Crude oil timeline

Specification references

* C10.1.1 Using the Earth’s resources and sustainable development
* WS 3.2

Aims

In this activity students will make a timeline that shows how humans have exploited crude oil.

Learning outcomes

After completing this activity, students should be able to:

* list some human uses of the Earth’s resources
* state an example of a natural product that is supplemented or replaced by agricultural or synthetic products
* explain the use of natural, sustainable, and finite resources
* interpret information from different formats including graphs, charts, tables, and prose
* understand data and interpret information using orders of magnitude to compare
* explain the role of chemistry in improving agricultural and industrial processes
* draw conclusions consistent with information provided from graphs, charts, tables, and prose and evaluate the validity of the data
* construct a timeline for crude oil.

Teacher notes

Timelines will vary greatly but it is important to emphasise to students the recent changes and increased usage of crude oil. Hopefully their timeline will confirm such exploitation can not last and that we will soon run out of this valuable resource. Following on from Student follow up question 3, an extension activity could be a discussion with students on the pro/cons fracking. The UK government is planning around eight fracking wells per square mile in some areas; if successful, new gas-fired power stations are planned. Protesters maintain that fracking can cause possible air pollution, noise pollution, earthquakes and damage to buildings on surface.

Task answers

Students’ timelines could include the following:

* Crude oil was formed millions of years ago from millions of microscopic animals and plants.
* Pools of crude oil collected in some places on the Earth’s surface. These were used around 3000 BCE (BC) by the Chinese and Egyptians to help light their fires.
* The ‘Oil Age’ will probably last around 200 years. It began in the 1840s when the first oil well was dug in Baku, a city on the Caspian Sea.
* In the early 1850s crude oil was refined and kerosene was produced.
* In 1859 Edwin Drake drilled the first oil well in the United States and extracted crude oil commercially.
* In 1905 a tar-like extract from crude oil was first used as a fuel.
* In 1909 crude oil was heated and separated into multiple fractions by distillation.
* In 1913 Henry Ford started to make cars on a large scale, which helped the oil industry develop and expand greatly.
* Polythene was first produced in 1933.
* In 1935 the first artificial fibre (nylon) was invented at the same time in New York and London.
* The first polyester (Terylene) was invented in 1941.
* The first commercial extraction by hydraulic fracturing (fracking) of oil from black shale rock in USA was in 1949.

Answers to main questions

1 a refinery/petroleum gas, gasoline/petrol, kerosene, diesel, oil/gas oil residue (*5 marks*)

b cooking/heating (refinery gases), fuel for cars (petrol), aircraft fuel (kerosene), fuel for lorries/cars (diesel), making roads or flat roofs (residue) (*5 marks*)

2 any three from: crude oil, natural gas, coal, metal ores, limestone (making cement) (*3 marks*)

3 any two from: nylon (polyamide), Terylene (polyester), viscose, rayon (*2 marks*)

Student follow-up answers

1 A natural resource is found in nature and can often be grown and harvested, like crops. They are normally sustainable resources but there are exceptions like fossil fuels.

A synthetic resource is man-made, like plastics and other materials. Many synthetic materials rely on unsustainable resources like fossil fuels. (*2 marks*)

2 Ethene from crude oil is unsustainable as crude oil is running out. Ethene from ethanol is renewable as ethanol can be made by fermentation of sugar and sugar is a crop that can be grown. (*3 marks*)

3 Fracking (hydraulic fracturing)

* Fracking allows you to extract difficult to reach resources of oil and gas.
* In the US it has significantly boosted domestic oil production and driven down gas prices.
* Requires black shale rock, which has natural gas trapped inside.
* Bore holes into this shale rock then make a small explosion to fracture rock so gas leaks out.
* Pump water, sand, and chemicals into the well, under high pressure, to force the gas out from the shale rock.
* Collect and store gas on surface. (*4 marks*)