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Scale Control in Chalk Reservoirs: The Impact of Reservoir Processes, Chemical Placement and Retention - from the Laboratory to the Field

Myles Jordan(1) and Eric Mackay(2)

(1) Nalco, Denmore Road, Bridge of Don, Aberdeen, AB23 8JX, UK, (2) Institute of Petroleum Engineering, Heriot-Watt University, Edinburgh, EH14 4AS, UK (eric.mackay@pet.hw.ac.uk, tel: +44 131 451 3670, fax: +44 131 451 3127)

The mechanisms of scale inhibitor retention when phosphonate, polymer, and vinyl sulphonate co-polymer inhibitor squeeze treatments are applied in a large North Sea carbonate reservoir are outlined. Chemical placement represents the most significant technical challenge when performing scale squeeze treatments into fractured chalk reservoirs. Examples from over 50 field treatments applied in the reservoir, where both phosphonate and vinyl sulphonate polymer chemicals have been deployed, are used to illustrate the difference in chemical retention observed in laboratory evaluations. The laboratory studies demonstrated a clear potential for significant extension in treatment lifetime by changing from a phosphonate to a vinyl sulphonate co-polymer-based scale inhibitor. The selection and qualification of chemical placement systems for deployment of inhibitors in fractured carbonate reservoirs are also outlined.

A key factor in the success of such treatments is an understanding of chemical placement and the effectiveness of the treatment chemicals. Evaluation of residual chemical concentration or scaling ion chemistry has long been used in monitoring programs, and more recently probes have been developed which increase the rate of evaluation/interpretation. All these methods prove that the chemical is present in the brine when sampled, or that scale formation is not occurring at the point of brine analysis. This paper outlines the experimental methods developed to evaluate the suspended solids collected from the produced brine by environmental scanning electron micro-

scope (ESEM) and the associated brine chemistry to evaluate the scale risk within the produced fluids. The combination of these methods has improved the integrated scale management program in terms of evaluating scale squeeze placement effectiveness and squeeze lifetimes, and provide the confidence to extend the period between scale squeeze treatments, and in some cases stop treatment were brine analysis alone would have suggested further scale squeeze applications.