SOLUTIONS ENGINEERING: CASE STUDY

NexTier

Taming Tricky Wells: Reining In Treating Pressure Using Step-Down Data

CHALLENGE

A Delaware basin operator faced unexpected high treating pressures, preventing them from reaching designed rate and resulting in longer pump time and higher costs

SOLUTION

NexTier's Solutions Engineering team rapidly implemented and analyzed step-down testing to identify the root cause.

RESULT

Revised perforations design enabled successful completion of the remaining stages and delivered measurable performance improvements across the program.

NexTier's in-house solutions engineering team was engaged to address unexpectedly high treating pressures on wells in the Delaware Basin. Analysis of fracture gradients from instantaneous shut-in pressure (ISIP) confirmed that the wells were treating significantly above design parameters. NexTier engineers recommended end-of-stage step-down testing to help identify the possible source of high treatment pressure. The step-down analysis revealed that near-wellbore friction was substantially higher than expected, indicating excessive tortuosity and prompting a targeted change in perforation design.

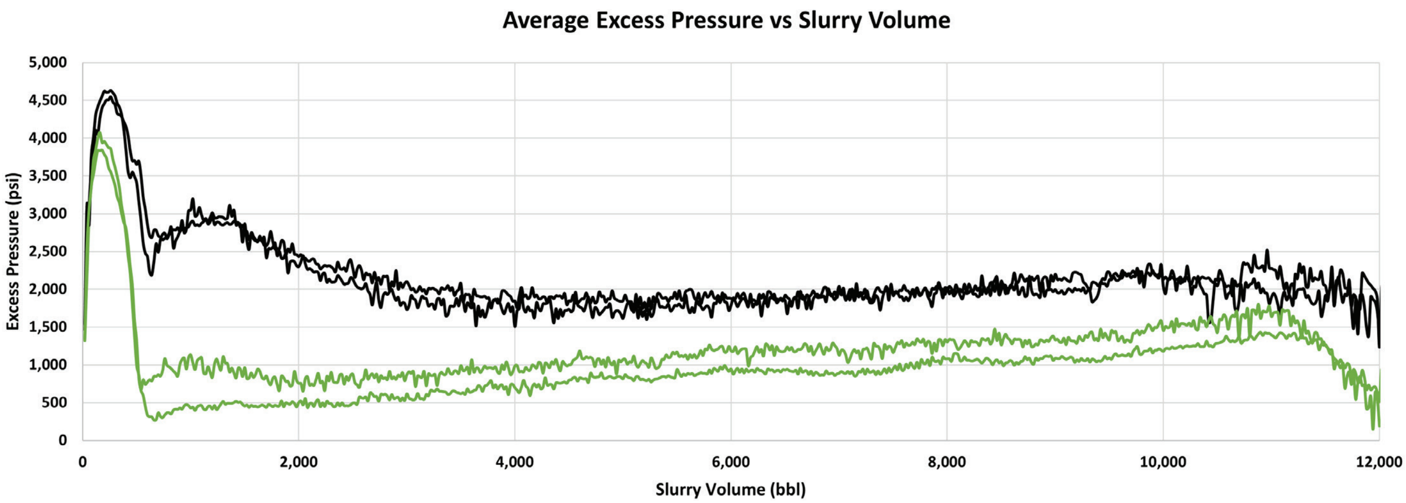

Fig. 1 illustrating average excess pressure versus slurry volume, reveals that stages completed with the 0° tool string exhibit elevated treating pressures indicative of high tortuosity. Stages completed with the 120° radial phasing show significantly reduced pressures within acceptable treating limits.

At the time, the operator was using a 3 shots-per-foot (spf), 0° oriented string. Based on step-down data, NexTier engineers recommended transitioning to a **120° radial phasing design**. Figure 1, illustrating average excess pressure versus slurry volume, reveals that stages completed with the 0° tool string exhibit elevated treating pressures indicative of high tortuosity. Stages completed with the 120° radial phasing show significantly reduced pressures within acceptable treating limits.

Testing was conducted on both wells for three stages each, followed by a confirmation test with the original 0° orientation on one well. Figure 2 illustrates perforation design revised to 120° radial while holding constant other design variables. Fine-tuning of gun systems reduced time-to-rate and associated near-wellbore friction.

Degree Phasing	Number of Stages	Average Rate (bpm)	Average Pump Time (Minutes)	Average Pexcess	Average k-NWB
0-degree	12	64.1	169	2,229	279.3
120-degree	17	77.2	147	1,007	114.6

Fig. 2 illustrates perforation design revised to 120° radial while holding constant other design variables. Fine-tuning of gun systems reduced time-to-rate and associated near-wellbore friction.

The revised perforation scheme proved highly effective, reducing near-wellbore friction to manageable levels and restoring the ability to reach target rate efficiently. Figure 3 highlights the time to rate between the 0° and 120° tool string.

Across the remainder of the six-well program, the operator achieved:

- **72.5% reduction in time to rate**
- **$1.24MM in total savings**, driven by reductions in fuel consumption, stage execution times, hourly rates, pressure brackets, and overall day rate

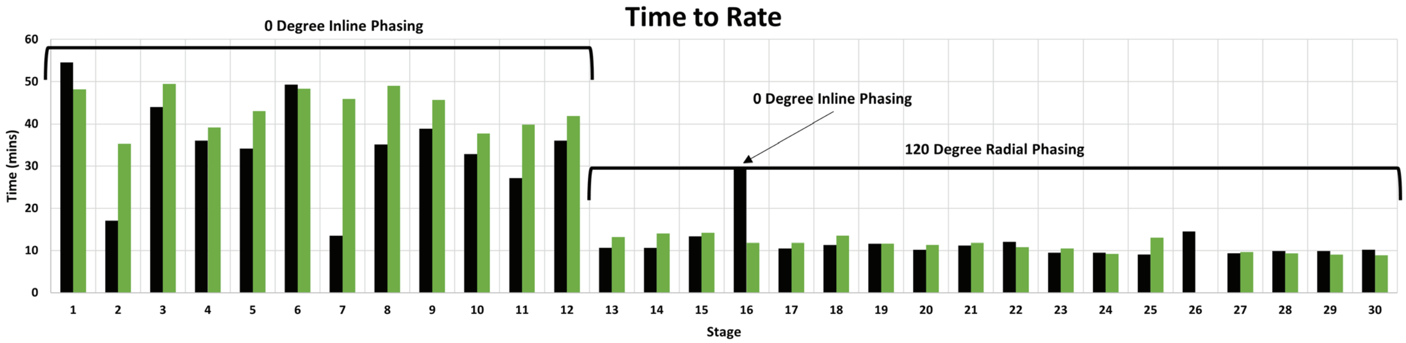

Fig. 3 highlights the time to rate between the 0° and 120° tool string.