Advanced EOR Foams for Naturally Fractured Carbonates

The EOR Alliance

Description:
Injection of foam exhibiting a reduced interfacial tension with oil. First, foam generates an important pressure gradient in fracture network. Second, the reduced interfacial tension favorably changes the capillary pressure. These combined properties promote flows from fractures to matrix to mobilize oil.

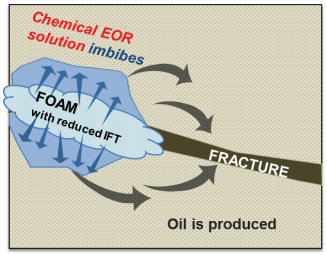

Fig 1. Schematic view of phenomena in the process.

Application:
Increase recovery factor of the matrix in highly fractured reservoirs, even in case of unfavorable wettability.

Results:
The Alliance has developed a unique formulation solution combining foam properties and reduced interfacial tension, even in high temperature and harsh conditions of injection brine. Coreflood experiments show that foam exists and propagates in fractures and aqueous formulation enters the matrix so that the reduced interfacial tension can boost the recovery factor of the matrix. These conclusions are supported by laboratory work and simulation models.

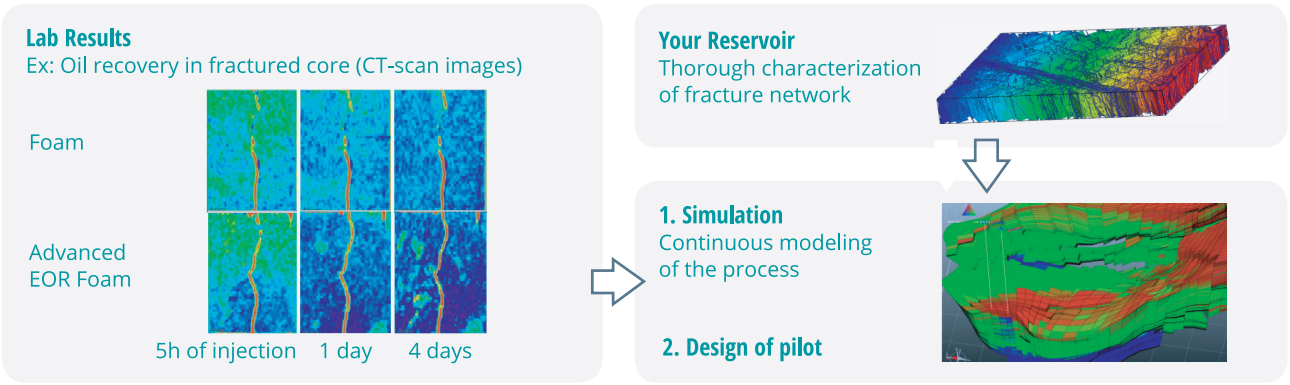

Fig 2. Simplified workflow: formulation evaluation in representative corefloods tests, fracture network characterization, simulation of process, and pilot design.

Challenges and Solutions
- The slow oil recovery kinetics in naturally fractured reservoirs is limited by permeability contrast and possibly unfavorable wettability. To address this, flows are boosted between fracture network and matrix by injecting a foam with reduced interfacial tension.
- Simulation models suited for this specific process were developed. They help decision process for pilot and the process design for an economical solution.

Objectives:
- Lab design and characterization of the most adapted formulation with industrially available surfactants.
- Design of a pilot, reservoir engineering for pilot zone selection, simulation for the process and on site assistance for pilot deployment.

References: SPE169140-PA, SPE179811-PA, SPE174658-MS, SPE190363-MS

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