



GreenZyme® Enhanced Oil Recovery

From NIXUS International Corporation

- **GreenZyme is a protein-based nonliving catalyst distributed worldwide by NIXUS International Corporation of WaterSound, Florida.**
- **GreenZyme has a proven history of significantly enhancing the recovery of crude oil from most wells, both onshore and offshore.**
- **GreenZyme stimulates oil well production, aids in the cleanup of sludge in Superfund sites, and removes clogging in pipelines, refineries, storage facilities, and ships' storage tanks.**

The Science behind GreenZyme

GreenZyme is a biological liquid enzyme—a protein-based nonliving catalyst. It is engineered through a proprietary process that involves impregnating a high-protein nutrient solution with the DNA of selectively cultured living microbes. This process produces nonliving enzymes that possess the partial DNA of oil-digesting microbes.

How GreenZyme Works

GreenZyme wets the surface of rock and sand, releasing oil trapped in its pores. This oil is then pushed out of the pores in the direction of flow. GreenZyme instantly transforms both the water-wetted and the oil-wetted surfaces of all sands it contacts into GreenZyme-water-wetted surfaces. This dramatically increases the total surface wettability. In accordance with Darcy's Law, GreenZyme increases the relative permeability of the formation. This results in a higher formation pressure and increases the length of the cylindrical shell section.

Superiority

GreenZyme is superior to microbe, chemical, and thermal enhanced oil recovery methods, as well as fracturing. Unlike these methods, GreenZyme EOR is entirely unaffected by adverse conditions such as temperature, pH, salinity, radioactive isotopes, NORM, metallic ions,

GreenZyme Applications

Waterflooding wells

Single huff-and-puff wells

Steam-injection wells

Chemical fracturing wells

Acid-treated and hot oil-treated wells

Chemical EOR-treated wells

Thermal extraction wells

Sludge cleanup in tanks, containers, ships, and pipelines

Spill and accident cleanup

sulfur, hydrogen sulfide content, paraffins, naphthenes, and asphaltenes (up to 50%). Significantly, GreenZyme's effectiveness is not diminished when used in wells previously treated with other EOR methods.

Chemical-enhanced oil recovery relies on a series of formation reactions and is therefore instantly self-diminishing. Because GreenZyme is a DNA-based catalyst, it only releases crude oil catalytically, giving it a far longer lifespan (proven in excess of three years) compared to other EOR methods.

Proven Performance

GreenZyme possesses a documented record of proven performance, releasing more "nonrecoverable" crude oil from oil-bearing sands in excess of expectations. Increased output generally exceeds 90%, and total fluid production is often doubled. GreenZyme EOR produces a significantly higher daily output than the typical chemical EOR or other technology-based EOR methods.

Simplicity

GreenZyme EOR requires no special tools, equipment, or training. It is infinitely soluble in produced water and insoluble in oil. Therefore, to apply GreenZyme, simply dilute it with produced water to create a 1%–10% solution. This solution is then injected by pump through the well's casing-tubing. The well is shut-in for just a few days to allow the solution to fully disperse. Once dispersed, normal production operations may be resumed.

GreenZyme EOR requires only a pump capable of 5,000 psi, a large mobile mixing tank for diluting GreenZyme, and saline or produced water.

Environmentally Friendly

GreenZyme is nonpathogenic, nontoxic, and biodegradable. The presence of living microbes in GreenZyme is no greater than that found in drinking water. All formulas of GreenZyme have a near-neutral pH of between 5 and 7. GreenZyme can be shipped "Non-Regulated" by USDOT, IATA, and IMO.



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