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Determining the Most Effective Diversion Strategy Using Pressure Based Fracture Maps: A Meramec (STACK) Case Study

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Summary

This paper discusses a STACK (Sooner Trend Anadarko Basin Canadian and Kingfisher Counties) case study that determined the effectiveness of different diversion techniques, including pods, sand ramps with sand slugs, rate cycling, and utilization of the completions order to control fracture growth. A secondary goal of this study was to evaluate the suitability of pressure-based fracture maps and oil and water phase tracers in monitoring diverter effectiveness.

Theory / Method / Workflow

Effectiveness of a given diverter technique and diverter drop was evaluated using the two techniques on a 3-well pad. The three wells were completed using a combination of:

- 4 pods per treatment interval
- 6 pods per treatment interval
- 8 pods per treatment interval
- high-volume proppant loading per treatment interval

The effectiveness of the diverter drop was evaluated using each of the diagnostic techniques listed above. The pressure-based fracture analysis uses the pressure response recorded in an isolated stage in the monitor well to compute fracture geometry and the rate of growth of the fracture dimensions, **fig. 1**.

The effectiveness of a given diverter drop is classified into one of four possible categories: stop dominant fracture growth, impede dominant fracture growth, no impact on growth of dominant fracture and accelerate the growth of dominant fracture. These results were then compared with the analysis from oil and water phase tracers and treatment pressure analysis.

Results, Observations, Conclusions

Successful (effective) diversion was observed on 82 % of the stages with pods compared to 64% successful diversion where sand ramps were used. In addition, stages using 8 pods for diversion had a 15% reduction in average fracture half-length compared to stages using 4 pods. Fracture height was better controlled through the order of completions of the stages between 3 wells. Completing the middle well in the upper part of the zone ahead of the two outer wells in the lower part of the zone, controlled the vertical height growth of the two outer wells.

Novel/Additive Information

The results from pressure-based fracture maps were consistent with those from water and oil tracer analysis. The offset pressure analysis provided a more robust and rigorous analysis of diverter effectiveness allowing to assess the success of diversion on a stage by stage basis

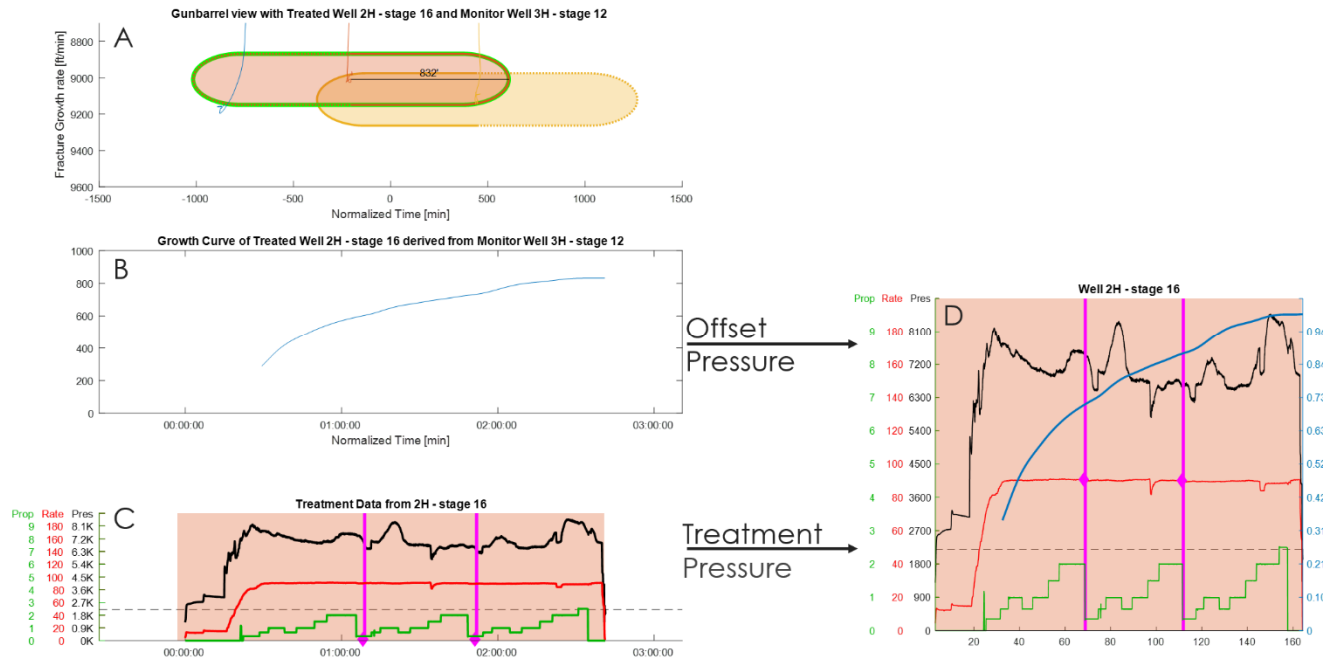


Figure 1 - Workflow for evaluating effectiveness of diverter using pressure-based fracture maps.

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