

Horizontal Multistage Hydraulic Fracturing

This EnerFAQs discusses a new technology known as horizontal multistage hydraulic fracturing, which is seeing increased use in Alberta as it allows oil and gas companies to enhance productivity by accessing a larger surface area of the target formation or by creating permeability in rock that does not normally permit fluid flow.

What is hydraulic well fracturing?

Hydraulic well fracturing, or fracing (pronounced “fracking”), is the process of pumping fracture (frac) fluid into a wellbore using powerful hydraulic pumps to create enough downhole pressure to crack or fracture the formation. Once fractured, oil and gas from the formation can flow into the wellbore and be produced to surface.

Frac fluid can be a liquid, such as water (often containing small volumes of additives to reduce friction, prevent scaling, and control growth of bacteria), light oil, or a gas such as carbon dioxide or nitrogen. The fluid generally carries a proppant—carefully sized sand or like materials—into the formation. Most of the proppant remains in place once the hydraulic pressure is removed, thereby propping the fracture open and enhancing flow from the formation to the wellbore.

What is horizontal multistage fracing?

Horizontal multistage fracing is the process by which multiple fractures are created along the horizontal section of the wellbore in a series of consecutive operations. The technology used in this operation varies, but all operate under similar engineering principles. The fracing operation occurs once drilling and perforating operations are completed.

Currently, most multistage fracing is being used to complete new wells. However, existing vertical wellbores can be re-entered—as per [Directive 056: Energy Development Applications and Schedules](#)—and a horizontal section drilled and completed using this fracing method in an effort to enhance production.

How does horizontal multistage fracing work?

Using mechanical means or fluid pressure, each segment of the horizontal wellbore is isolated and fractured individually. Frac fluid is pumped from the surface at a predetermined and constantly monitored rate to the “toe,” the farthest isolated segment in the horizontal section. When the fracture is created, proppant-laden fluid is pumped into the fracture to keep it open. Once complete, the process is repeated for each segment in the wellbore, working back towards the “heel.”

After all segments have been fractured, hydraulic pressure is removed from the formation and the fracing equipment leaves the location. The wellbore pressure is then reduced to allow the frac fluid to be recovered at surface, known as

flowback; often only a portion of the frac fluid and proppant is recovered, while the remainder is retained in the formation being fractured. Some of the flowback fluids can be recycled for use in fracturing other wells. The storage, handling, and disposal of recovered frac fluids must comply with requirements found in *Directive 055: Storage Requirements for the Upstream Petroleum Industry* and *Directive 058: Oilfield Waste Management Requirements for the Upstream Petroleum Industry*.

It is at this point that conventional well clean-up and testing operations occur. Short-term well testing is carried out to determine the well's productivity and this is when most flaring will occur. The operator must comply with *Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting* requirements on flaring. The duration of flaring depends on whether infrastructure exists to test in line.

What kind of activities occur during fracturing operations?

During horizontal multistage fracturing operations, typical activities that occur are

- an increase in traffic from required equipment and materials and, depending on the season, an increase in dust as a result;
- a possible increase in lease size to accommodate any extra equipment and materials;
- a longer presence on site to account for the additional time required for the fracturing operation, often several days in duration; and
- potential flaring and testing of the well to determine productivity.

The duration of a horizontal multistage fracturing operation depends on the number of segments to be fraced, the amount of proppant used in each segment, and downhole pressures, among other factors. Under optimal conditions, each segment can take six to eight hours to complete. The number of segments can range from 10 to 20 or more per well.

Operators must comply with *Directive 038: Noise Control* during any drilling and servicing activity to control noise emitted from sources that are associated with the fracturing operation, such as diesel engines and pumping equipment.

Flaring is also part of the well cleanup following a horizontal multistage fracturing operation. Its duration depends on the number of completed fracturing segments. All flaring operations must comply with *Directive 060* requirements.

Where does the water used in hydraulic fracturing come from?

The water for a fracturing operation can come from a variety of sources, such as a town supply, shallow or deep licensee-sourced water wells, dugouts, sloughs, creeks, lakes, rivers, and produced water from adjacent oil and gas operations. All non-saline water is obtained with permission from the appropriate parties, such as landowners, municipalities, cities, and Alberta Environment. Companies are encouraged to use produced (saline) water when possible and to treat and reuse flowback water for future fracturing.

Why carry out horizontal multistage fracturing?

Use of the technology has many advantages for both the company and area residents. Potential benefits include enhanced recovery of the resource, reduced number of well leases, and the need for fewer access roads. In addition, the overall time that drilling and servicing equipment and trucks spend in a given area can be reduced as companies are able to more effectively develop hydrocarbon reservoirs through fewer wells.

Additional Information

For additional information on the ERCB or its processes or if you have general questions about oil and gas in the province of Alberta, contact the ERCB's Customer Contact Centre: Monday to Friday (8:00 a.m. - 4:30 p.m.), at 403-297-8311.

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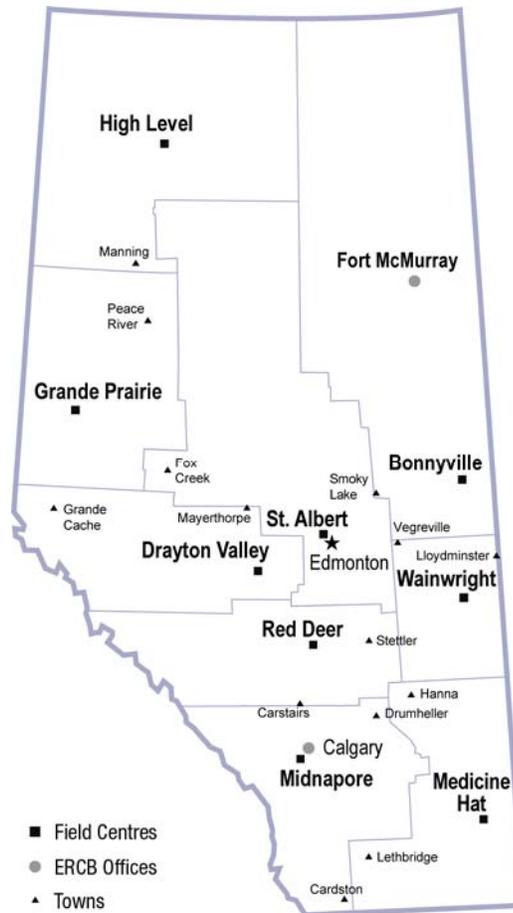
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