



# TITAN Oil Recovery, Inc.



## New life for oil fields by “finding” oil where it’s already been discovered...

---

Titan Oil Recovery, Inc. is a privately held oil field service company which applies the proprietary TITAN Process®, a state-of-the-art microbial enhanced oil recovery (MEOR) method for improving the performance and ultimate recovery of oil from mature oil fields. The TITAN Process® has been successfully demonstrated on both onshore and offshore fields on three continents.

### **The TITAN Process**

The TITAN Process utilizes a proprietary approach to microbial enhanced oil recovery (MEOR). The TITAN Process targets mature oil fields currently utilizing conventional water injection (waterflood) operations as a means of secondary recovery. Unlike previous attempts at MEOR, the TITAN Process does not attempt to introduce microbes into the oil-producing reservoir. Instead, through a very sophisticated analysis of field specific crude oils, microbes that are naturally indigenous in the oil are identified and quantified. Based on Titan’s laboratory analysis and specific field tests, a specific mixture of environmentally benign nutrients is

formulated and released into the reservoir via the water injection system. The water injection system becomes the transport medium for the designed nutrient formulation. The process is designed for crude oil production and is not currently suitable for either natural gas or condensate fields. By activating certain identified species of microbes, changes in the character of the oil is affected and induces the reservoir system to release additional oil to the active flow channels. In very highly permeable portions of the reservoir (“thief zones”), newly released oil, water and microbes can interact to form a transient emulsion which effectively alters the sweep efficiency of the injected water and improves ultimate recovery.

### **The “Big” Issues**

There is much debate on the topic of global supply and demand for crude oil. Many believe that peak oil production has, or will occur shortly. Others argue that there are still ample oil reserves to meet the foreseeable need. However, both “camps” agree that efficiency in production is important for the long-term supply of the

---

---

world's energy demand. Few new giant oil fields have been discovered since the early 1970's and most existing fields are currently on a significant production decline. Only new discoveries or improvements in existing oil field recovery can lead to an increase in supply. The TITAN Process "finds" oil where it has already been discovered by releasing "trapped oil". By doing this in an environmentally benign way, The TITAN Process can help in forming a "bridge to the future" for whatever that future may turn out to be.

### **The Target of the TITAN Process**

As a general rule, oil fields are developed and produced in phases. The first phase is primary production where the natural pressure and flow characteristics of the crude oil drive the production. The secondary mode of production often utilizes either water or gas injection—both designed to hold reservoir pressure and to "sweep" the oil toward the producing wells by displacing the crude oil. In successful fields, only about 35% of the oil originally-in-place in the oil reservoir is able to be produced—65% remains as "unproducable". This remaining oil is "trapped" in the native rock in the reservoir. The oil is held by capillary forces, interfacial tension between oil and water and between the oil and the rock surfaces. Certainly, no known process will recover all the remaining oil, but if only 5-10% additional oil could be recovered, the benefit would be huge. The remaining 65% of the oil in the reservoir is the target of the TITAN Process.

### **Reservoirs Suitable for the TITAN Process**

The TITAN Process is suited for a wide variety of crude oil reservoirs, but sandstone reservoirs with moderate temperatures (190 degree F or less) and water salinity in the range of 25,000 to 70,000 parts per million chloride are most readily treated. API gravity is an additional indicator of field suitability with targeted gravity of greater than 25 degrees API. Empirical data indicates fewer microbe species in lower gravity crudes, but laboratory testing is required to be certain. The TITAN Process does not target heavy-crude. Ideally, reservoirs with a well-documented history and sound mechanical conditions are most suitable. Fields that are using other additives or treatments need to be reviewed carefully. Ultimately, the laboratory analyses of produced fluids will determine if the appropriate microbes are present and whether they can be stimulated in sufficient numbers. Then, by the selective application of nutrients, the microbes are stimulated and cause certain identifiable, and predictable changes to the crude oil and water injection environment that both increase current oil production and affect the ultimate percent of oil recovery from the reservoir. Several different aspects of the oil and water system are impacted by the microbial action stimulated by the

TITAN Process. The key is achieving effective contact of the nutrients with the naturally occurring microbes in the reservoir.

