CASE STUDY

NexTier

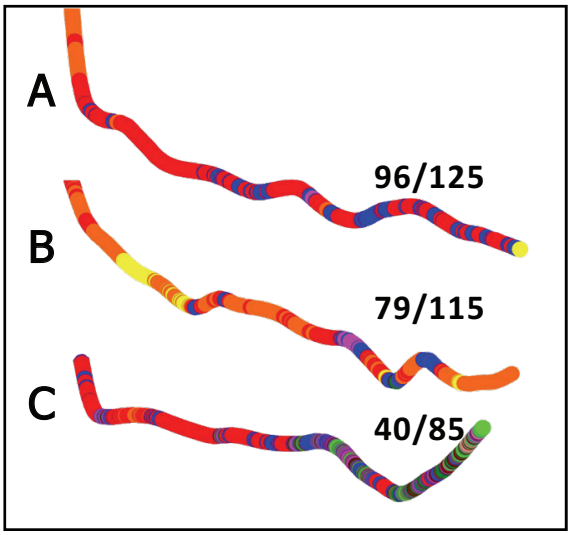
LateralScience℠ Wells Outperform Offset Wells in the Wolfcamp Shale

LateralScience Engineered Completion Delivers Superior Production Results

Completion Efficiency and Productivity

When proving the effectiveness of the LateralScience method, one of the strengths of the validation process is that the input drilling data (including weight on bit, RPM, standpipe pressure, torque and rate of penetration) is available on every well, even those that were drilled years ago. This enables NexTier to evaluate historical wells to understand the relationship between actual well productivity and the lateral heterogeneity results from the LateralScience method.

To make this approach credible, we choose sets of wells where conditions correlate closely. The geology, the drilling program and the completion procedures must be very similar on the subject wells, and they should be as close together as possible geographically. When these conditions are satisfied, the primary factors driving variability in productivity between these "sister" wells are differences in lateral heterogeneity.

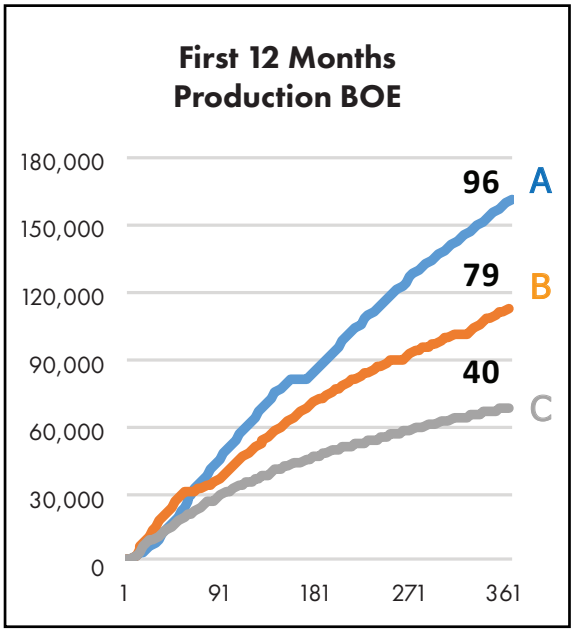


LateralScience trajectory plots for the three Bone Springs wells

Predicting Productivity in the Bone Springs Formation

The three subject wells were all drilled in 2013-2014, targeting the Bone Springs formation. TVD of the horizontal section is 10,640 +/- 20 ft. All completions were executed in a similar fashion; five clusters per stage, with 50-ft cluster spacing and 150,000 lb proppant per stage. The lateral lengths varied between wells (4,400-6,150 ft), as did the number of stages (17-25). As well productivity can be easily normalized to account for the lateral length, the similarity of these parameters made this set of wells appropriate for our evaluation of the relationship between lateral heterogeneity and well productivity.

Well A produced from a 6,150-ft lateral with a 25-stage completion. LateralScience analysis predicted that 96 of the 125 clusters (77%) would contribute to flow. Well B produced from a 5,550-ft lateral with a 23-stage completion. The prediction for this was that 79 of the 115 clusters (63%) would contribute to flow. Finally, Well C produced from a 4,400-ft lateral with a 17-stage completion where LateralScience predicted that 40 of 85 clusters (47%) would contribute to flow. Well C was particularly interesting because it drilled very much like Well A until the midpoint of the lateral, where it appeared to have strayed out of the target zone. The operator attempted to steer back into zone but ultimately chose to TD the well early because they were unsuccessful in their attempts to get back into the target formation.



