

Fracking – game-changer in world energy markets

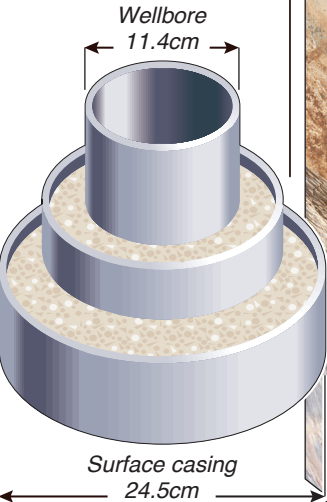
Hydraulic fracturing – also known as “fracking” – is a two-phase process to extract natural gas from prehistoric shalebeds thousands of metres below ground. The first phase includes drilling the wells, the second uses high-pressure blasts of water and sand-laden gel to fracture shale rock and release gas

DRILLING PHASE

Drilling rig: Time to drill each well from *spud* – point of breaking ground – to **total depth (TD)** is about three to six weeks depending on depth and length of horizontal well. (Record for 4,000-metre well is 7.5 days)

Aquifer: Water-bearing rock is at average depth of 100 metres

Fresh water protection: Three sets of steel casings are cemented into place to prevent accidental pollution of drinking water aquifers

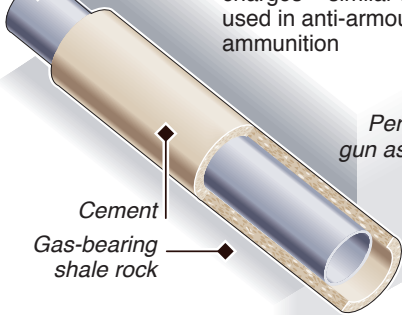


Shale layer: Rock formations are 1,000-2,500m underground

Kick-off point: Drill turns horizontal, roughly 150m above shale. Horizontal section extends up to 3,000m

Wellbore: Steel pipe surrounded by cement

Jet perforation: Holes punched through wellbore, cement and adjacent rock by shaped explosive charges – similar to those used in anti-armour ammunition

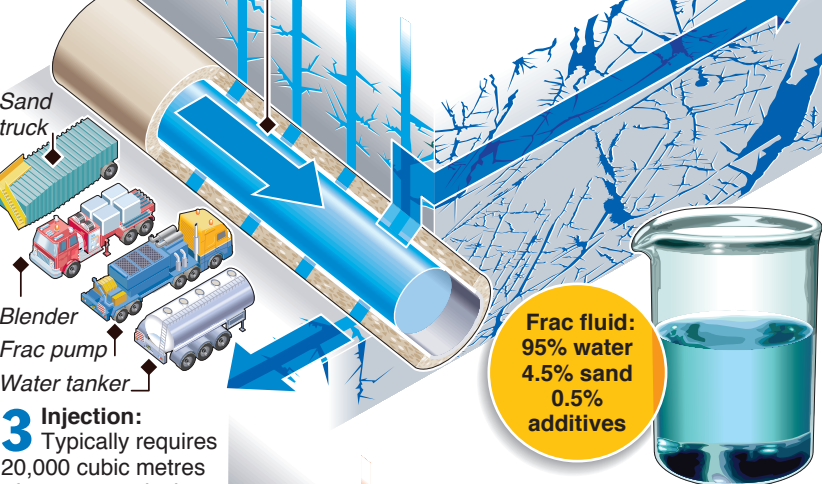


End of drilling: Wellbore cleared of debris and drilling rig removed

FRACKING PHASE

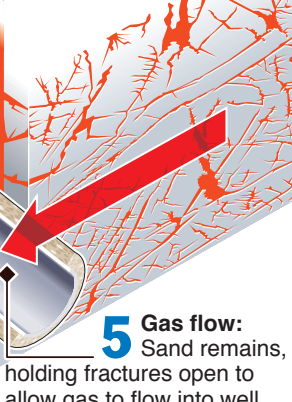
1 Hydraulic fracturing fluids: Water, sand and additives are pumped at extremely high pressure – over 100 bar, about 1,500 pounds per square inch (1 million kg/sq m) – down wellbore

2 Continual pumping: Increases pressure of frac fluids in well, breaking rocks apart. Fracking continues until rocks are cracked to desired length, about 200-300m

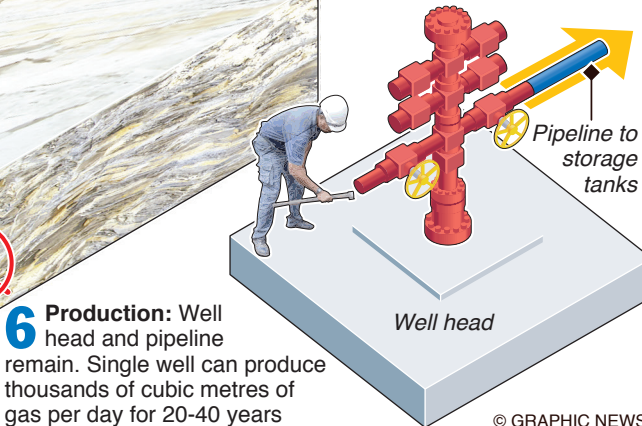


3 Injection: Typically requires 20,000 cubic metres of water – equivalent to 500 tankers – plus 1,800 tonnes of sand, blended with 100 tonnes of additives to promote gelling

4 Back-flushing: Frac wastewater pumped out of well for disposal or re-use



5 Gas flow: Sand remains, holding fractures open to allow gas to flow into well. Fracking process takes up to 10 days



6 Production: Well head and pipeline remain. Single well can produce thousands of cubic metres of gas per day for 20-40 years

