NaNoEOR

Carbon-Neutral Oil Production

Novel Nanofluid Injected in Light Oil Formations

Novel nanoparticles injected into light oil formations offers several benefits for enhancing light oil recovery, primarily due to the reactive nature of the unique properties of the nanoparticles. When nanoparticles are injected into the light oil formation, they undergo a chemical reaction. This reaction produces high-temperature heat, new reservoir pressure, each contributing to improved oil extraction.

Primary Benefit: Increased Reservoir Pressure

The natural reservoir pressure may have depleted over time, reducing the driving force for oil production. The in situ chemical reaction produces increases reservoir pressure, helping to push the oil towards production wells. This repressurization effect is particularly valuable in mature or depleted fields, providing a non-aqueous means of pressure support potentially avoiding issues such as water breakthrough.

Additional Benefits:

1. **Reduction in Interfacial Tension and Wettability Alteration:**

   The chemical reaction produces an agent that can react with acidic components in the oil to form natural surfactants in situ. These surfactants alter wettability and lower the interfacial tension between oil and water, mobilizing residual oil trapped by capillary forces. This chemical reaction` can be effective in light oil reservoirs with high residual oil saturation after primary recovery.

2. **Heat Generation:**

   The chemical reaction releases high-temperature heat, while less critical for light oil (due to its already low viscosity), can still reduce the viscosity of any heavier oil fractions or alter rock wettability. This may enhance oil displacement efficiency in localized areas of the reservoir.

3. **Potential Conformance Control:**

   Due to nanometer nanoparticles small size, the nanoparticles can penetrate deeper into the formation's pore space and potentially target high-permeability zones. The high-temperature heat generated in these areas could alter flow paths, diverting fluids into unswept regions improving overall sweep efficiency, which is a significant advantage in heterogeneous reservoirs.

Why Nanofluid Matters for Light Oil:

Light oil formations typically have higher permeability making the oil easier to extract initially. However, challenges such as residual oil trapped by capillary forces, pressure depletion, and uneven sweep efficiency can limit recovery. The novel nanoparticles address these issues by combining physical (pressure increase) and chemical (interfacial tension reduction) mechanisms, offering a multifunctional approach to EOR.

Conclusion:

The primary benefit of injecting NaNoEOR novel nanoparticles creating an in situ chemical reaction in light oil formations increases reservoir pressure and improves oil displacement, which enhances overall recovery. Additional advantages include wettability alteration and reduce interfacial tension from in situ surfactant production that improves sweep efficiency. This EOR method provides an innovative strategy for maximizing oil extraction from light oil reservoirs.