

Hydraulic fracture stimulation

Department of Mines and Petroleum (DMP) is responsible for regulating extractive industries in Western Australia; ensuring safety, environmental practice and resource management meet relevant legislation, regulations, guidelines and policies that reflect community expectations. DMP regulates onshore petroleum and geothermal activities through the Petroleum and Geothermal Energy Resources Act 1967, the Petroleum Pipelines Act 1969, the Petroleum (Submerged Lands) Act 1982 and associated regulations.

Hydraulic fracture stimulation (fracking) is an underground oil and gas extraction process used to stimulate the flow of oil and gas.

In Western Australia (WA), hydraulic fracture stimulation is typically required to extract natural gas from shale and tight sandstone rocks. These rocks are commonly found between 2 to 5 km underground.

WA's shale and tight gas industry is currently in the early stages of exploration and evaluation.

This information sheet provides an overview of the hydraulic fracture stimulation process.

How does hydraulic fracture stimulation work?

During a hydraulic fracture stimulation activity, fluid is pumped at pressure down a well lined with steel casing. The fluid passes through perforations in the casing target zone to create small fractures (cracks) within a gas-bearing rock formation. These fractures enable oil and gas, previously held tightly within the rock, to flow to the well.

Typically, a fracture network is 3 to 6 mm wide and can extend 400 m horizontally and up to 100 m vertically along the gas-bearing rock formation.

The pumping of fluid down a well to create these fractures is controlled and monitored in real-time. Pumping generally occurs at approximately 69MPa (10,000psi), or 300 times the pressure of an average car tyre.

What fluids are used for hydraulic fracture stimulation?

Typically, fracture fluids contain 90% water, 9.5% sand (or proppants) and up to 0.5% chemicals.

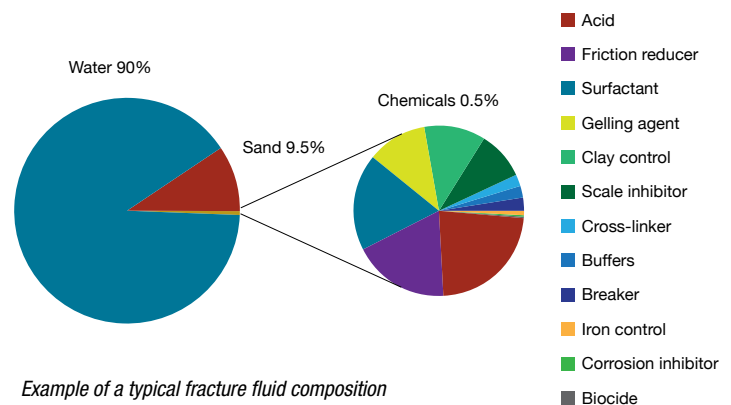
Fresh, salt, bore or recycled water can be used to create pressure to fracture the rock. It is also used to transport the sand and chemical additives through the well to the fractures (see information sheet on water use and management).

Sand is used to hold the fractures open to increase the amount of natural gas that can be extracted.

