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Technical Bulletin

One-Spot IOR Process Testing

The Single Well Chemical Tracer (SWCT) test is a method for measuring fluid saturations in oil producing reservoirs. A SWCT test for residual oil saturation is an in-situ direct measurement of S_{or}. The test is non-destructive and can be repeated on a single zone as many times as needed. A companion technical bulletin, "Residual Oil Testing", explains the details of the SWCT test for S_{or}.

The SWCT test method has become a fundamental tool for rapidly evaluating IOR processes using a single well. First, the SWCT test for S_{or} is carried out on a watered out zone that is a candidate for an IOR process. This base measurement is illustrated in Figure 1.

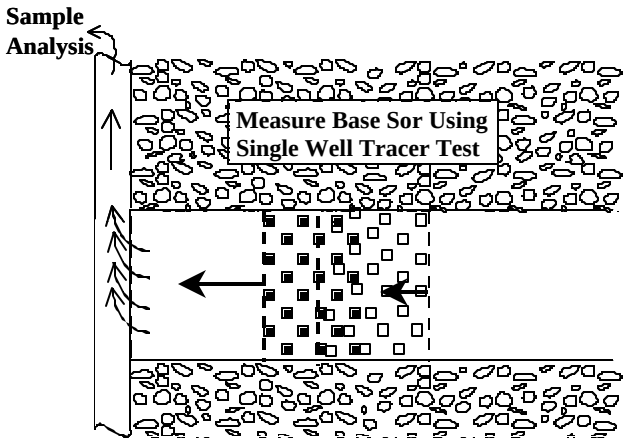


Figure 1
Measure Sor using
SWCT test method.

Following the initial S_{or} measurement, the zone is then flooded with a small IOR process injection using the same well. This flood is scaled to treat a 20-foot radius of pore space around the well. A small water injection is then carried out to push the IOR process chemicals outside the 15-foot investigation radius of the SWCT S_{or} test. Figure 2 shows the distribution of the mobilized oil and IOR process chemicals at the end of this treatment.

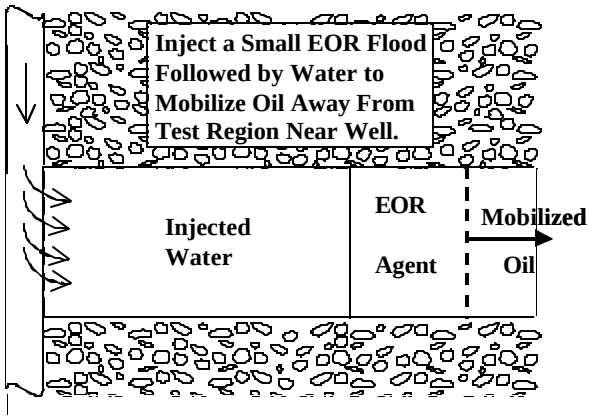


Figure 2
Inject small IOR flood
followed by water flood

The SWCT test for S_{or} is then repeated on the same well as shown in Figure 3.

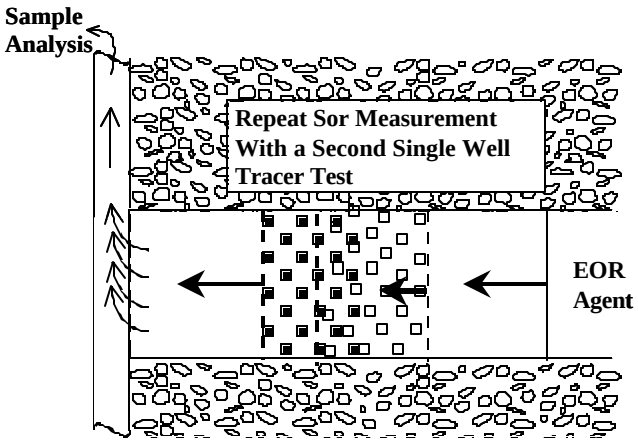


Figure 3
Repeat SWCT test to measure S_{or} after the IOR process

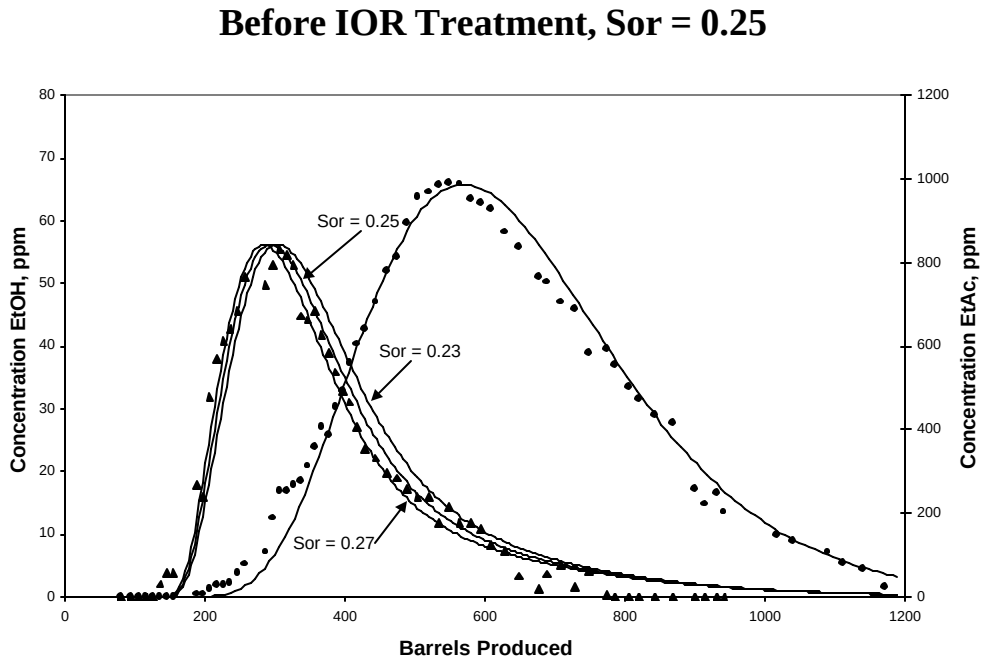
If the IOR process successfully mobilizes residual oil, the post-flood SWCT test will quantify how much oil can be mobilized. The single well evaluation of IOR processes has become one of the most popular uses of the SWCT test method. The approach is called a One-Spot pilot. The entire test-inject-test sequence is normally completed in about one month. The cost is small when compared to laboratory testing programs or multi-well field pilots.

