Channel Fracturing Gives Encana 24% More Gas Production

Case study: Increasing fluid recovery and reducing recovery time for a stimulation campaign in Wyoming, US

Challenge
Improve gas production in competitive Rocky Mountain region.

Solution
Apply HiWAY* flow-channel hydraulic fracturing technique to create stable channels and limitless fracture conductivity.

Results
Recovered fracturing fluid faster, enabling an additional 19 MMcf of gas to be sold in just 6 weeks. Achieved 24% more gas production than offset well and 14% more production than the campaign’s expected best producer (which had 40% more net pay) after 180 days.

Conductivity loss in the Rockies
Reservoir sands in the increasingly competitive Rocky Mountain region of the US require 8-to 12-stage completions, with the deepest stages at more than 12,000 ft deep. A major inhibitor of production from this area is conductivity loss, which also hampers proper fracturing fluid cleanup.

Working in the Jonah field near Pinedale, Wyoming, Encana needed to improve production and ultimate recovery from the Stud Horse Butte (SHB) area of the Lance formation. This formation ranges from 2,000 ft thick at the updip to 3,000 ft thick at the downdip. It comprises fluvial sand bodies with
- 6 to 9% porosity
- 0.0005- to 0.01-mD permeability
- 35 to 55% gas saturation
- net pay of approximately 800 ft.

Drilling operations for Encana SHB wells took an average of 15 days to reach approximately 13,000-ft TD. Wells were completed with 12 to 15 fracture stages, each with 150 to 250 ft of interval separated by flow-through bridge plugs. Stages consisted of 150,000 to 400,000 lbm of sand, pumped at concentrations of up to 4 to 6 lbm of sand per gal US of fracturing fluid. These treatments resulted in poor fluid recovery though, so the company moved to slickwater fluids—which did increase fluid recovery, but limited fracture length. So a higher-strength proppant was introduced to increase conductivity. Production improved, but not enough to offset the high cost of the proppant.

Schlumberger had to address two challenges: delivering adequate conductivity from lower, less-prospective zones and providing optimal conductivity from higher, more-conductive zones.
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Flow-channel creation for one well
The company chose to employ the HiWAY flow-channel hydraulic fracturing technique from Schlumberger for well stimulation in SHB. Two challenges had to be addressed in this effort: (1) provide adequate conductivity and fracture length in the lower, high-stress zones, which did not often produce, and (2) improve fracture conductivity to an optimal level in the higher, more conductive zones.

For a three-well campaign, one of the wells was treated with 12 stages of HiWAY channel fracturing. Because it had very similar properties, an offset (Offset A) was used as a direct comparison to the HiWAY well and was treated with 12 stages of conventional fractures. Offset B had slightly different properties and was treated with conventional fractures as well. Offset B was expected to be the best producer of the three because it contained significantly more net pay.

Rather than leaving fracture flow dependent on proppant pack conductivity, the HiWAY fracturing technique created stable channels for hydrocarbons to flow through, making the conductivity limitless.

Optimal fluid recovery and gas production
The enhanced conductivity provided by HiWAY channel fracturing gave the HiWAY well 20% more fracture fluid recovery than Offset A. Furthermore, the time of recovery shown by the HiWAY well was half that of the others, enabling an extra 19 MMcf of gas to be sold in just 6 weeks.

After 180 days, cumulative production of the HiWAY well was 24% (73 MMcf) higher than that of Offset A. And even though Offset B had 40% more net pay and was expected to produce the most, the HiWAY well outperformed it in cumulative production by 14%.

The HiWAY well outperformed its offsets, producing more gas than the campaign’s expected best producer.