Fracking Simulation – Student Activity

As a result of a decrease in conventional oil and gas production other techniques and other resources are necessary if we continue to support our present high levels of energy usage. We can use geothermal energy from underground by tapping into naturally hot rocks below us. We can also use different methods to release "tight" or "unconventional" oil and gas. In both cases *fracking, also called stimulation*, is used to increase the rate of fluid or gas movement within rock.

Stimulation and Fracking

A vertical hole is drilled down through the rock and then horizontal holes are drilled out from the base to penetrate surrounding rock. Water or other fluids are injected at great pressure to stimulate fracturing of the rock. Sometimes "proppants", which can be sand or man made ceramic materials, are injected with the water to hold the fractures open.

Stimulation for geothermal power production

In the Perth Basin we are fortunate to have hot water in our underground reservoirs that can be directly drilled to flow through drill holes to the surface. The water is heated by natural radioactive decay of minerals in granite.

Elsewhere, such as at Olympic Dam in South Australia, cold water must be pumped down drill holes to be heated by naturally "hot" rocks before it can return to drive turbines. Water must be able to penetrate widely into the surrounding rock to heat up. Rocks such as granite and basalt are made of interlocking crystals, have no pores and must be artificially fractured to permit movement of fluid.

Stimulation for oil and gas production

Muds and silts compact and have very limited permeability. They compact and are cemented to produce shale and siltstone. Any contained oil or gas is tightly held and difficult to collect. We have vast reserves of this "tight" or "unconventional" oil and gas in our five great sedimentary basins.

Aim To simulate fracking

Materials per student or group

- Newspaper to protect bench or table
- Small beaker (200mL) or clear plastic drink cup
- Enough sand or soil to half fill the beaker/cup
- Water
- Plastic drinking straw
- Paper towel

Method

- 1. Cover the working surface with newspaper
- 2. Place the beaker in the centre of the paper

3. Hold the straw upright in the beaker with its end touching the base

4. Pack the soil/sand round the straw to a depth of about 3 cm

5. Add water to soil to dampen it. Keep adding water until no more can permeate the soil

6. Gently tap the base of the beaker onto the paper to bring excess water to the surface











- 7. Mop up excess water with towel
- 8. Lift the straw about 25mm until it lies just above the base of the beaker
- 9. Blow firmly down the straw.
- 10. Tamp down the soil and repeat

Observation

Conclusion (Did the activity simulate fracking?)



Discussion
Why is stimulation or fracking used? ______

During fracking what is injected into the rock at pressure?

Name two different energy sources which may require use of fracking.

We already use geothermal power in Perth to heat swimming pools, air condition buildings and create electricity. Did this require fracking?

What is meant by "tight" oil and gas? _____

Why are we moving from	conventional o	il and gas as	energy sources	s to "tight"	hydrocarbons and
geothermal power?					

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