

Sample Research Essay 3

Oil and Natural Gas: The Lifeblood of Our Civilisation

Introduction

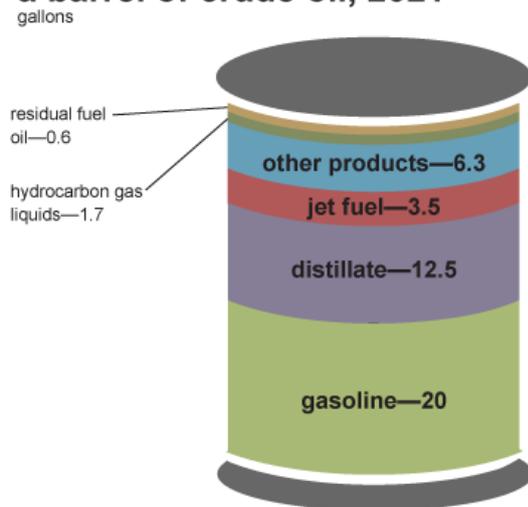
Our civilisation is built on oil and other cheap sources of energy. In this essay I will look at how important oil is to our way of life and consider if it is possible to reduce this dependency without destroying our way of life as we know it. I will explain what oil is and how it is used and then consider three case studies of how integral oil is to our current way of life.

Oil and its Uses

Crude oil is thought to be the remains of dead organic matter which was buried millions of years ago and decomposed in an anaerobic environment (Energy Education, online). Oil consists mostly of carbon and hydrogen, with some other trace elements but its exact consistency varies with its location. Venezuelan oil has a high sulphur content, for example, while Brent crude from the North Sea is sweeter, with a much lower sulphur content (Rentar Fuel catalyst, online). Oil is extracted by drilling wells and it is then refined into different products (Investopedia, online).

Figure 1 below shows the products of the refining process; 20% is used as gas, or petrol.

Petroleum products made from a barrel of crude oil, 2021



Source: U.S. Energy Information Administration, *Petroleum Supply Monthly*, March 2022, preliminary data
Note: A 42-gallon (U.S.) barrel of crude oil yields about 45 gallons of petroleum products because of refinery processing gain. The sum of the product amounts in the image may not equal 45 because of independent rounding.

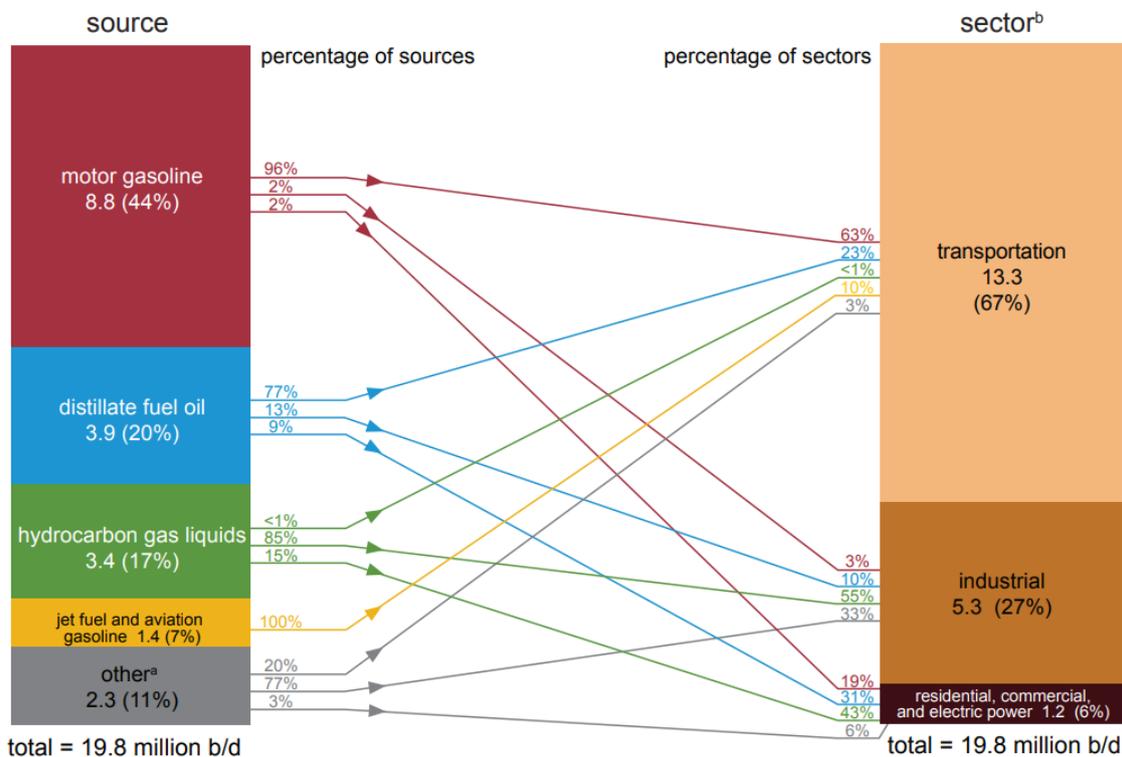
Figure 1: Source: <https://www.eia.gov/energyexplained/oil-and-petroleum-products>

As can be seen from **Figure 2** below most petroleum products in the United States are used for transportation (67%). Only 6% is used for power generation, and 27% is used for industrial purposes.