Cumulative oil production for the three subject wells correlates well with the contributing clusters prediction

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Findings

The cumulative oil production curves from the wells' first year online demonstrated an excellent correlation between well productivity and the LateralScience prediction of contributing clusters. The LateralScience method was able to differentiate the good well (Well A, with 161,355 BOE in year 1) from the bad well (Well C, with 68,801 BOE in year 1), both qualitatively and quantitatively. This case study supports the hypothesis that (1) well productivity is influenced by completion efficiency, and (2) the LateralScience method, can quantify the completion efficiency and predict well performance.

The LateralScience analysis in the Bone Springs formation convinced the operator to use the LateralScience method to design engineered completions for three wells in a Wolfcamp play that they were actively developing.

LateralScience Method Applied With Success in the Wolfcamp Shale

The three subject wells were drilled and completed in the Wolfcamp A formation during 2015. Two of the wells were direct offsets and were compared to 21 other wells (group A) that were within a four-mile radius. The third well was analyzed separately because it was not in close proximity to the other two wells. It was also compared to a group of wells within four miles. This group of wells (group B) included nine offsets.

The two groups were chosen to ensure that the comparison wells had minimal differences in both geology and hydraulic fracture treatment technique. By controlling these factors, we are able to effectively evaluate productivity differences between geometric completion designs and LateralScience-engineered designs. Productivity is expressed by the first six months' cumulative well production. The analysis is normalized for both proppant volumes and lateral length.

LateralScience Process Demonstrates Value

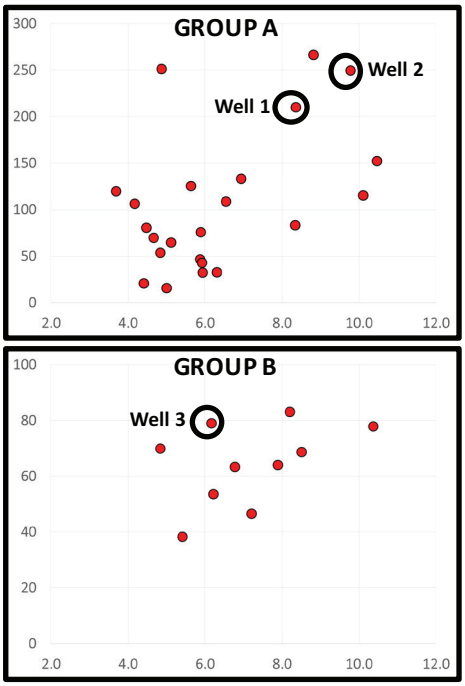
After a short time, both LateralScience wells significantly outperformed the best 15-cluster geometric and sonic-based designs. This confirms the excellent value delivered by the LateralScience advanced-analysis process.

Result – Group A

In the first six months, these 23 wells produced an average of 3.4 BOE/lateral ft per month. The two subject wells, completed with LateralScience designs, produced 5.7 and 5.2 BOE/ft per month respectively, 61% better than the average. Only two of the other 21 wells in group A wells outperformed the LateralScience wells, putting these wells clearly in the top quartile for this area. We also evaluated the technique by looking at BOE as a function of proppant volume. By this metric, the two wells were 50% better than the average with only three of the other 21 wells ranking higher.

Result – Group B

The third well, which is located 17 miles southeast of the group A wells, was compared to the nine other wells in group B. The group B wells, in general, are significantly less productive than the group A wells. Group B wells averaged 2.3 BOE/lateral ft per month. The LateralScience well produced 2.94 BOE/lateral ft per month, which is 28% better than this average and is the best well in the group according to this metric. As a function of proppant volume, the subject well was 38% better than the average, and only one of the other nine wells outperformed the subject well.



Cross-plot for each group with six-month production (BOE × 10^3) on Y axis and total proppant volume (lbs × 10^6) on X axis

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