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## Fracking With Gelled Propane Sparks Debate In NY



*A new proposal to use gelled propane for hydraulic fracturing in New York has attracted widespread attention. Ros Davidson investigates the viability and appeal of the technology.*

US news outlets exploded in July as a proposal was unveiled to use gelled propane to frack for natural gas in a New York State shale play. While the industry's response was decidedly more muted, the proposal raises some interesting questions about the viability and appeal of the technique.

New York currently bans high-volume fracturing with water – defined as any “stimulation of a well using 300,000 or more gallons of water as the base fluid for hydraulic fracturing for all stages of well completion, regardless of whether the well is vertical or directional” – limits which essentially act as a de facto ban. The measures were implemented amid a furore over fracking, and with the backing of an array of pressure groups which claimed that the procedure could taint the state's water supply.

The key point for drillers, and one which has been hinted at since the law was introduced, is that gelled gas fracturing would allow them to circumvent the State's regulations. But gas fracking, typically using propane or butane, has only been used in a thousand or so wells in North America. And there has been little published independent research on the technique. Of the drillers that have tested it, few have reported details.

Notably, a pioneering firm behind the technology – Calgary-based GasFrac Energy Services – filed for US and Canadian bankruptcy reorganisation in January 2015. At the time, observers said the move followed years of financial stress, the indication being that the technology did not have killer appeal to the US shale market.

GasFrac's technology was since bought by another Canadian company, Step Energy Services.

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**Unconventional alternative**

It is still early days for the group of New York landowners leasing 53 acres (0.21 square km) in the Southern Tier to site operator Tioga Energy Partners. The company plans to use to use a mixture of propane gel and sand in a well that would be drilled through the Utica and then horizontally into the Marcellus shale formation. The application, listing Tioga as the operator, is now being reviewed by the state Department of Environmental Conservation.

But Adam Schultz of Couch White law firm, who represents Tioga, confirmed to InnovOil: "The technology will be similar to that... used by GasFrac."

On paper, gas fracking appears fairly viable. In comparison with the potential environmental footprint of conventional fracking, and the need to dispose of millions of gallons of wastewater, it can offer some significant benefits. Water can also lessen the potential production from wells, especially those producing oil, a problem not encountered with miscible gas. With drought gripping much of the western US, in many places gas may well be a more plentiful alternative to water.

GasFrac is on record as having touted its technique for using a gas that is widely available because it is a by-product of the hydrocarbon industry. The propane used can also be recaptured and re-used again and again, or even resold.

GasFrac has also said that unlike water, propane – which is non-reactive – leaves behind salts and naturally occurring radioactive materials, rather than dissolving them. "We leave the nasties in the ground, where they belong," the company's then-CTO Robert Lestz was quoted in 2010.

**Water solution**

"In theory [the technique] has a smaller environmental footprint, and wells completed with this technology would offer better performance," said David Burnett, director of technology at the Global Petroleum Research Institute and a member of the Department of Petroleum Engineering at Texas A&M University. "In the future, we will need a more environmentally sustainable shale well completion technology, [and] one option is to find a substitute for water," he told InnovOil.

With conventional fracking, production is decreased when water reacts with clay. According to Penn State Marcellus Centre for Outreach and Research hydro geologist David Yoxtheimer, water can also block a particular flowpath when an oil well is being fracked. Oil and water are not miscible, he notes, whereas natural gas can flow more easily through gelled propane.

But Yoxtheimer told InnovOil that in deeper wells, propane works less effectively because more pressure must be built up. In contrast, water is almost virtually incompressible and so allows the driller to increase pressure more easily. Because of this, he says, gas fracking would likely be more commercial at shallower depths of 1,000 metres, rather than 2-3,000 metres.

GasFrac personnel have previously disagreed, claiming that depth is not an issue, and that they have fracked at depths of more than 3,000 metres. At the proposed New York site, however, the Marcellus is relatively near the surface.

With LPG fracking, there is an approximate 50% reduction in the volume of truck traffic to a well site owing to the lower volume of propane (versus water) needed to complete the stimulation, says Tioga. LPG is also a more effective carrier of proppant (such as sand) based upon its ability to hold the sand in suspension for longer periods, the company adds. This results in more sand entering and remaining in the rock fractures.

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***At what cost?***

The cost of gas fracking, however, remains an issue. Hydraulic fracturing with gas is generally thought to be about 25% more expensive than with water, gauges Burnett. Because the technology is still relatively new, it is also pricier to procure the surface equipment appropriate for handling propane gel. Well testing after a gas fracturing will have to accommodate larger portable well test separators to handle the increased volume of the hydrocarbon.

The propane also has to be brought in, stored, and afterwards put into a pipeline or trucks. It is simply more expensive to bring in large volumes of propane to a fracking site, says Yoxtheimer. Yet if propane is already plentiful in an area – e.g. because of existing hydrocarbon production – then fracking with gas makes more commercial sense. In New York State, for example, a major propane pipeline already runs through the Southern Tier.

From a safety perspective, propane is also explosive, and must be handled accordingly. But proponents note that the industry is well used to dealing with liquid gas, and that propane has been handled safely by communities for decades.

***In the right place***

What is apparent from these claims and counter-claims is that the technique is not widely employed. In 2012, Chevron reported that LPG was used in a pilot project, in multiple-staged fracture treatments in Colorado's Piceance Basin. This led to "significantly increase[d] production while minimising water usage," said the supermajor shortly afterwards. Chevron declined to comment further on the test results, citing confidentiality. A Chevron spokesman also told InnovOil that, as of mid-August 2015, the company had not used propane in hydraulic fracturing since the Colorado test.

The same year, Quicksilver Resources reported on its use of the process in Colorado's Sandwash Basin/Niobrara formation. The company "completed the first 3 vertical wells with oil fracs and the second 3 wells, 2 vertical and the horizontal, with a different style gas frac," said CEO Glenn Darden. "This technique has shown significantly better results," he told analysts in an earnings call.

According to the company results, the horizontal well fractured about 1,500 feet (450m) of a 4,500-foot (1,370m) lateral and had a 45-day production average of 230 barrels of oil equivalent per day, primarily oil. Darden added: "The 2 vertical wells completed in this manner are steady producers, with the best well averaging 120 barrels of oil equivalent per day, again mostly oil, over the same 45-day period."

Yet despite the implied advantages of gas fracturing in some locations, experts do not see the niche technique catching on widely any time soon. "This pause in drilling is allowing companies to sharpen their technology – but gas fracturing is speculative," said Burnett. "It's a Mars shot, a long shot."

Yoxtheimer agreed that more field research would be needed to know how widely applicable the technology is. "Right now, companies are not looking to put too much money into experiments," he said. The technique has a lot of promise in the right formations, namely where NGLs are produced, where oil is being sought, and perhaps where water is in short supply. "[But] it's a bit of a boutique technology."

For the time being at least, it would seem that gas fracturing is set to remain the exception, rather than the rule.

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