



Fact Sheet: Hydraulic fracturing fluid.

AGL Gloucester Gas Project
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What is frac fluid?

Hydraulic fracturing is a technology which allows natural methane gas trapped in low permeability coal seams deep below the surface of the earth to be brought to the surface and used for a variety of purposes including heating, cooking, electricity production, and industry. When a coal seam is hydraulically fractured, water – along with a few diluted additives (frac fluid) – and sand are injected into the coal seams to open fractures through existing cleats (natural fractures) in the coal. When the fractures close, the sand is held in place, and the fluid is returned to the surface. The water and gas trapped in the natural cleat system can then flow into the high permeability fracture pathway left in the coal, back to the wellbore, and be safely produced to the surface.

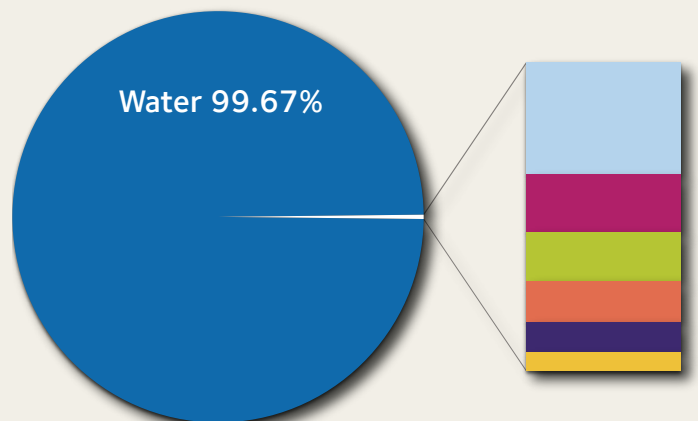
Why are additives needed at all?

The additives that are used in hydraulic fracturing fluid are designed to disinfect the water, reduce friction to decrease the pumping power required, and make the liquid thicker, or more viscous, to enable a smaller volume of fluid to work more effectively to create the fractures in the coal seams and deposit sand within the fractures. Once this is done, a breaker thins the fluid back out and allows it to flow more easily back to the surface.

AGL does not use BTEX.

BTEX is a term which refers to a group of chemicals banned in 2012 by the NSW Government for use in coal seam gas activities because of their potential to harm the environment. AGL has never used BTEX chemicals in hydraulic fracturing, either before or after the ban was put in place.

What additives does AGL use?



Average overall treatment percentages

AGL adds very little to its fracturing fluid which is mainly water. In Gloucester, we plan on using a fracturing fluid that is more than 99% water. For the most part, the additives in our fracturing fluid are common substances found in a wide range of household, cleaning and personal care products.

Guar gum is one of the main ingredients used to thicken the fluid, and is also commonly found in products such as salad dressing and commercial ice cream. Other ingredients in the fluid include vinegar and citric acid as well as cleaning agents commonly used to make soap, toothpaste and detergents. In general, all these additives are used in far lower concentrations than they are found in other domestic and industrial applications.

For more information please visit our website – www.agl.com.au/waukivorypilot

Volumes and constituents in proposed Waukivory Pilot Program fracture stimulation fluid.

Purpose	Compound Present	Well Pre-treatment ⁽¹⁾	Treated Water	Linear Gel	Cross-Linked Gel	Indicative Quantity ⁽²⁾	
						(litres)	(%)
		% volume of compound in fluid					
Main Fracture Fluid	Water	88.12%	99.81%	99.65%	99.53%	4,025,771	99.67%
Clean Perforations	Hydrochloric Acid	10.88%	-	-	-	2,067	0.05%
Iron Sequesterant	Citric Acid	0.36%	-	-	-	69	<0.01%
Corrosion Inhibitor	Ground Coffee Beans	0.04%	-	-	-	7	<0.01%
pH Adjusting Agent	Acetic Acid	0.60%	0.03%	0.03%	0.03%	1,320	0.03%
Bactericide	THPS Tetrakis(hydroxymethyl) Phosphonium Sulfate ⁽³⁾	-	< 0.01%	< 0.01%	< 0.01%	302	<0.01%
Gelling Agent	Guar Gum	-	-	0.16%	0.16%	4,916	0.12%
Gel Breaker	Hemicellulase enzyme concentrate	-	-	< 0.01%	< 0.01%	60	<0.01%
Clay Stabiliser	Choline Chloride (only used on 2 wells)	-	0.15%	0.15%	0.15%	2,550	0.06%
Cross-Linker	Monoethanolamine borate	-	-	-	0.11%	1,836	0.05%
pH Buffer	Sodium Hydroxide	-	-	-	< 0.01%	102	<0.01%

Indicative Volume of Fluid ⁽²⁾	Well Pre-treatment ⁽¹⁾	Treated Water	Linear Gel	Cross-Linked Gel	Total Treatment
Average per well (L)	4,750	252,500	327,500	425,000	1,009,750
Total for all 4 wells (L)	19,000	1,010,000	1,310,000	1,700,000	4,039,000

Quantity of Proppant - quartz silica sand	Total Treatment
Average per well (kg)	110,500
Total for all 4 wells (kg)	442,000

Notes:

⁽¹⁾Well pre-treatment is conducted to clean perforations prior to fracture stimulation.

⁽²⁾The volumes of each fluid are indicative only and actual volumes cannot be determined until fracture stimulation treatment occurs. This is because during the fracture stimulation treatment AGL monitors the fracture growth using a variety of diagnostic tools. This allows AGL to analyse the fracture geometry and fine-tune the final volumes. In addition, information gained from the initial treatments will enhance design of subsequent treatments.

⁽³⁾As an alternative to using THPS as a bactericide, AGL may use a mixture of sodium hypochlorite and sodium hydroxide in treated water, linear gel and cross-linked gel recipes at a concentration by volume of 0.015% sodium hypochlorite and 0.001% sodium hydroxide, which will represent a total volume of 605 litres of sodium hypochlorite and 40 litres of sodium hydroxide.



Water monitoring site at AGL's Waukivory Pilot Program.

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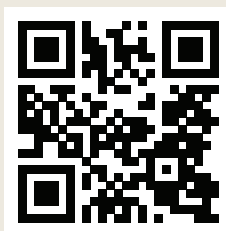
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