

Breaking Up Is Hard to Do

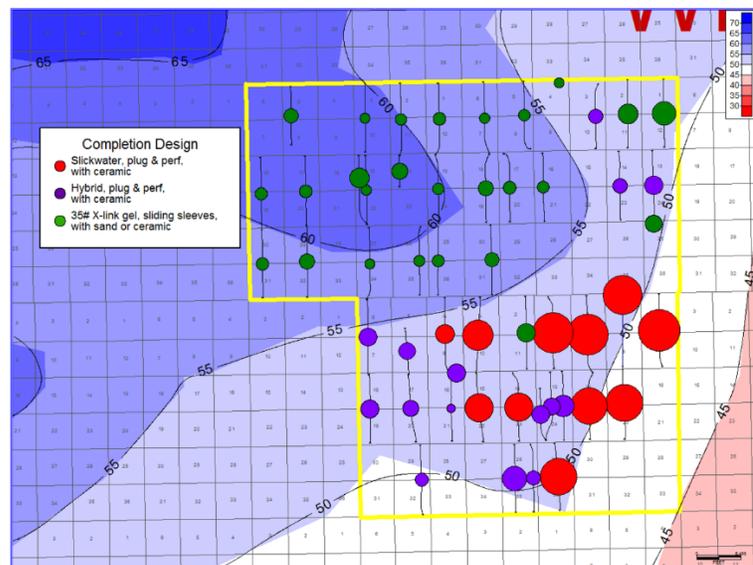
"Down dooby doo down down, breaking up is hard to do", Neil Sedaka

He makes it sound so easy, but Neil Sedaka knows that creating conductivity and complexity in shale fracturing is hard to do. The signature Liberty 2Cs Design creates fracs with Complexity with sufficient Conductivity to result in some of the best Bakken producers.

Liberty's method of breaking up shale is a brute-force "slash-hammer approach" with high rate, large-volume slickwater jobs. A "toy hammer approach" with tiny gel volumes pumped at low rate through ball-sleeve completions simply does not create the intensity in surface area that shale wells need.

Of course, screen-outs always loom with slickwater jobs, but can be avoided with a well-designed fracture treatment and good technical oversight during the pumping. These jobs are also tough on equipment, but with an industry-leading maintenance program and an extra parts warehouse on location, Liberty is well-prepared to handle the extra wear and tear.

The bubble map shows a production bubble plot with bubble size equivalent to 2-year production response for Middle Bakken wells just North of Williston.



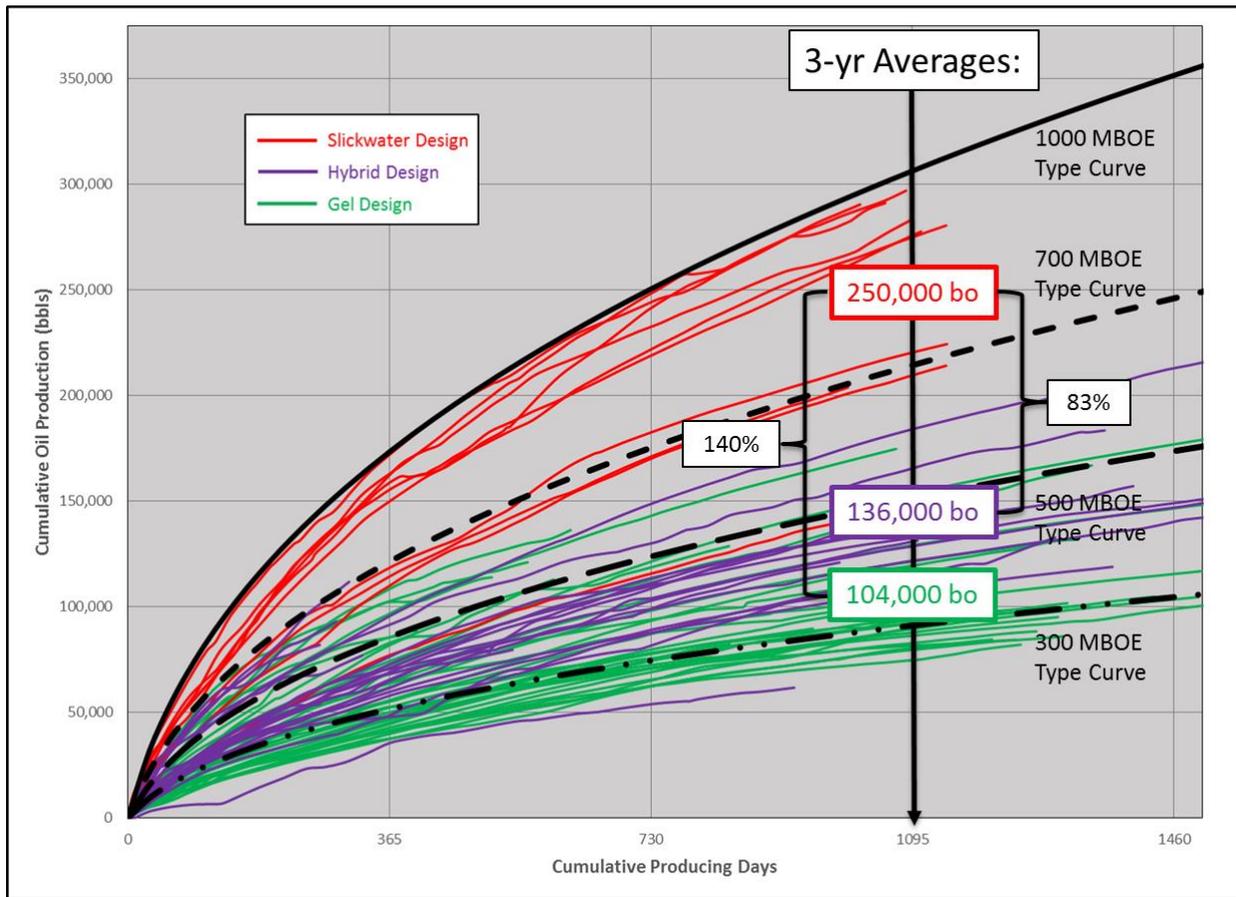
The three different bubble colors illustrate the dramatic difference in production performance for a design with a stout gel in sliding sleeve completions (in green); a hybrid design (in purple); and, the Liberty 2C's design (in red). While reservoir quality differences are minimal, the production response for the Liberty Design wells is 80 – 140% better.

Our fracture mapping experience has taught us a few things about Bakken fracs:

- Fracs grow primarily upward. The 2Cs design helps to keep proppant within the thin Bakken
- The plug-and-perf completion in conjunction with high rate effectively breaks more rock along the entire lateral, creating more Complexity

....the long-term production response for the signature Liberty 2Cs Design wells is 80 – 140% better than other frac designs

- Large volumes and slickwater generate more fracture contact area beyond the wellbore
- Ceramics deliver the necessary Conductivity. The Liberty Design later evolved into larger-volume sand-only designs as a cheaper alternative to deliver conductivity



These three different completion designs also lead to dramatic differences in long-term production and ultimate recovery. EURs for the Liberty Design are much higher, tracking the 850 MBOE type curve, while the hybrid and gel designs track the 500 MBOE and the 300 MBOE type curves, respectively.

Higher production pays for the higher well cost within a few months. Liberty's 2Cs Design makes better wells in the Williston Basin. Even Neil Sedaka knows it's true.

More information

SPE Paper 163827, "Breaking Up Is Hard to Do: Creating Hydraulic Fracture Complexity in the Bakken Central Basin", by C. Mark Pearson et al.