HYDRAULIC FRACTURING

HYDRAULIC FRACTURING HAS BEEN SAFELY USED IN AUSTRALIA FOR OVER 40 YEARS.

QGC produces natural gas from wells drilled in coal seams in the Surat Basin.

Sometimes, when the natural rate of production from a well is low, a technique called "hydraulic fracturing" or "fraccing" is used to improve gas flows coming to the surface.

Not every QGC coal seam gas well is hydraulically fractured – currently the technique is used on less than 3.5% of all QGC Wells.

We seek to minimise the effects of our operations on landholders and make a positive contribution to the protection of the environment.

We run our business in accordance with all government regulations, industry standards and the access rules that we agree with landholders.

WWW.SHELL.COM.AU/QGC

HOW DOES HYDRAULIC FRACTURING WORK?

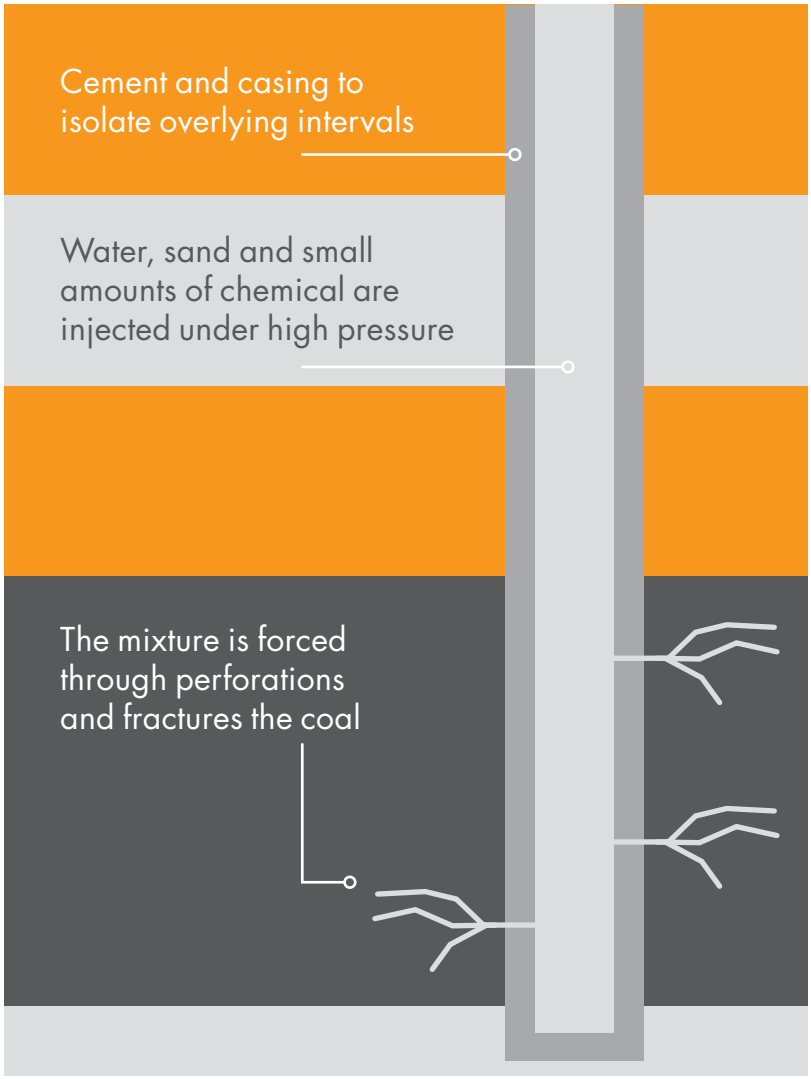
If the flow of water or gas to the surface is low, hydraulic fracturing may be used to stimulate the flow of natural gas from a well to the surface.

QGC use high pressure pumps to inject a mixture of water, sand and proppants into the well. Small amounts of chemicals may be added to the injection water, mainly to help carry the sand and water through the well.

