

7th World Congress on

Petrochemistry and Chemical Engineering

November 13-14, 2017 Atlanta, USA

Preformed Particle Gels (PPGs) compressibility measurement in the fluid channels of super-high permeability streaks/fractures formations

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A newer trend in gel treatments is using Preformed Particle Gels (PPGs) to reduce fluid channels through super-high permeability streaks/fractures. Therefore, water production decrease and sweep efficiency increase in mature oilfields. This work sought to determine what factors influence the blocking efficiency of PPG on fluid channels. It will determine what factors effecting on PPGs pack compressibility. A transparent model was designed to observe the compression of gel particles in fluid channels at different load pressures and thus to study the effect of different parameters on PPG blocking efficiency. After each load pressure, PPG compressibility was calculated to study the effect of various particle sizes, gel types and brine concentrations on the PPG compressibility. Permeable gel pack was formed in fluid channels by gel particles and its compressibility depends on PPG particle size, gel strength, types, brine concentration and load pressure. Gel pack is compressed and its compressibility is increased as load pressure increases. A weak PPG with small particle size, low brine concentration and low gel strength compressed more than a strong PPG with large particle size, high brine concentration and high gel strength. A gel pack which has a desired compressibility can be designed by selecting proper gel strength and particle sizes at reservoir pressures. The results can be used to optimize a PPG design. A gel pack which has a desired compressibility can be designed by selecting proper gel strength and particle sizes at reservoir pressures. In field applications, it is very common that operators often increased gel particle size or gel strength if they planned to increase blocking efficiency. Contrary to the conventional concepts in PPG treatment practices, we find that gel particles can better block fluid channels if weak and/or small particles are used for conformance control treatments.

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