# 7. Pouring oil

Children observe the 'runniness' of different liquids and investigate shapes for 'oil pourers'.

## OBJECTIVES

- To observe the viscosity, or runniness, of different liquids.
- To investigate different shapes of 'pourer' to find the best for pouring oil accurately and without spills.
- Observing closely, using simple equipment

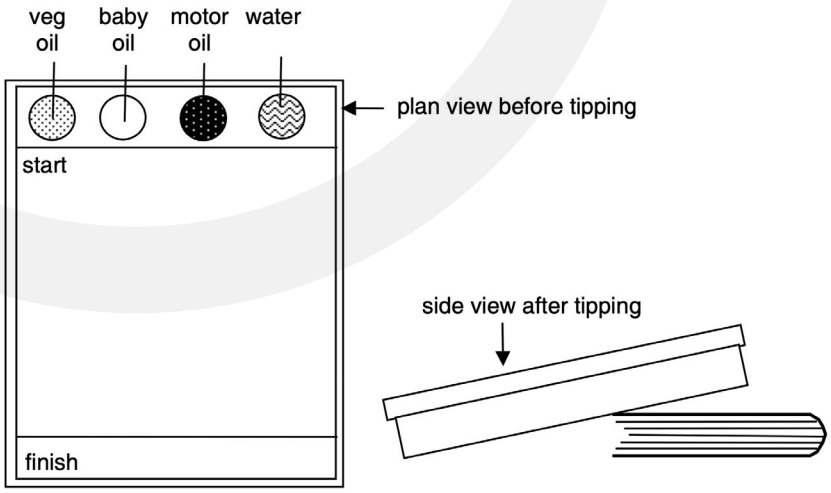
## RESOURCES

- Activity sheet 16
- Washing up liquid
- Water
- Baby oil
- Vegetable oil
- Bicycle/motor oil
- tray (e.g. tidy tray)
- 1-4 stop clocks (optional)
- Smartie tube and Vaseline
- Aprons
- Thin card, made into funnels (see diagram on page 51)
- Adhesive plastic
- Syringes
- Measuring jugs & cylinders
- Teaspoons, tablespoons
- Washing-up liquid bottles
- Droppers/pipettes
- Bicycle oil container
- Cooking oil container
- Funnels
- Scissors
- Sellotape
- Cooking oil, some in mini pop bottles
- A4 card

## STIMULUS TASK

A tray has a teaspoonful of each of four liquids placed inside 'rings' on a start line, as shown below. The rings can be made by cutting a Smartie tube into slices and then coating the inside of the rings with Vaseline (to stop the oils absorbing into the cardboard). Washing-up liquid could be used to replace bicycle or motor oil, if desired.

Tell the children that you are going to remove the rings and tip the tray, and ask them to describe what they think will happen. Their ideas can be recorded for comparison with the outcome.




The rings are removed and the tray is tipped and children observe the different rates at which the liquids move to the end of the tray.

> "The children wanted to remove the rings and tip well, as the rings could be removed the tray themselves. This worked at the same time.

## RECORDING & MEASURING

Measuring the time taken for each liquid to reach the finish line in the tray is not essential, but can give children practice with either a sand timer or a stop clock. Four children can each operate a stop clock, each being responsible for a different liquid. They should start the clocks simultaneously and stop the clock when 'their' liquid reaches the finish line.

Record either the time taken, or the order in which the liquids reach the finish line.

## DISCUSSION

Talk to children about the runniness of each liquid and how this affects the time it takes each liquid to move down the slope.

Now link the runniness of the oils to the requirements of the 'pourer'. Oil used for lubrication (to stop things sticking together or squeaking) is often needed in small quantities and on a specific spot, so the 'pourer' is important in achieving this. Discuss this, using some of the following questions:

- Can you remember some of the things we said we use oil for? (Prompt with the ideas of unsticking, and preventing squeaking).
- What sorts of things do we want to stop squeaking or sticking? (e.g. Hinges on doors and gates, bicycle parts, locks).
- Do we need a lot of oil? Why?

Depending on the ability of the children, discussion can also focus on the best materials to make pourers from, e.g. 'oil can't soak in' (non-absorbent), stiff and not bendy (rigid), etc.

## TASK

Show children the resources, which are best displayed in a wet area of the classroom. Children should wear aprons to protect their clothing. Adult supervision throughout the task is advised.

Ask children to try using the different pouring devices, to find out how well they pour cooking oil. They do this by pouring a small amount of oil onto a target, as shown on Activity sheet 16. These targets can be photocopied (and enlarged for younger children), laminated or mounted on small cards and covered in adhesive plastic. Alternatively, the target can be drawn with an indelible pen onto plastic covered card. After pouring each oil and recording the outcome (see the recording section opposite). The children try and add enough oil to fill only the small circle. The ability of pourers to achieve this will depend on the size and shape of the outlet.