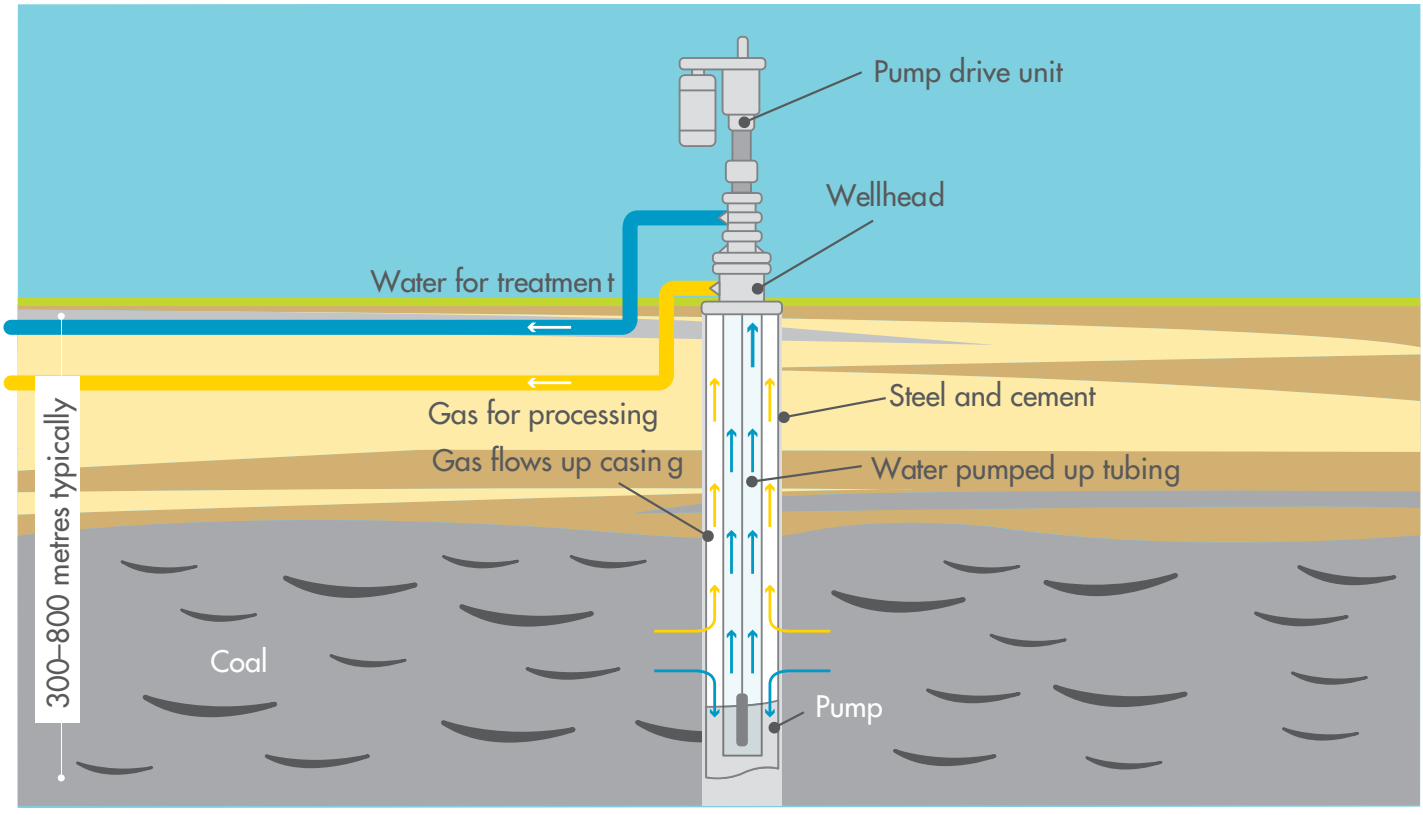
The force applied by the water makes tiny cracks, usually around 1cm high, in the coal which are then held open by the sand and proppants particles, allowing the gas to more freely flow to the surface.

This process can increase the productivity of a well by two or three times, compared to production rates before fracturing. In some cases, it may lead to a reduction in the overall number of wells required.

Not all gas wells require hydraulic fracturing. The process is generally only used for wells targeting low permeability (tighter) coal seams.



WELL INTEGRITY



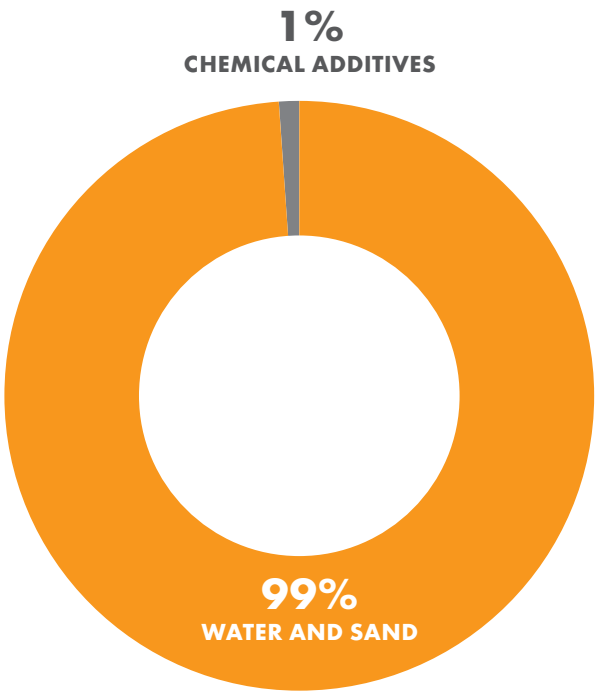
Wells are designed and built using steel piping and cement. These barriers seal the well to prevent the flow of liquids or gases from the coal seam into other formations.