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U.S. petroleum products consumption by source and sector, 2021

million barrels per day (b/d)



Sources: U.S. Energy Information Administration (EIA), *Monthly Energy Review*

(April 2022), Tables 3.5, 3.7a, 3.7b, and 3.7c.

Note: Sum of components may not equal total due to independent rounding.

See "Extended Chart Notes" on next page.

a Includes asphalt and road oil, aviation gasoline blending components,

lubricants, kerosene, petrochemical feedstocks, petroleum coke, residual fuel oil, still gas (refinery gas), special naphthas, waxes, unfinished oils, and miscellaneous products.

Also includes renewable fuels, excluding fuel ethanol.

b Industrial, commercial, and electric power sectors include primary energy consumption by combined-heat-and-power (CHP) and electricity-only plants in the sector.

Figure 2: Source: <https://www.eia.gov/energyexplained/oil-and-petroleum-products/use-of-oil.php>

Natural Gas and its Uses

Natural gas is a hydrocarbon of mainly methane with a few trace elements (US Energy Information Administration, online). The gas is recovered from underground fields by drilling a well, in the same way oil is. It is then processed at a gas processing plant to remove impurities. It is used for power generation, heating, cooking, in the manufacture of some plastics and other organic chemicals and sometimes as vehicle fuel.

Case Study 1: Sports Clothing and Technical Fabrics

Nylon and polyester fabrics are derived from oil. Nylon was invented in 1938 and is now found in a huge variety of materials like toothbrushes, carpets and car parts (Science History, online). Polyester is made from a chemical reaction between ethylene (an oil product) and an acid and is used as a fabric on its own and as part of poly-blends, like poly-cotton (Sustainability Chic, online).

If you shop in Sportsland, for example, then the vast majority of the products you will see in that shop are made of nylon and polyester. Practically everything is an artificial fabric, except for the natural down filling of some winter clothing. The Patagonia brand, popular with environmentalists (<https://www.patagonia.com/home/>), also has a product line which is almost 100% artificial fabrics. Modern technical fabrics used in waterproof and winter jackets, outdoor and sports gear tend to be a form of polyester or nylon. Fleece

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are made from recycled PET bottles, which are manufactured from oil originally. Even footwear which used to be exclusively leather is now often made with a large amount of nylon and polyester fabrics. Such clothes and footwear are more durable and technically capable than natural fabrics like cotton or wool or leather.

Case Study 2: Computers

Polypropylene (PP) plastics are used in computer cases, keyboards and computer screen housings. Polyvinyl Chloride (PVC or Vinyl) is used in wiring for computers. By volume most of a computer is plastic. Both of these kinds of plastics are derived from crude oil: Ethane and propane are processed into ethylene and propylene (Pleasant Precision Inc., online), which are then used as the basis for different kinds of plastics. Products of crude oil also used to construct the factories where computers are made and used to extract and transport raw materials to the factories, and then transport the finished products to warehouses and to the shops. Oil is essential to computers and other electronics.

Case Study 3: Food

Oil obviously plays a large role in food production – in powering farm machinery in planting and harvesting crops, and in moving goods to market, processing plants and on to the consumers. This transport will be any combination of truck, train, ship and plane.

Natural gas also plays a key role in cereal food production as nitrogen-based fertilizers depend on ammonia, which mainly comes from natural gas (Market Watch, online). Without artificial fertilisers like these crop yields can drop by 30%, as has recently been seen in Sri Lanka (Reuters, online). Oil and natural gas are an essential part of modern farming. Without these fossil fuels large-scale farming would be impossible.

In other farming systems natural gas is used, as well as other fuels, to heat greenhouses so that food can be grown year-round, as is the case in Holland (Dutch Greenhouses, online). The Dutch are the second largest food exporter after the USA, and this is largely due to growing food under huge complexes of greenhouses (Dutch Review, online), which would be impossible without natural gas and oil and artificial fertilizers.

Conclusion

Oil and natural gas are essential to our modern way of life. Without these we would not have long-distance transport, modern technology, technical clothing, or efficient and productive farming. We live in an oil and gas fuelled civilisation.

Word Count excluding References and Figures: 857

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