Titan will seek to apply its technology to producing fields in the 300 to 20,000 barrels of oil per day range, but larger fields are not a limitation. Such fields will be well within Titan's initial strike zone. If larger fields are treated and/or purchased, a revised operating model allowing, more or less, continuous treatment on a repeating cycle will be implemented. This would be applicable to large onshore fields with a high number of both producing and injection wells. This will lead to centralization of Titan's field operations for mixing nutrients, pumping to the injection wells and sampling the results of the treatments. Applying the TITAN Process to very large fields would be analogous to painting the Golden Gate Bridge—a continuous and repetitive process to optimize ultimate resource recovery.

### **The Treatment Technique**

There are two types of treatment with the process. The preferred means of treating a field is to treat the water injection fluids. In such a treatment, nutrients are added as a "batch" treatment to the water being pumped into the reservoir in the waterflood operations. Injection water is treated with a volume determined in the pre-treatment analysis and reservoir characteristics. Then, the injection well(s) is intentionally restricted to allow the nutrients to contact and affect the microbes. After three to seven days, the injection well is gradually returned to its normal injection rate—increasing to the original rate over several days as the activated microbes are distributed through the reservoir. Injection continues and then the process is repeated on a cyclical basis for a number of cycles depending on the reservoir characteristics. Nominally, these cycles are 6 to 10 weeks apart.

The second approach involves treatment of the producing wells by pumping nutrients directly into the well, letting the nutrients "incubate", and then returning the well to production. Short-term results and wellbore cleanup can result from such a treatment, but the results will not lead to the significant results of the preferred mode of treatment. However, results from this technique have been significant and substantial.

### **Expected Results**

By treating the water injection in mature waterfloods, two basic production mechanisms are affected. In the first recovery mechanism, small oil droplets are freed from restrictive pore channels in the reservoir rock. These small oil droplets can then move more easily through the pore channels and they will be "picked-up" by the water injection and released to the nearby producing wells.

---

---

Such “drag-oil” is typical where high volumes of water are cycled through the reservoir and water cuts are very high; i.e., greater than 95%.

The second recovery mechanism is a result of the emulsion formed in highly permeable parts of the reservoir. By forming an “emulsion block” for the injected water, new flood patterns are created and additional oil is pushed to the adjacent producing wells. Depending on individual reservoir characteristics, Titan has seen production increases of between 18% and 250% on six oil fields. Increases in ultimate production are yet to be documented, but it is believed that significant increases are possible. Increased recovery of 24% has been shown in the lab, but field expectations will be more moderate—perhaps 3% to 10% with continued cycles of treatment.

### **Titan’s Business Model**

Titan’s focus will be oil production with a three-strand approach to its business.

The first strand is the servicing of fields for owners and operators. Revenue will be produced by a straight fee arrangement or by earning a share of the incremental production generated by the TITAN Process. While not ruling out any oil province, the initial thrust will be in circumferences around Houston, Denver, Los Angeles (or more broadly the southern part of California) and Calgary, Canada, respectively. As significant, mature, producing areas, these “oil centers” provide an excellent venue for success and an opportunity to grow the TITAN Process by duplicating successes many times over. International operations will be reviewed and pursued on a case-by-case basis taking into account specific field characteristics, operating environment and overall logistics for the treatment.

The second strand of the business is the joint venturing of producing mature fields with other owners and operators by purchasing operating interest or farming-in to an operating interest by supplying the TITAN Process. It is unlikely that Titan would be the operator of the fields under these circumstances. Operating percentages could range from 5%-20% depending on individual field size and characteristics.

