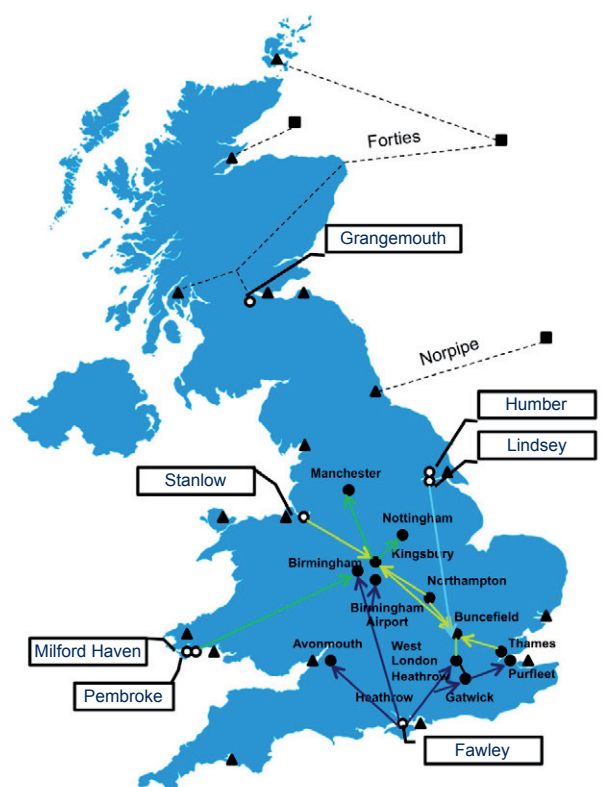
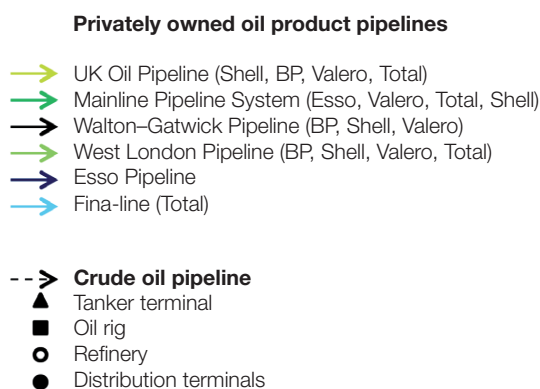




- Crude oil is transported by pipelines and tankers to oil terminals located in UK coastal areas. Oil is then stored in terminals, transported to refineries or exported.
- Refined products are transported by pipelines or road to distribution centres, petrol stations and airports across the UK.
- The cheapest and most efficient way of transporting oil and refined products in bulk is via pipelines. The UK has a dense network of private- and government-owned underground pipeline systems that transport refined products to distribution centres and airports.

Figure 1: Crude oil and refined products pipeline and terminal system



Source: Deloitte based on *UK PIA Statistical Review 2012* (p. 9) and *Finding an unusual suspect* (p. 34) by BP

1. Transporting crude oil

Crude oil produced in the UK Continental Shelf (UKCS) is transported by subsea pipelines running from the North Sea oil fields to terminals on the east coast of the UK and the Shetland Islands.

The two most important oil pipelines from the UKCS are the Forties Pipeline System and the Norpipe.

The 169 km **Forties Pipeline System** serves both the UK and Norwegian zones of the north and central parts of the North Sea. It runs from the Forties oil platform to the Cruden Bay landfall in Scotland. From Cruden Bay an underground pipeline carries the crude oil to the Grangemouth refinery on the Firth of Forth. The Forties pipeline is owned and operated by BP and at one million barrels per day, it transports about 40% of UK oil production.

The 354 km **Norpipe system** transports crude from the Ekofisk oil field and a number of other oil fields both in the UK and Norwegian zones of the North Sea. The pipeline runs to a landfall by the Teeside storage terminal and is owned by a joint venture of several national and international oil companies.

Imported crude oil from other European countries and further afield also arrives in oil tankers at terminals located near coastal refineries.



