce microbes cultured and grown at the surface. The oil reservoir becomes a natural bio-reactor to create the quantity of organisms necessary to cause the oil to be released.

The process is biologically complex but elegantly simple in application. There is no attempt to genetically modify the natural microbes. The process is an acceleration and concentration of natural processes already occurring within the oil reservoir.

From the application of the Titan Process on 48 oil fields on 4 continents and after over 300 well applications, production at the targeted project wells have increases by 92%. These increases have lasted from 30 days to three years from a single Titan Process application. Increases in ultimate recovery of the original-oil-in-place by 10-20% is possible over longer periods of time.

A New Direction in Microbial Enhanced Oil Recovery

The Titan Process® allows microbes to dislodge and uniquely break down the trapped oil within the pore spaces into smaller droplets (micro oil droplets) which can be recovered more efficiently. This activity is an entirely new direction in the field of microbial enhanced oil recovery (MEOR). This process is simple, efficient, inexpensive and 100% environmentally friendly.

Ultimate Reservoir Performance

The Titan Process stimulates naturally occurring microbes within the oil reservoir allowing for increased oil production. First, they dislodge and then uniquely break up oil droplets from the pore spaces within the rock matrix, which then become recoverable. The oil globules become micro-oil droplets. Second, they also create a unique natural and mild emulsion within high permeability thief zones (channels that divert water from pushing oil toward a production well). This mild emulsion blocks thief zones and allows for a more efficient waterflood dispersions into other areas of the reservoir helping the water's sweep efficiency. Third, the microbes help with well bore clean up as some of the organic matter

near well bore that has built up becomes a source of food for the expanded population. This well bore cleanup is also aided by better fluid flow emanating from the reservoir as oil fluids in the pore spaces are released.

The process is all natural, no harsh chemicals are used and there are no adverse effects in the reservoir. A single well test can be easily implemented to gain important performance predictability for an entire field.

The Titan Process® causes specific effects in a reservoir to increase the efficiency and performance of the waterflood to move oil towards the producing wells. It is a dynamic technology that solves many reservoir management problems.

An Industry Milestone

Below, Microscopic photos show for the first time an oil droplet deforming and breaking up by the activity of microbes under the influence of the Titan Process.

In the following series of nine microscopic photographs the Titan Process can be seen at work, surrounding an oil droplet, distorting and breaking off a smaller droplet of oil. These droplets will again be broken down into even smaller micro-droplets.

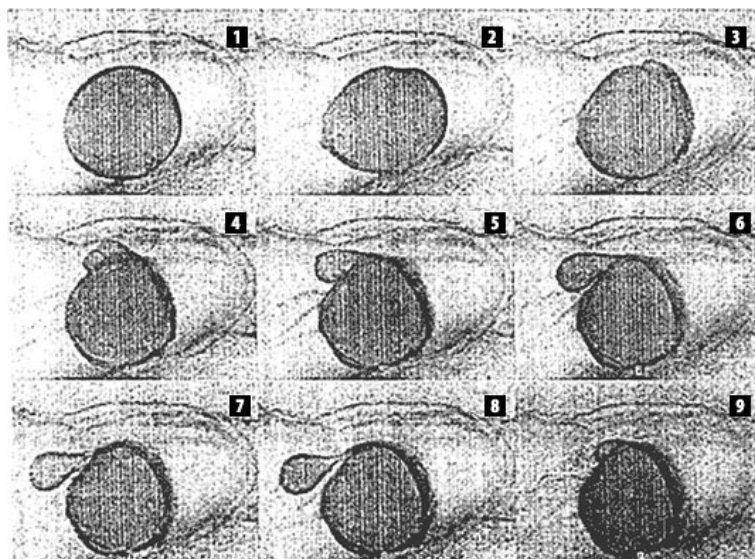


Photo 1: Titan Process microbes surround an oil droplet,

Photos 2 & 3: Oil droplet distorts due to microbial action.

Photos 4 through 8: A smaller droplet is formed by the microbes and released.

Photo 9: Another smaller droplet starts to form and break away by the action of the microbes. These newly formed smaller oil droplets have less resistance to capillary pressure within the pore spaces of the reservoir and thereby are more mobile and can more easily move through the pore throats and the pore matrix.

Reservoir Characteristics and Microbes

According to the “Handbook of Physical Quantities” by Grigoriev & Meilikous, there are 10 billion grains of fine sand in a cubic foot. In between all these grains are spaces (pore spaces). In sandstones, a cubic foot of fine sand contains over 10 billion pore spaces. In an oil reservoir there are oil and water molecules occupying and trapped in these pore spaces.

Relating this to the Titan Process, the microbes that will be used in the reservoirs are about 2,000 times as small as a fine sand grain. The microbes can penetrate the pore spaces and smaller pore throats of the oil-bearing rock and attach to the oil trapped within the pore spaces and act to dislodge the oil.

Efficient, Low Cost Recovery

It is now possible that an oil field that has produced 30%-40% of its known resource over a period of time (and is now considered almost depleted) could, with the Titan Process, continue for many years and economically extract significant amounts of the original oil in place.

The Titan Process versus Other Enhanced Recovery Methods

Other EOR methods require long lead times, large amounts of chemicals and expensive equipment to maintain. The Titan Process requires none of these aspects. The Titan Process is:

- Low Cost
- Biodegradable
- Requires no capital expense
- Easily piloted
- Fast to deploy. Start to finish of pilots 120 days.
- Requires little deck space offshore
- Scalable
- Process works deep within the reservoir
- Water Cuts are decreased
- H₂S is decreased as Titan microbes crowd out the Sulfate Reducing Bacteria in the reservoir.
- Oil production increases
- Reserves increase