TenEx Technologies, LLC, develops proprietary, materials-based technology solutions for the oil & gas industry. TenEx focuses on generating the lowest cost per barrel of oil using innovative, high performance materials that can be tailored for every reservoir.

NANOCLEAR® ER | ENHANCED RECOVERY FOR WATERFLOOD

NanoClear® is a patent-pending portfolio of high performance, materials-based solutions tailored for specific treatments designed for oil well and reservoir stimulation.

Unlock the Waterflooding Potential with Nanotechnology

NanoClear® ER is a water-based nanofluid that can be readily incorporated with existing or new waterflood programs to increase the oil recovery factor.

Waterflooding is the most common secondary oil recovery method which displaces oil by injecting water. A modified waterflood process can reduce the potential problems regularly associated with waterflooding. NanoClear® ER will provide added value by increasing the efficiency of waterflood processes in an environmentally-friendly and cost-effective manner.

NanoClear® ER comprises of multiple types of nanoparticles (solid particles with diameters of 10-30 nm) with different charges which enhance the performance of waterflooding by their interactions with the rock and fluids in the reservoir.

NanoClear® ER is beneficial in:

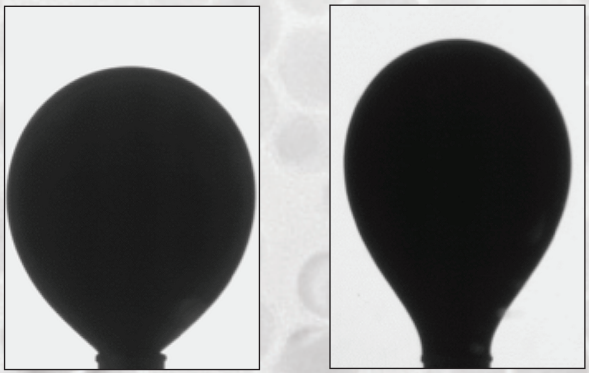
- *Decreasing residual oil saturation by reducing the contact angle and altering wettability by covering the pore surface with nanoparticles*
- *Reducing interfacial tension (IFT) between different phases (oil and water) and increasing effective oil permeability*
- *Increasing sweep efficiency and breakthrough time by improving the mobility ratio*
- *Removing possible organic and inorganic depositions by disjoining force*

Reduction in Interfacial Tension

Interfacial Tension (IFT) plays a critical role in multi-phase flow in porous media, particularly for water-oil systems. The lower the IFT, the more efficient the two-phase fluid flow. NanoClear® ER significantly reduces IFT, assisting water to transport more oil.

Figure 1 (right): IFT between oil droplet (black) and water (white)

FIGURE 1



Without NanoClear®

With NanoClear®
91% reduction in IFT

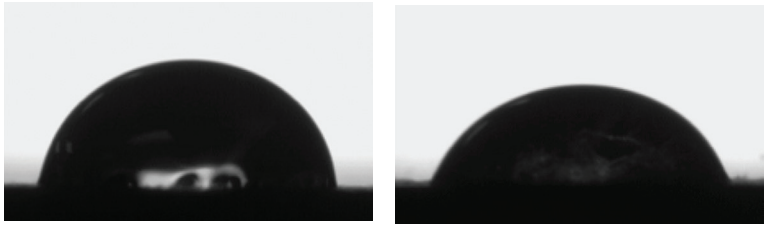
NANOCLEAR® ER Key Performance Data

Reduction in Contact Angle

Contact angle determines the wettability of the rock and hence the tendency of water to cover the rock surface and therefore, is a vital parameter in determining residual oil saturation. NanoClear® ER reduces the contact angle of water yielding to an improved wetting and lower residual oil saturation.

Figure 2 (right): The contact angle between water droplet and oil covered sandstone rock before (left) & after (right) NanoClear® treatment in core flood experiments.

FIGURE 2



Before core flood

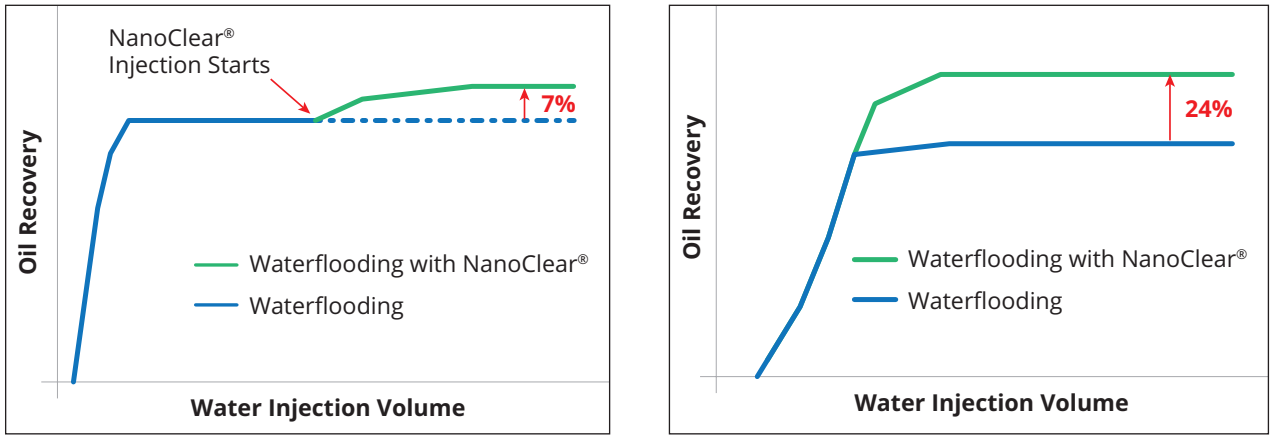
After core flood NanoClear®
17% reduction in contact angle

Improving Oil Recovery in Waterflood

The performance of waterflooding is primarily associated with the oil recovery factor. NanoClear® ER will effectively improve this performance by increasing ultimate oil recovery. Although a better performance will be achieved if waterflood is initiated with NanoClear® ER in the beginning, incorporating NanoClear® at later stages will still yield improvement in oil recovery.

Figure 3 (below): The waterflood performance in different core flood experiments. (Left) Adding NanoClear® at a later stage when regular waterflood has reached plateau still improves the recovery factor by 7%. (Right) Starting waterflood with NanoClear® improves ultimate recovery by 24% compared to a regular waterflood.

FIGURE 3



The TenEx Principle. In his book, *Zero to One,* author Peter Thiel describes the rules for creating a great business; Rule 1? **Build proprietary technology that is 10x better.** In other words, shoot for game-changing innovation, not incremental steps. At TenEx, it is our mission to develop disruptive solutions for the oil and gas industry by developing high performance, materials-based technologies that maximize productivity, lower costs, and spark imagination.

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