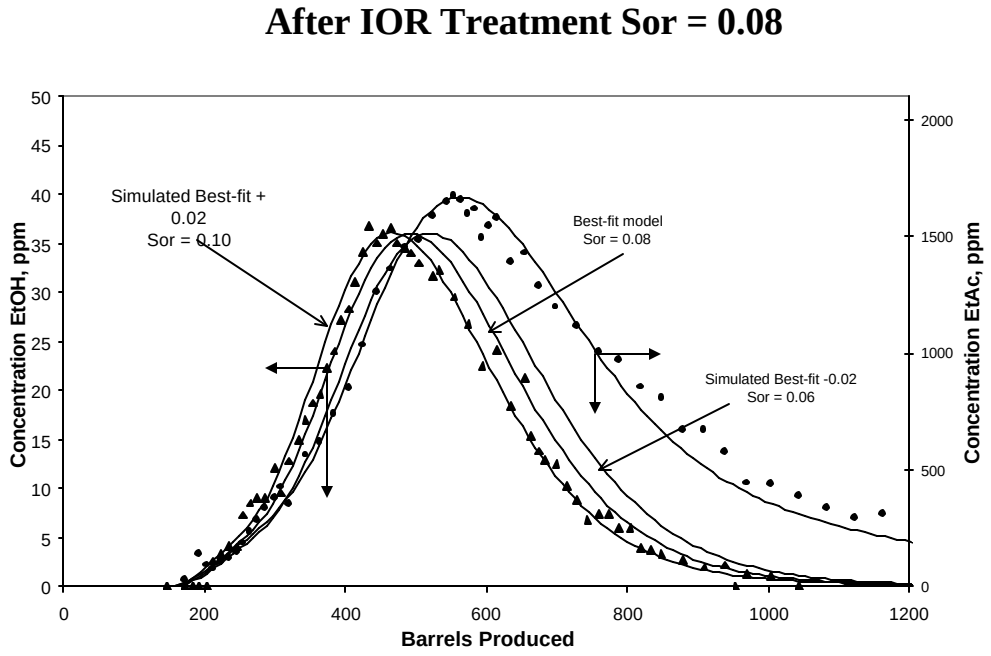
The IOR processes evaluated so far using the One-Spot pilot method are;

- **surfactant-polymer**
- **lignin-surfactant-polymer**
- **alkaline-surfactant-polymer (ASP)**
- **alkaline-polymer (AP)**
- **carbon dioxide (CO_2) and**
- **miscible hydrocarbon.**

As an example, figure 4 shows field and simulated data from a One-Spot IOR Pilot project carried out in Prudhoe Bay (SPE No. 48951, Cockin, A.P, McGuire, P.L., Giordano, R.M., and Sitz, C.D., "Design, Implementation and Simulation Analysis of a Single-Well Chemical Tracer Test To Measure Residual Oil Saturation to a Hydrocarbon Miscible Gas at Prudhoe Bay", 1998 SPE Annual Technical Conference and Ex., New Orleans, Louisiana. September 27-30). Change in residual oil Saturation reflects IOR process effectiveness. In the case shown, the initial residual oil measured by the first SWCT test was 0.25 ± 0.02. After a small miscible hydrocarbon injection followed by water, the second SWCT test measured Sor to be 0.08 ± 0.02. The change in Sor is reflected in the position of the product alcohol profile. Notice that the alcohol profile in the first SWCT test is well separated from the ester whereas in the second test the alcohol and ester profiles are almost superimposed.

Figure 4
SWCT test production profile with simulations for a One-Spot Pilot project carried out to evaluate MI performance. Sor before treatment was 0.25 ± 0.02. Sor after treatment was 0.08 ± 0.02.





The One-Spot pilot offers precise measurement of IOR process performance at reservoir temperature, with live oil and water, in actual reservoir rock, in several hundred barrels of reservoir pore space. In-situ proof is now available for any miscible of chemical IOR process.

Contact Charlie Carlisle at CTI (307) 742-0418, cell (307) 351-3629 or visit our website at www.chemtracers.com for more details on this unique approach to rapid, in-situ IOR process evaluation.