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TECH TALK

Could we someday see waterless fracking by use of rocket fuel?

BY GARY BEERS • FOR ENERGY PIPELINE

The dawn of fracking wells to stimulate oil/gas production began in the mid-1880s, when liquid nitroglycerin/dynamite was placed into a metal cannister, lowered into the well and detonated. This risky approach to fracking a well was replaced in the late 1940s, when hydraulic fracking emerged as the preferred and safer practice (Shooters – A Fracking History, Oil and Gas Natural History, 2017).

During the past 50 years, the widespread use of hydraulic fracking – while highly effective – has highlighted undesirable environmental side effects, such as use of large volumes of freshwater, subsequent generation of flowback water, deployment of heavy equipment at the site, extensive local tanker-truck traffic to move liquids and soilds to and from the site, and suspicion of indirect contributions to causes of nearby earthquakes.

Given these undesirable environmental side effects, there has been strong interest in identifying and evaluation alternate fracking methods that do not use water.

One direction for the development of waterless fracking emphasizes the use of liquefied gases. In the Dec., 26, 2014 issue of The Energy Pipeline, a column addressed this technique (Dry Fracking Could Be A Game Changer). For the layman, a good introduction is an article from Inside Climate News (New Waterless Fracking Method Avoids Pollution Problems, But Drillers Slow to Embrace It, November 2011). Numerous other reports on this technology are available, especially reports related to GasFrac Energy Services.

Another direction empahsizes a second look at the initial fracking method – explosives. Starting in late 1967, controlled atomic explosions (Gasbuggy Program) were tested for fracking in New Mexico and Colorado. These test programs detonated downhole (about 4,300 feet) nuclear devices that were approximately twice as powerful as the Hiroshima bomb. This approach was discontinued in 1975 due to economic and environmental concerns (Project Gasbuggy Tests Nuclear Fracking, Oil and Gas Natural History, 2017).

UPDATED APPROACH TO EXPLOSIVE FRACKING

In 2017, a start-up Canadian company (RocketFrac Services) launched testing of using a properietary solid, rocket fuel mixture as a propellant fracking mechanism (Startup Aims to Advance Rocket Fuel Technology for Fracturing, Society of Petroluem Engineers, September 2017). The underlying technology was developed during the past 50 years by a leading developer of high-performance propellants for the aerospace industry (Propellant-based Well Stimulation, Orbital ATK, 2017). This technology has been tested by the Sandia National Laboratory and others to frac over 600 wells in the past three decades, resulting in an average 225 percent increase in hydrocarbon recovery (Waterless Fracturing Technology, RocketFrac Services, 2017).

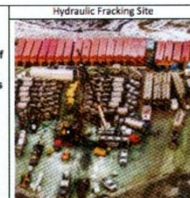
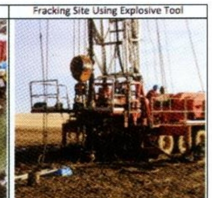
This green fracking is very attractive and should provide many advantages over hydraulic fracking (Figure 1). Obviously, this waterless approach offers minimal environmental impacts, especially minimal use of water, no injection of fracking chemicals, and no releases of backflow. Detailed information on the costs of utilizing this green technology and effectiveness of fracking has not been released to the public.

SOLID-ROCKET FUEL PROPELLANT FRACKING

The process is simple and does not require imported water or a proppant such as sand (Startup Aims to Advance Rocket Fuel Technology for Fracturing, Society of Petroluem Engineers, September 2017). A long cylinderical tube (PSI-Clone tool, RocketFrac Services) is loaded with a block of the solid, proprietary propellant, deployed down the well using a single coiled tubing unit, and it is ignited. The propellant explosion releases high-pressure gas and creates enough pressure to produce fractures at targeted sites along the well bore. The tool can be strung together to simultaneously treat several zones. Also, the tool is reusable and can be reloaded.

The solid rocket fuel is safe to transport (in a single truck), requires no special handling, and has no potential for spill of costly cleanups. The supporting equipment setup can be quickly and easily assembled on-site, even in the most remote and arid locations.

While this waterless fracking method offers promise, public information on costs and on effectiveness of fracking has not been released. Another concern is the willingness of oil/gas companies to consider this waterless approach as a possible replacement for the well-established water fracking approach and run tests at several wells. ♠

Figure 1 Comparison of Hydraulic and Waterless Fracking (Source: RocketFrac Services)	Hydraulic Fracking Site 	Fracking Site Using Explosive Tool 
Water Requirement	Average of 5 million gallons	In-situ only
Proppant (Sand) Required	Up to 4 million pounds	None
Equipment Required	Multiple pumper trucks and water tanks	One coiled tubing unit
Onsite Personnel	20 to 30	3 to 5
Time Duration (Single Zone)	Multiple hours up to days	Less than 30 seconds
Infrastructure	Equipment, water and proppant delivery traffic damages roads, inconveniences residents	Small equipment required, protects local infrastructure
Environmental	Water must be recycled or disposed of, risk of spill and groundwater contamination	No contaminated water to potentially damage local environment

For over 50 years, **GARY BEERS**, has worked in numerous fields of environmental science as a consultant, regulator and educator. This career included senior management position with major consulting, nonprofit and public organizations. He has founded several successful firms to capture emerging resource management markets. One of his latest ventures, EnviroScienceINFO, provides content for public media.