

Preformed Particle Gels for Conformance Control
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Track Section: Materials for Energy Applications

Crude oil is found in underground porous sandstone or carbonate rock formation. After primary (natural energy) and secondary recovery (water flooding) have been exhausted, about 2/3rds of the original-oil-in-place is left behind. The US DOE states that Enhanced Oil Recovery (EOR) methods can produce another 200 billion of oil from the US reserves, same as what has cumulatively been produced so far. Excess water production is a major issue that leads to early well abandonment and unrecoverable hydrocarbon for mature wells. The average water to oil production ratio is greater than 7:1 in the USA. Gel treatments at injection wells to plug off preferentially the water thief zones are a proven cost-effective method to improve sweep efficiency in reservoirs and reduce excess water production during hydrocarbon production. A newer trend is applying preformed gels for the purpose because the preformed gels can overcome some distinct drawbacks inherent in in-situ gelation systems. This paper will summarize the preformed particle gel (PPG) conformance control technique which has been applied for about 2,000 wells. The paper will present: (1) the importance of the method to oil industry, (2) the properties of PPG products, (3) the mechanisms for PPG to control conformance; (4) the lessons we have learned from field applications, and (5) future research to improve the current technology for better conformance control results.