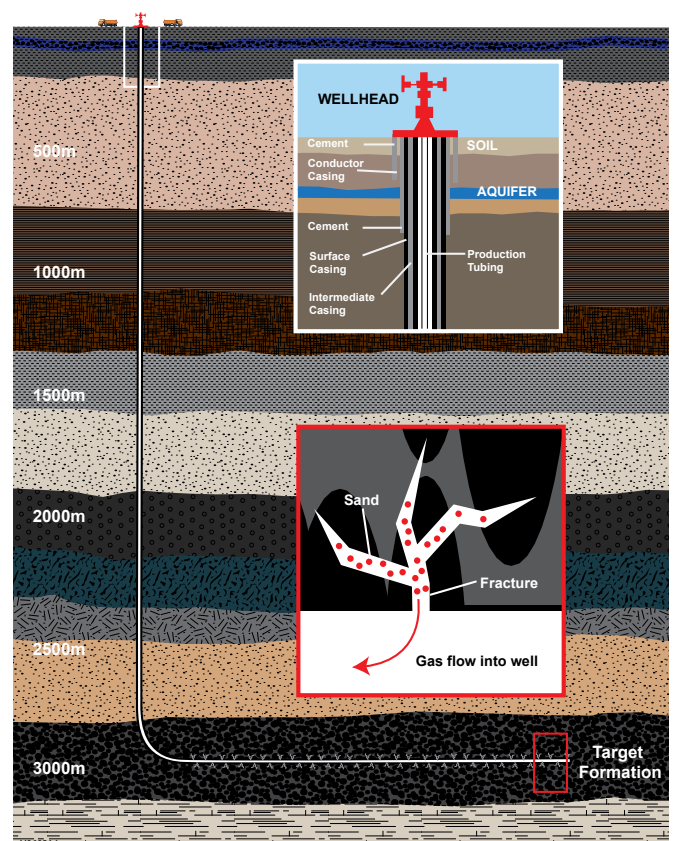
Chemicals are used to thicken the water to suspend the sand in the cracks. They are also used to prevent corrosion inside the well and prevent mineral and bacteria build-up (see information sheet on chemical use).

All hydraulic fracture fluids, including chemicals, must be assessed and approved by the Department of Mines and Petroleum prior to use. Chemicals and additives introduced to a well or formation are publically listed on the department's website.

Up to 80% of fracture fluid used during a hydraulic fracture stimulation can be recovered and stored above the surface in lined and bunded evaporation ponds. The fluid, if not reused in another well, evaporates naturally, leaving a small residue at the bottom of the pond. This residue is tested and, if required, removed safely and disposed of at a licensed waste disposal facility.



Example of a typical fracture fluid composition



Example of hydraulic fracture stimulation for shale gas development based on Western Australia geology.

Petroleum information sheet

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Arrowsmith 2 well in the northern Perth Basin undergoing hydraulic fracture stimulation. Source: Norwest Energy NL

When can hydraulic fracture stimulation occur and how long does it take?

Hydraulic fracture stimulation can occur during three stages of well development – exploration, evaluation and production.

During exploration, hydraulic fracture stimulation of a vertical well may occur to test different rock formations for oil and/or gas.

During evaluation, multiple vertical and/or horizontal wells can be drilled and undergo hydraulic fracture stimulation to determine the physical extent of a newly discovered oil/and or gas field.

During production, vertical and/or horizontal wells are drilled and can undergo hydraulic fracture stimulation to enhance commercial flows of oil and/or gas.

Usually hydraulic fracture stimulation activities take between one to 10 days.

What happens after a hydraulic fracture stimulation is complete?

After a hydraulic fracture stimulation activity is complete, most equipment is removed from the site. This reduces the site from around 1.5 to 2 hectares down to 0.4 to 1.2 hectares (see information sheet on land use and access).

Gas and/or oil can flow to a production well and into pipelines for 10 to 40 years. At the end of a well's production life, the well is sealed with a series of cement and/or mechanical plugs, decommissioned and the site is rehabilitated.

Is hydraulic fracture stimulation a new process?

No. Hydraulic fracture stimulation has been a commercial process in the international oil and gas industry since 1947. Approximately 2.5 million

hydraulic fractures have been completed worldwide, with about one million of those for shale gas or oil.

In WA, 610 wells have been hydraulically fractured, the first in 1958. Most of these were in conventional oil and gas wells on Barrow Island.

Historically, hydraulic fracturing involved pumping a small amount of fluid under relatively low pressure into a targeted rock formation to open up small gaps in the rock to increase oil and gas flow. However, advancements in technology mean higher pressures can now be used to create small fractures to release gas from shale and tight rocks.

Where can I find more information?

Visit our website at www.dmp.wa.gov.au/shaleandtightgas for related subjects such as water use and management, land use and access and chemical use.

More Information

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