New Technology magazine
THE FIRST WORD ON OILPATCH INNOVATION

THE LATEST ISSUE

Open-Hole Or Cased And Cemented

Weighing the pros and cons of completion choices for multifrac horizontals

[**Print Article**: ***November 2011***, by ***By Pat Roche***] As the use of multiple fracture stimulations in horizontal wellbores skyrocketed in recent years, a debate emerged over the best completion method: open-hole ball drop or cased and cemented holes?

It boils down to a question of whether mechanical packers or cement provide the best means of isolating between frac stages during multiple completions in horizontal wellbores.

Murray Reynolds, a veteran completions engineer with TAQA North Ltd., looked at the advantages and disadvantages of each system in a presentation at an Infocast tight oil conference in Calgary in September.

The open-hole ball-drop system is typically associated with Calgary-based Packers Plus Energy Services Inc., though a number of competitors also run similar systems. A packer is set in the external casing, uncemented. In the case of the Packers Plus StackFRAC system, balls made of thermal-plastic material such as Teflon are dropped into the well to shift a sleeve, isolate the previous frac and open the next frac port up-hole.

Other open-hole systems use a dart instead of a ball to shift the sleeve. Others use swellable packers where an elastomer element reacts with the wellbore fluid or temperature to expand, thus creating a seal with the open-hole. Depending on conditions, it could take a week or more for these to be set up in a wellbore before a frac operation begins.
Most of the fractured horizontal well completions in western Canada use open-hole packer-based systems, which may be the cheapest option.

The Barnett shale is currently almost 100 per cent cased and cemented. Reynolds noted that early experiments with open-hole gave poorer results from the standpoint of microseismic monitoring as well as production performance.
On the other side of the debate are the advocates of fully cemented liners. These wells are typically more expensive Â¿to complete, but allow maximum control of fracture placement, providing there is good Â¿cementing in the horizontal section, which can sometimes be a challenge.

Listing the pros and cons of each system, Reynolds said the big advantage of the open-hole packer system is that it's a Â¿continuous frac process. It can be done quickly if logistics allow everything to be located on site. "If you're pumping 100,000 kilograms per fracture stage, you might not be able to do it all in one day," he said. "But generally...you can do 15 fracs in a day, or more."

Other advantages include high pump rates and the fact that there's no frac fluid or proppant limit. Also, Reynolds said open-hole completions may enjoy a slight cost advantage over cased and cemented wells.

On the downside, one of the disadvantages of open-hole Â¿systems is the number of frac intervals has historically been limited to about 24 stages. Â¿"But now multiplier systems Â¿are becoming available where we can frac up to 60 stages," Â¿so there may be fewer limits Â¿in the number of stages, Reynolds conceded.

Open-hole systems have less control over frac length and frac placement, he said. "In tight oil, as in tight gas, fracture half-length is everything." Frac Â¿half-length refers to the radial distance from the wellbore to the outer tip of a fracture. Also, he said setting the hydraulic packers may create frac initiation points.

If the balls aren't recovered, the operator may need to mill out the balls and seats, adding significant cost. However, Reynolds noted one vendor has retrievable ball/seat assemblies.

Looking at the pros and cons of the cased and cemented systems, Reynolds said two big advantages are longer fracs and more control over where each frac initiates. He believes one of the biggest future innovations of cemented completions will be the opportunity to use cemented frac ports, which can be shifted with a ball or coiled tubing.

"This is, I think, the future. We've run a couple of these. [We've had] very good results in terms of fracture placement and productivity," he said about cemented frac ports, which he called a "potential breakthrough technology for cemented completions."

He said cemented frac ports are currently being used in relatively shallow applications such as in Viking tight oil in Saskatchewan.

Other new technologies for cased-hole frac isolation include composite bridge plugs that can be easily milled out. Reynolds said Halliburton Energy Services has a self-removing bridge plug that can be set on a timer to explode into a pile of ceramic dust-"a really good way to remove bridge plugs."

On the downside, it takes Â¿longer to frac the same number of intervals in a cased and cemented well than in an open-hole well. This is because of the time it takes to perforate and the fact that it isn't a continuous process.
"People who are looking strictly at cost are going to probably stick with ball-drop systems," Reynolds said. But if the operator and its service companies are adept-and don't encounter any problems that extend the operation-the cemented completion "can be cost competitive," he added.

In some cases, reservoir conditions may dictate the use of cased and cemented completions. In the Horn River, for example, packer systems can't withstand the high temperatures.
Reynolds said many innovative tools and techniques are emerging that he believes have the potential to change the way multi-fractured horizontal wells are completed in the future. "Hang onto your hat-there's a lot of technical innovation going on," he said.

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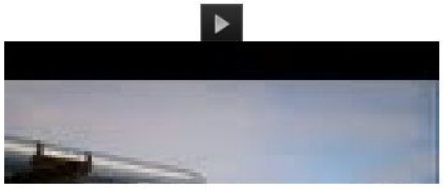

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