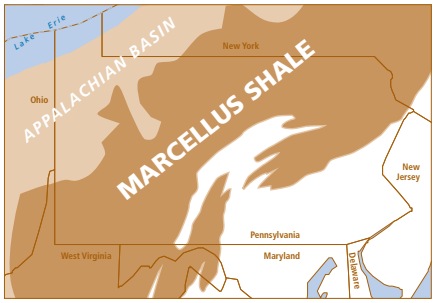
Packers Plus® Case Study

Benefits of the Packers Plus StackFRAC system for the Marcellus Shale



Background

With an estimated 262 Tcf of recoverable natural gas, the Middle Devonian Marcellus Shale has become one of the main unconventional shale gas targets in the United States. The Marcellus is part of the Appalachian Basin and underlies 95,000 square miles of Pennsylvania, New York, Ohio and West Virginia.

The Challenge

The Marcellus is a challenging target due to its depth (4,000 to 8,500 ft), making it cost-intensive to develop. In addition, operators working in the Marcellus have had to contend with public challenges to hydraulic fracturing, prompting them to look for technologies to make this process more efficient and environmentally sensitive.

There are two main methods of multi-stage hydraulic fracturing: cemented liner, "plug and perf" and open hole fracturing systems. Although both methods have the same goal of increasing access to the reservoir through the induction of fractures along the entire length of the horizontal wellbore, they have significant differences from an operational perspective.

The Solution

The Packers Plus StackFRAC® system was introduced in 2001 with the goal of making multi-stage fracturing more efficient, both in terms of time and cost, as well as repeatable and reliable. StackFRAC is an open hole, multi-stage fracturing system that uses external, hydraulically set, mechanical RockSEAL® II packers instead of cement to isolate sections of the wellbore, and FracPORT™ sleeves to create openings in between the packers for fracture treatment. Size-specific actuation balls are injected into the system to allow for hydraulic opening of the FracPORT sleeves. The balls create internal isolation from stage to stage, eliminating the need for bridge plugs.

The Results

The major advantage of the Packers Plus StackFRAC system is that all the fracture treatments can be performed in a single, continuous pumping operation without the need for a drilling rig or wireline/coiled tubing services. This not only saves time and costs, but also reduces the number of HSE high-risk operations. The continuous operation also allows the well to be immediately flowed back and production brought on line as soon as fracturing is complete.

Another benefit of StackFRAC completions is that it is more environmentally sensitive because less fracturing fluid is used in the fracturing operation. The cemented liner, plug and perf method requires bridge plugs to be pumped down the tubing, which entails flushing the entire wellbore to remove proppant from the previous stage. This excess fluid can have detrimental effects on fracture conductivity near the wellbore by pushing the previous stage's proppant further in the reservoir resulting in overdisplacement. By using less fracture fluid, the StackFRAC system reduces the amount of water required, decreasing the environmental impact and saving upfront water costs as well as the costs to treat and dispose of produced fluids.

An unexpected benefit of StackFRAC completions that operators have noted has been a dramatic reduction of excessive fracture initiation pressure, as high fracture gradients are a characteristic of shale rock. On earlier cemented liner treatments, it was common that some hydraulic fracture treatments could not be initiated on some stages simply due to excessively high breakdown pressure. Because fractures are able to initiate anywhere within the open hole section of each isolated stage, the fracture will take the path of least resistance – where the breakdown pressure is the lowest.

As of September 2010, over 5,000 StackFRAC systems have been run worldwide in a variety of formations, both on and offshore, proving the versatility of these systems. In particular, over 20 StackFRAC systems have been run in the Marcellus accounting for more than 150 stages and over 700 systems have been run in the Devonian Shale.

Benefits of StackFRAC

- Reduced equipment on location
- Reduced fracture fluid
- Reduced proppant overdisplacement
- Reduced fracture initiation pressure
- Immediate flowback

Time savings

Cost savings

Reduced environmental impact

Improved production

Packers Plus®

Do It Once
Do It Right

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