

Great Spirits Lower \$/BOE in the DJ Basin

“Great spirits have always encountered violent opposition from mediocre minds”, Albert Einstein

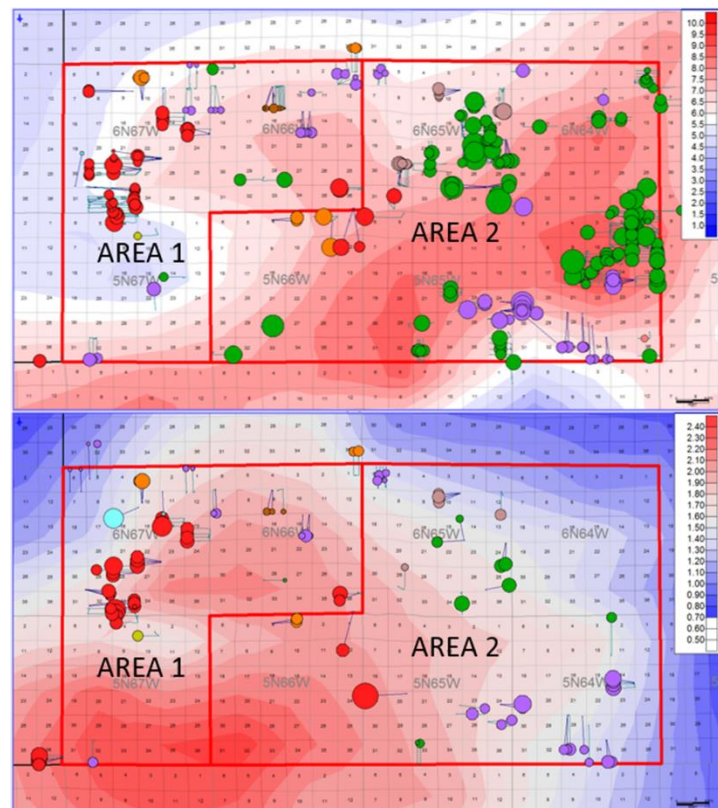
For a number of years prior to 2014 the DJ Basin was a service company paradise, where the completion method was directed by service companies at the height of the industry cycle. Designs were characterized by ball-sleeve completions (fast, to maximize our competitors pump efficiency), sand (cheap, so our competitors can compete) and a complex gel system (so our competitors can up-charge chemicals). Extraction and Liberty decided the basin was ready for some changes.

...this new DJ completion strategy lowers \$/BOE by 14% – 35%.

The objective of this paper is to discuss the benefits of these new designs and further evaluate what completion changes deliver the most “bang for the buck” in a challenging pricing environment. Use of a novel completion design and development of a low-cost ultra-low concentration fluid system resulted in significant cost saving while maintaining or improving overall production, thus lowering \$/BOE in a challenging industry environment.

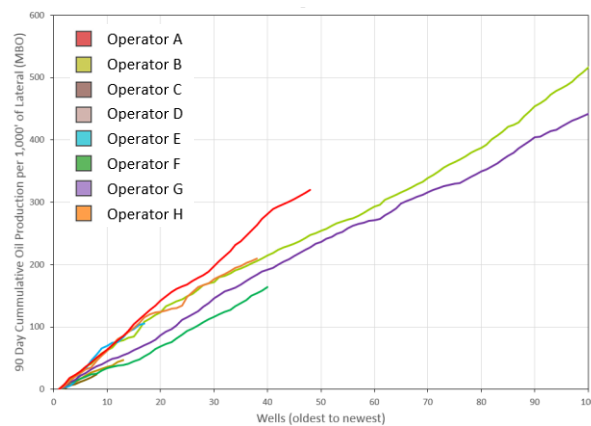
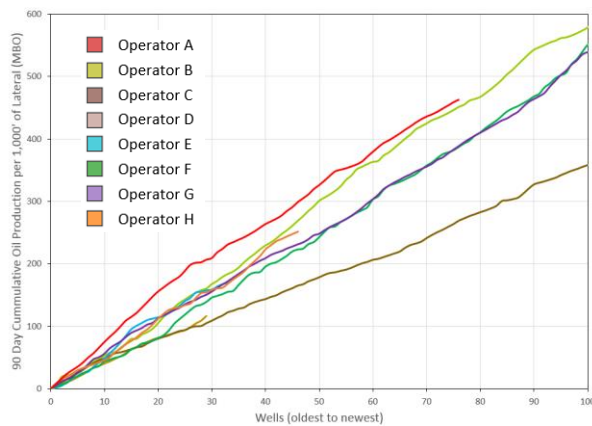
Lowering cost per BOE produced drove a process of completion design changes that started with fluid compatibility testing. Regained permeability testing in proppant load cells showed that a light and more cost-effective Borate Guar can result in similar or better cleanup than a CMHPG-Zirconate system traditionally used in the DJ Basin. As only a fraction of guar is required for cross-linking and carrying proppant, Liberty baptized this the “Spirit” fluid system. Multi-variate analysis (MVA) showed production in this area of the basin predominantly benefits from increased proppant mass and higher stage intensity.

More than 150 horizontal wells were completed between mid-2014 and early 2016 in T5-6N R64-67W using this new strategy. When compared to about 350 other horizontal wells, mostly completed without these changes, overall results of the new completion strategy have been very encouraging.



First, higher injection rates and improved pump time-to-downtime resulted in a 20+% reduction in days required to complete a typical 8-well pad. Over a period of about 130 pumping days, more than 2,100 frac stages were completed (average of about 16 stages per day). Supply chain efficiency improvements were implemented to keep up with proppant demand averaging 3.5 million pounds of sand every day, occasionally peaking to above 8 million pounds of sand per day. In addition, our ultra-low concentration Spirit system was developed so that it could be crosslinked at concentrations down to 8 lbs/Mgal. Together with high rate, this fluid system enables placing proppant concentrations up to 6 PPA, making the system significantly cheaper and cleaner than the conventional 20+ lbs/Mgal CMHPG systems that were routinely used in the DJ Basin.

Overall production in both Codell and Niobrara was above results for nearby peers over a wide range of production metrics. The figures below show a simple production comparison with “creaming curves”, showing the first 90-day cumulative production in MBO per 1,000 ft for all the wells by operator in the order they were completed. These cumulative production curves for all wells of one specific operator are ranked from oldest to newest wells, and are generally used in the investor community to evaluate an operator’s success in completing wells. Extraction’s (Operator A) 90-day creaming curves lie significantly above those curves from offset operators.



In summary, the change in completion design described in this paper reduced overall well cost by between 5% and 10% and achieved 10% – 40% production improvements in both Codell and Niobrara in comparison to average production from nearby operators over a wide range of production metrics. Combining the well cost savings and production uplift, with the assumption that 180-day cumulative production uplifts are indicative of EUR changes, this new DJ completion strategy lowers \$/BOE by 14% – 35%.

More information

SPE Paper 181457, “A Spirit of Change Sweeps the Denver-Julesburg Basin: Lowering \$/BOE Using A Novel Completion Strategy”, by M. Owens et al.