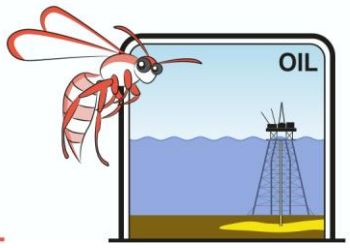


Viscosity & Raising Raisins - Student Activity

Some liquids are more viscous than others. The viscosity of oils trapped in hydrocarbon reservoirs has a big impact on how they are recovered (brought up from underground) and on their other chemical behaviours.

Definition of VISCOSITY _____

Measure the Flow Rate of Various Liquids

Materials per group or teacher

- A washable ramp (e.g. a tray propped up by books at one end)
- Masking tape and ruler
- Transfer pipettes or teaspoons
- A variety of liquids with different viscosities
- Stopwatch

Method

1. Use masking tape and ruler to create a start and finish line 30 cm apart on the inclined surface.
2. Measure out equal amounts of each substance to be tested (e.g. 1 teaspoon or 1 full pipette). Pour each substance at the start line and time how long it takes for the substance to flow 30 cm to the finish line. Record your observations in the table below.
3. Wash and dry the ramp in between every test so each measurement uses the same set up.
4. Repeat the measurement 3 times for each substance and calculate the average time it takes to flow 30 cm for each substance.

Substance	Time taken to cover 30cm				Comment
	1	2	3	Ave	

Discussion

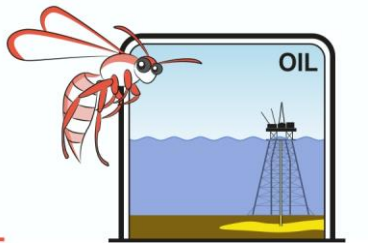
Was the data you collected:

Observable? _____

Measurable? _____

Repeatable? _____

Was this a "FAIR TEST?" _____



Viscosity & Raising Raisins - Student Activity

Estimate Viscosity

Materials per student or group

- Two transfer pipettes
- Samples of liquids with different viscosities
- Ruler or measuring tape

Method

1. Squeeze out air from both pipettes at the same time.
2. Place the tips of the pipettes into each liquid.
3. Release the pressure on the pipette bulbs, allowing the pipette to draw up the liquids.
4. Measure the height of the top of the liquid in each pipette.
5. Repeat the test two more times and calculate the average height for each liquid.
6. Record your observations in the table below.

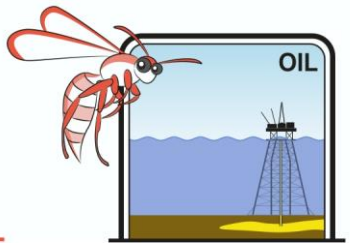
	Liquid 1:	Liquid 2:
Height of liquid 1st		
Height of liquid 2nd		
Height of liquid 3rd		
Average height of liquid		

Discussion

Which liquid has a *higher* viscosity? _____
Which liquid has a *lower* viscosity? _____
Were all the variables kept the same? _____
Was the data measurable? _____
Was the data repeatable? _____
Was this a fair test? _____

The two oils pictured below were sourced from oil wells in Western Australia. This photo was taken after they were laid on their side and left for 10 minutes. Which oil was the most viscous? Explain your answer below.

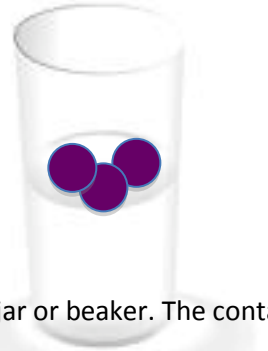
Viscosity & Raising Raisins - Student Activity



Viscosity also affects the rate of recharge in a reservoir. Most depleted oil reservoirs will recharge but it will take geological time.

Raising Raisins (Gas lift)

When either reservoir pressure decreases or oil becomes too viscous, flow from the well can slow or stop. Gas can be pumped into the well to decrease the density and viscosity of the oil and raise it more easily to the surface. Carbon dioxide is a by-product from oil and gas refining and may be pumped back down the hole. This technique is called "***GAS LIFT***".



Materials per student or group

- 500ml beaker or clean glass jar
- 6 raisins
- Lemonade, soda or clear fizzy drink

Method

1. Place some raisins at the bottom of a clean, empty, large glass jar or beaker. The container must be clean and free from detergent.
2. Cover well with lemonade or soda water (anything with fizz).
3. Observe for at least 5 minutes.

What did you observe? _____

_____

Explain why you think this happened: _____

_____

What can be done to more easily raise viscous oil to the wellhead? _____

_____

In onshore areas producing little oil, a donkey pump or pump-jack (like the one depicted on the left here) can be used to pump shallow oil to the surface when reservoir pressure falls.