WI12

Inter-well Tracer and Marker Monitoring Strategies in Carbonates

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SUMMARY

In a multi-well tracing test, one of the key parameters is the selection of an appropriate tracer molecule and its relative analytical process regarding the local environmental and operational constraints. Many tests in the past have been unsuccessful due to improper tracer selection. The first part of this presentation provides guideline data and advice on selecting the best possible tracers/markers and analytical processes for a tracing campaign according to the test's main objective which may be linked to the inter-well network, connectivity/injectivity, flow allocation, residual oil saturation, etc.

Abstract

In a multi-well tracing test, one of the key parameters is the selection of an appropriate tracer molecule and its relative analytical process regarding the local environmental and operational constraints. Many tests in the past have been unsuccessful due to improper tracer selection. The first part of this presentation provides guideline data and advice on selecting the best possible tracers/markers and analytical processes for a tracing campaign according to the test's main objective which may be linked to the inter-well network, connectivity/injectivity, flow allocation, residual oil saturation, etc.

In the current tracing tests of oil reservoirs chemical tracers, such as fluorinated benzoic acids (FBAs), are broadly used as chemical water tracers to obtain a better description, model and understanding of the reservoir (fluid movements, velocities and heterogeneities), and inter-well connectivity before any EOR design. As an alternative to methods currently used by oil companies or sub-contractors, a direct and sensitive technique using a 2D UHPLC-HRMS method was developed. The separation of FBAs was achieved within 8 min using less than a 125µl sample aliquot. A direct injection of salty reservoir water is possible with a detection limit in the 20 pg/mL range. This novel method is more sensitive and efficient than the other available methods. Moreover, it does not require any chemical modification, large sample volumes or sample pre-concentration/purification as are currently used by sub-contractors. It is sufficiently robust to meet the requirements of chemical tracer campaigns and can minimize environmental impacts and operational costs. The novelty of such an approach is the high potential to achieve, in parallel, a complete non-specific screening of produced or condensate water with additional qualitative raw data for the reservoir engineer. A high quality and accurate set of data could be easily stored *in silico*. Then after critical events or for further studies, we will be able to re-extract data to explore new frontiers in time and within the chemical water memory.

The last part of the presentation deals with emerging applications for screening for tracers or biomarkers from producing wells such as fluorescent molecules or nanoparticles, direct analysis in real-time of asphaltenes and identification and detection of ions from completion. A short overview will be provided of how state-of-the-art analytical chemistry leads the production optimization with a minimum water footprint and the understanding of inter-well integrity, connectivity and production allocation.

Key words: InterWell, Tracers, Non specific monitoring and reservoir management.