Integrated Stimulation Strategy Identifies Savings of USD 734,000 Per Well in the Wolfbone Play

Endeavor Energy maximizes pay zone contact with Mangrove stimulation design software and HiWAY flow-channel hydraulic fracturing technique

CHALLENGE
Gain a better understanding of the spatial variability found in Wolfbone formation wells and apply cost-effective completion solutions.

Identify and rank productive targets for horizontal well field development.

SOLUTION
Incorporate advanced reservoir characterization data into Mangrove* reservoir-centric stimulation design software to stimulate nine wells with HiWAY* flow-channel fracturing technique.

RESULTS
■ Identified USD 734,000 in savings per well for future operations.
■ Increased initial oil production of horizontal wells by 60% compared with offset horizontal wells.
■ Conserved 6% more fluid per stage.
■ Used 30% less proppant per stage.
■ Ranked in the field’s top 20th percentile.

Based on the production results of this project, Endeavor Energy converted all of its stimulation treatments from conventional systems to HiWAY channel fracturing.

Detailed data and cost-effective completion strategy needed
“Wolfbone” is the local name given to the Delaware basin’s vertical wells with comingle production from the Wolfcamp and Bone Spring intervals. Because the Wolfbone comprises multistacked conventional and unconventional packages, the interval is characterized by highly heterogeneous lithologies and formation properties.

To ensure the economic success of its Wolfbone campaign, Endeavor Energy partnered with Schlumberger to characterize the reservoir and understand the acreage’s spatial variability. Detailed completion and production evaluation of the vertical well program would be critical in identifying and ranking productive horizons for future horizontal well developments. Schlumberger proposed an integrated strategy encompassing detailed reservoir characterization, complex fracture modeling with Mangrove software, and HiWAY channel fracturing technique.

Integrated workflow helped optimize well completion effectiveness
Schlumberger constructed oil shale montages using data from Platform Express* integrated wireline logging tool, ECS* elemental capture spectroscopy sonde, and CMR* combinable magnetic resonance tool. This provided petrophysical interpretations of the Wolfbone interval and improved identification of the pay zones. Sonic Scanner* acoustic scanning tool was also run on the subject wells to derive anisotropic mechanical rock properties and stress models, which are critical inputs for accurate hydraulic fracture simulations.

All available reservoir data was imported into Mangrove stimulation design software to determine treatment staging, choose perforation placements, and perform hydraulic fracturing simulations—optimizing fracture treatment parameters. To address completion costs and fracture conductivity concerns, the subject wells were treated with the HiWAY technique. A completion and production analysis, which includes post-treatment fracture simulation, production log analysis, rate transient analysis, and production history matching, was performed on the subject wells, aiding the calibration of the petrophysical and anisotropic stress models.

HiWAY flow-channel hydraulic fracturing technique reduced proppant and water usage, simplifying logistical and supply chain requirements as well as reducing completion costs.
CASE STUDY: Complex hydraulic fracturing simulations and HiWAY technique maximize pay zone contact

The integrated stimulation solution resulted in the identification and completion of a deeper target interval, which resulted in a 39% improvement in 10-month cumulative oil production compared with offset laterals landing in the shallower, traditional target.

Pilot vertical and horizontal wells yielded more oil and more cost savings

Initial oil production of the subject wells ranked in the Wolfbone play’s top 20%. In addition, HiWAY flow-channel fracturing technique used 30% less proppant and 6% less fluid than conventional stimulation treatments. Based on the production results and commodity reductions of this project, Endeavor Energy converted all of the stimulation treatments from conventional systems to HiWAY channel fracturing.

The completion and production evaluation also provided critical input into the future drilling and completion program. The evaluation validated the effectiveness of HiWAY technique, allowing for further optimization of this completion method. Endeavor Energy identified cost savings of USD 734,000 per well in regard to drilling and completions operations. This analysis also identified high-potential horizontal targets within the Wolfbone play that would be targeted in future horizontal developments.

Key vertical Wolfbone findings and integrated solutions have been applied on the client’s initial horizontal development. Through advanced reservoir characterization, PowerDrive® RSS, PeriScope® bed boundary mapper, and integrated completion design and evaluation, Endeavor Energy drilled and completed a subject well in a new, deeper target interval. The well exhibited 60% higher initial oil production and 39% higher 10-month cumulative oil production compared with offset laterals landing in the shallower traditional target. Based on the production results of this project, Endeavor Energy converted all its stimulation treatments from conventional systems to HiWAY channel fracturing.