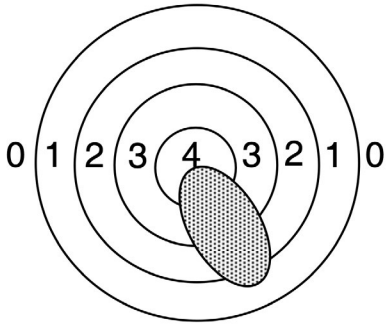
The wider the opening, the quicker the oil will pour out. This will make the pourer harder to control.

Together with an adult, the children can decide how to get the oil from the pop-bottle to the target on the sheet, e.g. placing funnels over the top of the bottle, moving liquid with syringes or droppers, etc.

## RECORDING

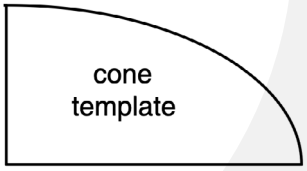
Activity sheet 16 provides a record sheet. A pourer is drawn, or its name recorded in the box. The target is then coloured in, according to the number of circles the oil spread onto during the test. The results of up to 4 pourers can be recorded on this sheet.

More able children can score the pourers using numbers added to the targets before carrying out the test, as shown below. The higher the score, the better the pourer. The score in the diagram would be 1, and represents an inaccurate pourer.



## VARYING THE TASK

The range of pourers can be changed for each group of children. In this way, more able children can be given the opportunity to make their own card funnels. Thin card is cut into the shape illustrated below, turned into a cone and taped together. The narrow end of the cones can vary in diameter.




## DISCUSSION

Children can then be shown the containers for bicycle oil, household lubricating oil, etc. They will see that sometimes a plastic funnel is attached to the top of the tin to help accurate pouring of small amounts of oil to the necessary place.

Children can be told that this type of oil (for lubrication) comes from oil that has been drilled out of the ground. Avoid explaining to children of this age group that it is only part of the oil from the ground.

# Background Information

**Note:** *This information is provided as a reference for the teacher. Most of the information is too difficult for 5-7 year olds to understand. Some aspects can be discussed, though these must be carefully selected to provide simple and appropriate discussion points with the children.*

## THE FORMATION OF OIL

Oil is formed from the remains of small sea animals and plants from 50 million years ago. Immense pressure and heat over time changes these tissues physically and chemically into crude oil and natural gas.

## SEARCHING AND DRILLING FOR OIL

Nobody knows precisely where oil can be found.

Geologists gather information about rock formations to make intelligent deductions about possible locations, often under the sea. Exploratory drilling then takes place, using a drilling rig. This is a tall structure with suspended steel pipes and a strong steel drill bit. Once oil is reached (sometimes as deep as 6000 metres below the sea bed) the drilling rig is replaced with a production platform - a more permanent structure in which the crew will live and work.

The platform must be strong enough to support its community and buildings, and withstand the severest storm conditions at sea. The platform is therefore made from a combination of steel and cement.

The North Sea has many oil rigs and platforms which have been built on the North East coast of Britain, and then towed out to the place where oil production will begin.

Rigs used for exploration are quite different from those erected for long term oil extraction. There are also a variety of platform designs for extracting the oil, which depend on the sea and weather conditions. For example, floating platforms are anchored in very deep seas. Others can sit on the sea bed with the legs of the structure deeply embedded. 'Feet' for a platform can be used on dry land, but the force of the sea water would still move the platform about in the water. For the children's activities, distinctions between different types of platforms are not made.

The rate of drilling depends largely on the hardness of the rock. In ideal conditions up to 60 metres an hour can be achieved; whereas extremely hard rock can reduce this rate to 60 metres in 24 hours. A typical drill bit varies in diameter from 30 to 60 cm, depending on the drill hole and depth. In very deep holes, the diameter of the drill bit can be as small as 12.5 cm. The bit has many individual teeth which are made from steel that has been toughened by adding chips of tungsten carbide. For exceptionally hard rock, the teeth are toughened using diamond.

To weigh down the drill bit, 'collars' are used. These are each 9 metres long and weigh 1.5 tonnes. Up to 20 in a 'string' can be added. Replacement of a worn drill bit can take 24 hours - 12 hours to bring it up, and 12 to take it down again.

## WORKING ON A PLATFORM

100-200 people can work on one platform, though small or 'satellite' platforms have less. Due to the difficult travelling to and from work, most staff work 1-2 weeks on the platform, followed by 1-2 weeks on shore. People usually travel by helicopter, whilst supplies can travel by boat or helicopter. One helicopter typically transports 20 people.

The platform functions as a small community, so jobs vary widely, as in a village or town. As well as the production, maintenance and drilling team, there are cooking staff (head chef, baker, cooks, and stewards), cleaning staff, medical staff, radio operators, etc.

A typical weekly 'shopping list' for the platform crew includes:

| | |
|---|---|
| 100 kg butter | 500 kg vegetables |
| 350 kg flour | 1,000 kg meat |
| 500 kg fruit | 2,000 litres milk |

In addition to this food, a fresh supply of water must always be available. For this reason, a platform has its own desalination plant which converts sea water into fresh water. A typical demand for fresh water can be 30,000 litres per day!