The third strand is the outright purchase of mature fields and the operation (direct or under contract) of those fields. Titan will use a portion of its initial capital to establish the oilfield service business and acquire partial or complete interests in mature waterflood oil fields. The objective of field purchase is to realize the full benefit of the TITAN Process. As an example, by reducing the field decline rate from 8% to 4% per year, the incremental production generates a significant return on the field

purchase investment. This cash flow would finance Titan’s activities in the U.S. and internationally with a staff of 9 to 12 employees plus some contractor supplied assistance and would lead to additional field purchases and joint ventures. The first field purchase will have the combined objective of generating cash flow and serving as a showcase for the TITAN Process as well as providing an ideal place to test and implement improvements and modifications to the process. Subsequent field purchases will generate significant cash flow to grow the business.

The common thread connecting all three strands is the proprietary TITAN Process.

### **Titan Fee Structures**

Revenues will be derived from oil production by providing oil field servicing for others, revenue sharing contracts, by owning oil fields, and through oil fields co-ventured with partners including royalty structures. When operating in a service mode, Titan’s fee structure will be flexibly applied to meet the operators’ needs. In the first case, a fee will be applied on a fixed, lump sum basis related to either of barrels of injection-water-treated or barrels of produced fluid to be impacted (both relate to the volume of nutrients required). In the second model, a fee would be charged or a royalty interest could be earned based on incremental barrels of oil produced. This structure is only applicable when the producing characteristics of the field are well established, agreed and consistent. A third fee structure is a combination of these two concepts; i.e., a portion of the fee as a fixed lump sum and a portion on a “performance-basis” related to incremental production.

Titan’s long-term business objective is to own production revenue interests based on a foundation of oilfield servicing. Cash flow will be improved through ownership and/or joint ventures on mature oil fields where oil production can be increased by incorporating the TITAN Process. Titan will start by specifically focusing on mature oil fields where secondary and enhanced oil recovery methods are declining in effectiveness, yet a substantial resource is still trapped within the reservoirs. Field owners who are experiencing annual production declines and rising costs should be interested in the TITAN Process either as a service buyer, or as a seller of field interests. Typically, the TITAN Process results in more oil production and reduced water injection volumes—both improving the per-barrel operating costs of the mature oil field.

The servicing business will form a cash flow foundation and, then, by focusing on the acquisition market, Titan will optimize the application of its MEOR process. Titan anticipates that many fields will be undervalued by the conventional acquisitions marketplace. Therefore, Titan could purchase potential reserves in these properties

---

---

relatively inexpensively. Titan will then add value by enhancing oil production using its MEOR technology and efficiently operating the fields. The goal of the Company is to “stimulate” mature oil reservoirs by the use of the TITAN Process and sound petroleum engineering practices which will enable the Company to: a) increase proven developed producing (PDP) reserves; b) reduce normal declines; c) decrease operating expenses per barrel of oil produced; and d) increase the market value of the oil field in all cases.

The Company will not engage in exploration. Revenues will be derived solely from oil field servicing and revenue interests in oil fields co-ventured with partners including, in some cases, incremental production royalties and incentive payments, or fields owned outright by the Company. The TITAN Process is the common element of all aspects of the business strategy.

Leveraging the Titan technology is the business strategy.



**Corporate Office**

9595 Wilshire Boulevard, Suite 303  
Beverly Hills, California 90212  
Tel: (310) 281-0015  
Fax: (310) 550-0814

**Houston Office**

P.O. Box 131683  
The Woodlands, Texas 77393  
Tel: (281) 364-6980  
Fax: (281) 364-6981

**Executive Office, Los Angeles**

609 Deep Valley Drive, Suite 200  
Rolling Hills Estates, California 90274  
Tel: (310) 265-4436  
Fax: (310) 265-4435

General Email: [info@TitanOilRecovery.com](mailto:info@TitanOilRecovery.com) • Web Site: [www.TitanOilRecovery.com](http://www.TitanOilRecovery.com)