WHAT'S IN STIMULATION FLUID?

Fracking fluid is 95 - 99 per cent water and sand. A very small percentage of chemicals are also used to improve the transportation of sand, reduce friction, remove bacteria and control reaction with some minerals.

The chemicals are not unique to the oil and gas industry and are found in many household products such as toothpaste, baked goods, ice cream, food additives, detergents and soap.

We do not use BTEX compounds (benzene, toluene, ethylbenzene and xylenes) and support the Queensland Government banning the use of these in hydraulic fracturing of coal seams.



CHEMICALS TYPICALLY USED IN QGC'S HYDRAULIC FRACTURING OPERATIONS*

Additive function	Chemical Composition
Diverting agent	Sodium chloride
Fracturing propping agent	Silica sand, ground walnut hulls
Brine formulation	Sodium chloride, potassium chloride
Brine conditioning	Sodium hypochlorite with/without sodium hydroxide, tetrakis (hydroxymethyl) phosphonium sulfate, sodium thiosulfate
Low pH buffering agent	Concentrated hydrochloric acid, muriatic acid
High pH buffering agent	Sodium hydroxide, potassium carbonate, sodium carbonate
Gelling agent breaker (enzymatic)	Hemicellulase enzyme with/without sodium chloride
Gelling agent breaker (oxidizing)	Sodium persulfate, diammonium peroxidisulphate
Gelling agent crosslinking agent	Disodium octaborate tetrahydrate, boric acid, boric oxide
Gelling agents	Guar gum, hydroxyl-propyl guar, carboxy-methyl, hydroxy-ethyl cellulose

**Note: Not all the chemicals listed above are used in every instance. The composition of fracturing fluid varies according to the specific requirements of the job.*

For further information of the approved stimulation chemicals, please visit:

http://www.shell.com.au/about-us/projects-and-locations/qgc/about-onshore-natural-gas/hydraulic-fracturing-and-chemicals-used.html

IS FRACCING SAFE?

Hydraulic fracturing is a well-established and a tightly regulated technology. It has been used safely to enhance production for 65 years worldwide, and for more than 40 years in Australia.

The Queensland and Australian Government regulate the process and the chemicals used.

The chemicals do not remain in the environment after use because most of the frac fluid is brought back to the surface and collected. Those fluids remaining in the formation will degrade over time.

Detailed information and risk assessments for all chemicals used are provided on the QGC website.

During the course of the fraccing process, the chemicals are mixed with water prior to injection. The chemicals are further diluted by the water already present in the seams so that they are present in very low concentrations.

To restrict fluids and gas in the well from entering surrounding aquifers, rigid design standards are followed and well integrity is confirmed prior to fraccing.

All wells have multiple steel casings with cement sheaths that isolate surrounding formations from each other and the well bore. The wellhead system used is designed specifically to manage the fraccing process.

MONITORING

QGC often uses micro-seismic and "tiltmeter" monitoring of hydraulic fracturing treatments to understand the dimensions, or the size and direction of the fractures created.

Water produced from the gas wells and nearby groundwater bores is also monitored.

The monitoring program confirms that the impact of the fracturing is confined to the target area.

Potential impacts at the surface relate mainly to noise and vibration from water pumps. These are not usually noticeable beyond 200 metres of the well and cease at the completion of the work.

QGC CAREFULLY MANAGES ALL RISKS ASSOCIATED WITH ITS HYDRAULIC FRACTURING ACTIVITIES TO THE HIGHEST SAFETY AND ENVIRONMENTAL STANDARDS THAT ARE CONSISTENT WITH THE QUEENSLAND AND AUSTRALIAN REGULATORYREQUIREMENTSAND INTERNATIONAL BEST PRACTICE.

CONTACT DETAILS

Please contact your Land Access Advisor or a member of the community engagement team for more information.

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