## TRANSPORTING THE OIL

Tankers are used to transport oil around the world. They are categorised according to the quantity of crude oil they carry. Very large crude oil carriers (VLCCs) can carry 300,000 tonnes, whilst the cargo of ultra large crude oil carriers (ULCCs) can be 500,000 tonnes. The largest tankers are 400 metres long - approximately 5 football pitches placed end-to-end. Often the crew use bicycles to travel around the ship.

These ships are too large to travel through the Suez Canal, and so their route from the Middle East to Europe takes them around the Cape of Good Hope. This journey takes 60 days, rather than the 40 days needed to travel through the Suez.

The oil is carried in several compartments in the ship. As a cargo is unloaded (in order to maintain the ship's stability) the compartments are filled with water for the return journey.

Smaller coastal tankers sail between refineries, and usually carry loads of 20,000 tonnes or less.

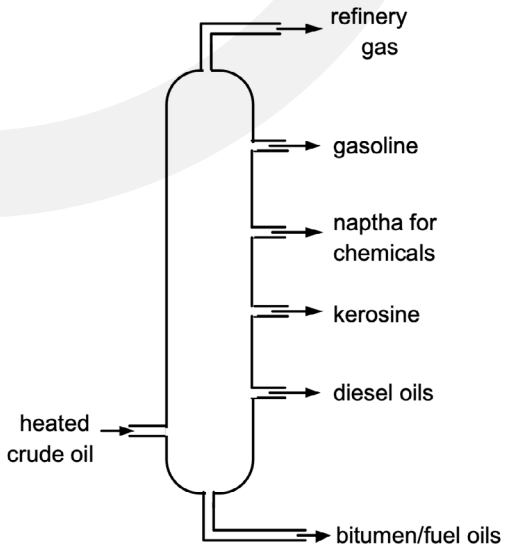
In addition to tankers, pipelines are used to carry crude oil from platforms in the North Sea to shore. Oil can be transported from several platforms to the shore by one pipeline. Pipelines are also used within the UK to transport oil products, such as petrol, to large consumers and distribution centres. For example, nearly 90% of Esso oil and gas products are transported by pipeline. A network of 1100 km of pipelines runs from the Esso refinery near Southampton to centres such as Manchester, London, Birmingham and Gatwick Airport. It is the safest means of transportation, as spillages are rare. It is also environmentally friendly, as pressures on road transport are reduced, and the only visible signs of the pipeline are small markers along its length - similar to those seen on street corners for gas pipelines.

The pipeline consists of sections of steel pipe welded together. When being laid, the newly-welded joints are cleaned, X-rayed, wrapped and waterproofed before the pipeline is covered over. To ensure no leakage occurs, the entire pipeline is regularly tested by running high pressure water through its length.

Road tank vehicles are used to carry oil products to smaller distribution centres, such as petrol stations, and to some customers. These tankers can weigh 38 tonnes and carry 35,000 litres of petrol, though smaller vehicles are used for less accessible places.

## SEPARATING CRUDE OIL

Crude oil is a mixture of components which can be separated by heating. This process is called 'distillation'. The process relies on the fact that each component in the mixture changes from a liquid to a gas at a different temperature. The crude oil mixture is heated up to 400°C before being passed into a tall tower (about 80m high). Some of this mixture is now a liquid, but most of it has turned into gases. As the mixture enters the tower, the liquid falls to the bottom, and the gases rise up the tower. As the gases rise they cool down, and one by one they become liquids. As each gas becomes a liquid, it is drawn away from the tower by pipeline. The diagram overleaf shows the main components of the mixture. These components are often further distilled, or refined, to provide a wider range of products.




## USES OF OIL

In the 1860s the main use of oil was as a fuel for domestic lighting (paraffin lamps). However, the demands for lubrication grew as industry developed, for lubricating wheels, pulleys and engines. In the 1960s the main use was for producing heat. Today, the main demands on oil are fuels for transportation, a wide range of lubricants, and for the production of chemicals.

A variety of oil products provide fuels, such as aviation fuels, diesel oil and petrol. Each product is tailor-made for its use, be it a heavy grade of fuel oil for use in ships, or kerosene used to heat large buildings such as hospitals, or liquefied petroleum gas (LPG) for camping gas stoves. In many countries these fuels are also used for cooking.

Similarly, products for lubrication vary - from a fine clear liquid to thick grease for the rollers in a steel mill. Paraffin wax is extracted from oil during lubricant manufacture. It is used to make candles and waxed containers for packaging.

Fine oils and greases are used in cosmetics and medicines.

Bitumen is used for road surfacing and for waterproofing roofs, dams and tunnels. This list is not exhaustive, and oil products are found in many applications - such as plastics, ointments, polishes and a wide range of chemicals. In the children's activities the distinction between crude oil and its many products is not made. It is sufficient to say that crude oil is changed in 'factories' (oil refineries) to make many types of oil and products.