

Hydraulic Fracturing: An Overview

About Hydraulic Fracturing

Hydraulic fracturing is essential to produce oil and natural gas that is otherwise trapped in low-permeability rock formations. It significantly improves the recovery from the reservoir by stimulating the movement of oil and natural gas.

It is important to understand where hydraulic fracturing fits into the entire drilling, well construction/ completion and production phases of oil and natural gas activities. Hydraulic fracturing is **not** a method for drilling or constructing a well.

To reach a hydrocarbon formation – thousands of feet below the surface and freshwater resources – the hole (wellbore) is drilled in successive sections through the rock layers. Once the desired length of each wellbore section has been drilled, the drilling assembly is removed, and steel casing is inserted and cemented in place. As the well is constructed, concentric layers of steel casing and cement form the barrier to protect groundwater resources from the contents that will later flow inside the well. Next, only the section of casing within the hydrocarbon formation is perforated at the desired location.

The well is now ready for the hydraulic fracturing process. This process involves pumping fluid through the perforations. The fracturing fluid itself exerts pressure against the rock, creating tiny cracks, or fractures, in the reservoir deep underground. The fluid is predominantly water, proppant (grains of sand or ceramic particles) and a small fraction of chemical additives.

Once fluid injection stops, pressure begins to dissipate, and the fractures previously held open by the fluid pressure begin to close. Proppants then act as tiny wedges to hold open these narrow fractures, creating pathways for oil, natural gas and fracturing fluids to flow more easily to the well. A plug is set inside the casing to isolate the stimulated section of the well. The entire perforate-inject-plug cycle is then repeated at regular intervals along the targeted section of the reservoir. Finally, the plugs are drilled out, allowing the oil, natural gas and fluids to flow into the well casing and up to the surface.

The hydrocarbon/fracturing fluid mixture is separated at the surface, and the fracturing fluid (also known as flowback water) is captured in tanks or lined pits. The fracturing fluids are then disposed of according to government-approved methods.

Hydraulic fracturing operations generally occur over a three-to-five day period. The entire well construction process (including hydraulic fracturing) takes only two-to-three months, compared to the 20-to-30 year productive life of a typical well.

Importance of Hydraulic Fracturing

Since the late 1940s, over 1 million wells have been hydraulically fractured in the United States and more than 2 million have been fractured worldwide. When used in conjunction with horizontal drilling, an advanced drilling technology, hydraulic fracturing has made it possible to develop vast unconventional resources. Without hydraulic fracturing and horizontal drilling, resources like tight sands, coalbed methane and shale gas would remain largely undeveloped. According to the U.S. Energy Information Administration, all of these resources combined accounted for 50 percent of U.S. natural gas production in 2009 and are projected to account for 60 percent of supply by 2035.

A Safe and Proven Technique

Hydraulic fracturing is a safe and proven technique that has enabled oil and natural gas resources to be developed safely for over 60 years. The National Petroleum Council reported that “up to 95% of wells drilled today are hydraulically fractured.” Many studies – and decades of history – indicate that oil and natural gas operations, including hydraulic fracturing, are safe when wells are properly designed, constructed and operated.

Recent studies have found no substantiated connection between hydraulic fracturing and groundwater contamination:

- A 2004 Environmental Protection Agency (EPA) study of fracturing of coalbed methane reservoirs found “little or no threat” to underground sources of drinking water. Hydraulic fracturing continues to be studied by the EPA.
- A 2009 study by the Ground Water Protection Council, an association of state regulators, reviewed 10,000 wells and found only one complaint, which proved to be unrelated to hydraulic fracturing.
- In 2010, the Interstate Oil & Gas Compact Commission, representing 30 state governments, affirmed that there have been no verified cases of drinking-water contamination resulting from hydraulic fracturing operations in states where shale gas is produced.

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