Challenge
Reduce costs and improve efficiency of plug-and-perf operations in a horizontal well.

Solution
Use Diamondback composite frac plugs to
- minimize premature setting
- maintain effective seal without slippage
- reduce millout time and debris.

Results
Minimized costs by preventing premature plug setting, maintained effective seal at depth, and reduced average millout time by up to 80%.

Endeavor sought to minimize plug failures
Developments in horizontal drilling and stimulation technologies have increased initial oil production rates in the Woodbine Oilfield of East Texas from 50–75 bbl/d to 500–1,000 bbl/d per well. Cumulative production volumes have also risen tenfold, from an average of 40,000 to 425,000 barrels of oil. With the consequent exponential increase in activity, Endeavor Natural Gas, like other operators in the area, wanted to maximize the efficient use of its resources and minimize costs by completing wells as quickly and safely as possible, with minimum NPT.

The plug-and-perf stimulation method was the Endeavor technique of choice. Accordingly, the company needed a plug that was both reliable and durable, minimized the risk of presetting and the costs of remedial work and NPT, and was easy to mill out—all without changing the company’s fracturing and milling procedures. Finding the right plug was critical to these objectives since plug failures increase the costs associated with fracturing and wireline downtime and with mobilizing a CT unit to mill out any prematurely set plugs.

Endeavor Natural Gas had experienced some premature setting of competitor plugs caused when the plugs hit obstructions, usually sand, as they were being run in at high speeds and when the setting tool misfired, requiring that the plug be pulled out of the well. The company wanted to minimize such events. It also wanted to reduce the competitor’s millout times—40 to 60 minutes for each plug.

Robust Diamondback composite frac plugs were selected on basis of track record
Schlumberger proposed using Diamondback composite frac plugs, which have an excellent track record for holding their seal and shortening mill-out time. The plugs feature a special mechanism to prevent presetting, and they are made of a composite material that eliminates many problems during milling that hinder flowback. Moreover, they are designed to be milled out into small, consistently sized cuttings that can be easily circulated out of the well.

Plugs performed well and millout time was greatly reduced
The wireline company that ran the 21 Schlumberger Diamondback plugs encountered only three problems, none of which caused the plugs to set prematurely or to present problems when they were pulled out of the well, thus preventing the need for costly interventions. Two misfires occurred that involved pulling the plugs out of the hole and running in new plugs. Another plug was immediately halted by sand debris, but the remaining 18 plugs held their seals and did not slip after being set. Also important, compared with the time it took to mill out the competitor’s kill plug in the same well—60 minutes—Diamondback plugs in the first 16 stages averaged only 12 minutes per plug, with an overall plug average of 23 minutes—an improvement of 50% to 80%. All 21 Diamondback plugs were milled out in a single trip.

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