2. Transporting refined products

Refined products are transported by pipelines, sea tankers, rail and road from refineries and coastal terminals across the country to regional distribution centres, storage facilities, petrol stations and end users, such as airports.



How do pipelines work?

In terms of costs, the most efficient way of transporting refined products in bulk is by pipeline. Although building pipelines requires high upfront costs, they have a long economic life.

The southern part of the UK is covered by a network of multi-product underground pipelines. These usually transport diesel, gasoline and aviation fuel from refineries to distribution terminals and airports.

The pipelines transport products in separate batches. They are controlled by computer systems that operate automated valves and sensors to ensure that speed of flow is optimised and that different products are not mixed together.

UK fuel market review

Transport of crude oil and refined products

Pipeline ownership

Refined product pipelines are owned both by the UK government and privately by international oil companies. To share infrastructure and costs, some pipelines are owned by oil company consortia.

The **United Kingdom Oil Pipeline**, owned by a consortium of oil companies, connects the Stanlow refinery and the Coryton refinery (now closed) with oil product terminals at Buncefield, Kingsbury and Northampton. From Buncefield the **West London Pipeline**, owned by the same set of oil companies, can transport fuel to Heathrow with a further connection to Walton. From Walton, the **Walton-Gatwick Pipeline** carries aviation fuel to Gatwick airport.

The **Mainline Oil Pipeline** ships refined products from the Milford Haven and Pembroke refineries to the Midlands. One of its sections leads up to Manchester, while another one goes to Nottingham through Birmingham and Kingsbury. The pipeline is owned by a consortium of four oil companies: ExxonMobil, Chevron, Total and Shell.

The **Esso Pipeline System** has three branches running from the Fawley refinery. A pipeline carries refined products to the Avonmouth terminal near Bristol. A second one runs to Birmingham and the third line takes fuel to the West London terminal from where it can be further transported to Heathrow. A branch of this also runs to the Purfleet oil terminal via Gatwick airport.

The **Finaline pipeline**, owned by the French oil company Total, mainly ships aviation fuel from the Lindsey refinery to the Buncefield oil terminal.



Apart from the privately owned pipelines, a public pipeline system also exists. The **Government Pipelines and Storage System (GPSS)** was built before and during World War II and used to supply aviation fuel, mainly to military airports around the country. Today, the 2,500 km pipeline only transports 10% of its fuel for military purposes, with the remainder being for commercial use. The system supplies around 40% of all UK aviation fuel. The government is currently considering the sale of GPSS, the earliest target date being 2014.

Travel times

Travel times to the UK depend on the origin of the crude oil or refined products, the speed of the ship and the route taken. On average, crude oil via pipelines from Norway reaches the UK in two days. If it is shipped from Russia, and depending on the terminal, it can take between 3.5 and 10 days to arrive in a UK port. North African oil typically takes between 4.5 and 8 days to reach the UK, while Nigerian and Angolan oil could take between 12 and 13.5 days.

The location of the UK destination port can either add or reduce travel times by about half to 1.5 days.



Potential issues

The UK pipeline system was built and extended over an 80-year period to serve a growing population around major cities. Ageing assets may require upgrading or refurbishment in the near future.

Pipelines constructed to transport conventional fuels also face another challenge. The government's recent Renewable Transport Fuels Obligation requires products sold in the UK to be blended with a progressively increasing proportion of biofuels. This raises a number of issues for the UK refined products pipelines. Aviation fuel does not contain biofuels and is subject to strict quality standards to avoid contamination. As biofuels have different characteristics, transporting them in the same network has the potential to contaminate aviation fuel. Engineers have to find solutions for shipping both biofuels and aviation fuel in the same pipes.



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The Royal Automobile Club Foundation for Motoring is a transport policy and research organisation which explores the economic, mobility, safety and environmental issues relating to roads and their users. The Foundation publishes independent and authoritative research with which it promotes informed debate and advocates policy in the interest of the responsible motorist.

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