

Cinderella comes of Age

As the oil price rises and technology develops, interest in alternative forms of hydrocarbons such as 'heavy' oil has increased.



Steve Jenkins is Chief Executive of Nautical Petroleum, which specialises in developing known heavy oil discoveries in the North Sea. Steve has had a varied career as a geologist throughout the world and became interested in heavy oil while working in Kazakhstan and South America.

exclusively in heavy oil. "In fact, we avoid light oil, explains Steve. "A sister company, Quadrise, manufacture fuel for power generation using heavy oil, so Nautical was set up partly to feed this ready market, although we are not obliged to sell to Quadrise. But, in addition, we realised that no one was actually specialising in the field of heavy oil here and with the oil price rising, we knew that the time of heavy oil had arrived"

"It is true that heavy oil appears to be more difficult and expensive to produce and process, but there are advantages," Steve explains, when asked why heavy oil is of interest to Nautical. "What you lose in the quality of the oil, you gain in reservoir quality. Heavy oil tends to be found in good quality, shallow sandstone reservoirs, with excellent permeability and porosity and at

depths of less than 1,500m, particularly in the North Sea. Wells are therefore relatively cheap, as it often takes less than two weeks to drill to that depth, offsetting the additional cost of processing the heavy oil."

"Typically, a heavy oil field in the North Sea has a thick oil column with a large aquifer and sometimes a substantial gas cap. North Sea heavy oil also has the advantage of being unusually low in sulphur, usually less than 1.5%, although it does have a high acid content."

Heavy oil specialist

"The Mariner Field on the East Shetland platform was discovered in 1981, and extended well tests have been performed, so the resource was proven when we decided to specialise in this market. We formed the company with this intention in 2005

Jane Whaley, Associate Editor

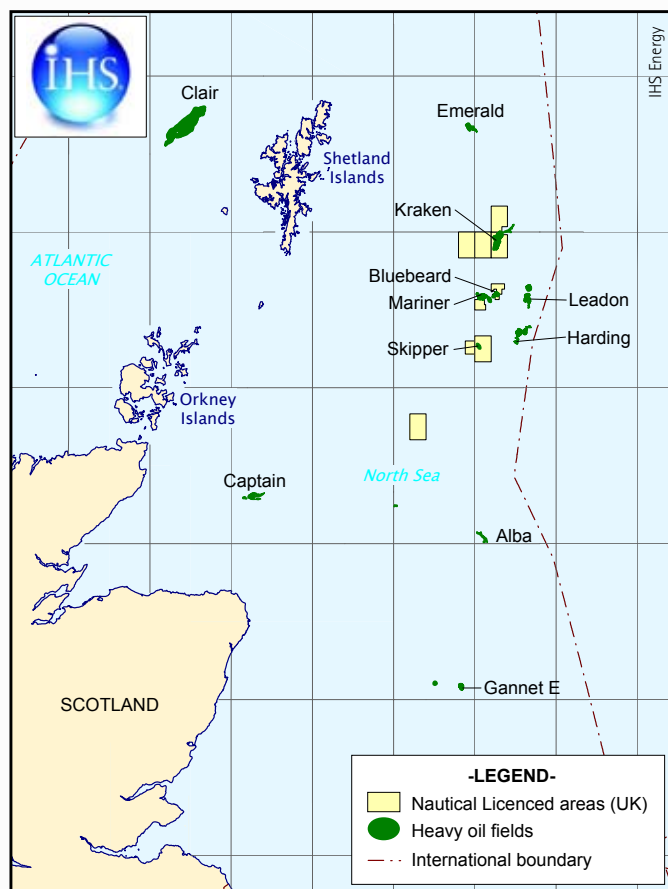
"Heavy oil has always been the Cinderella of the petroleum industry," declares Steve Jenkins, CEO of Nautical Petroleum. "While there was nicer 'sweet' stuff to get hold of, the heavy oil was considered a nuisance. With rising oil prices, rapidly developing technologies and declining reserves of light crude, there is now much more interest in heavy oil."

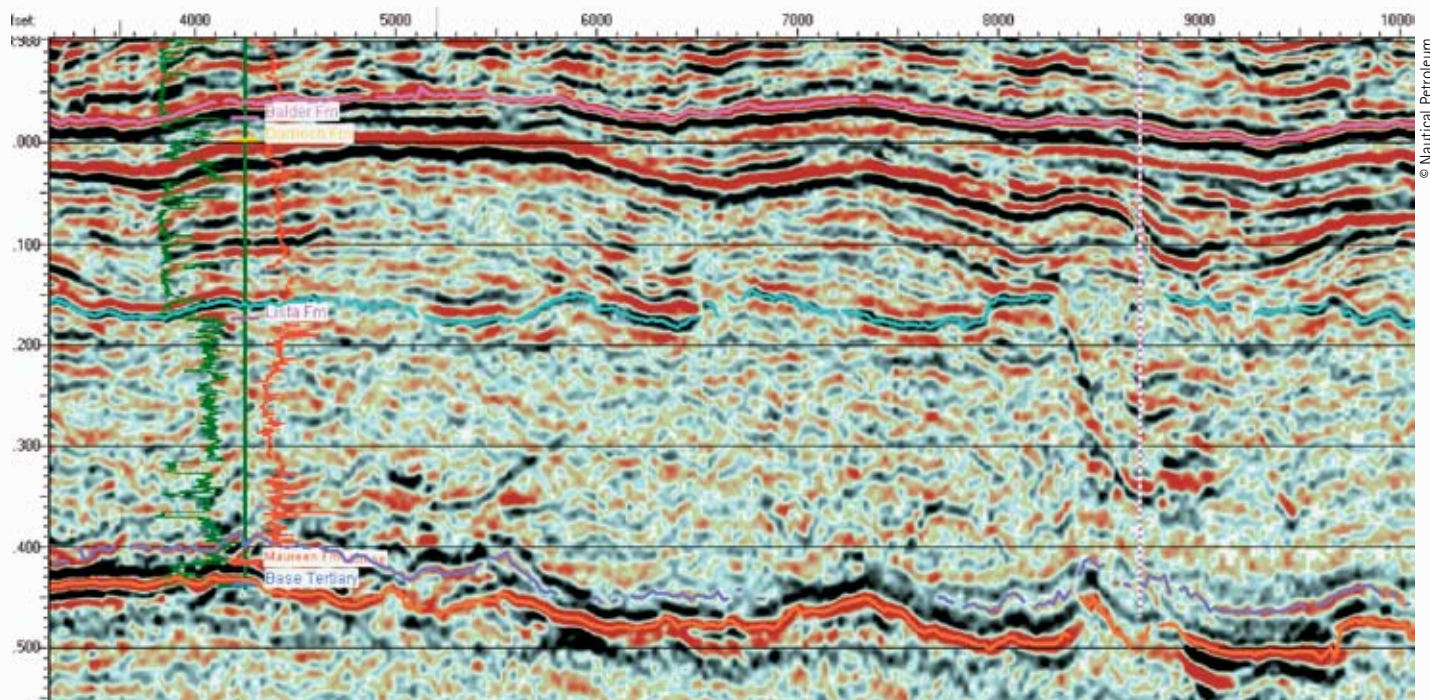
Six trillion barrels

It is estimated that there are over six trillion barrels of heavy oil in place waiting to be exploited worldwide – almost six times the entire known conventional oil reserves. It is found throughout the world, but especially in South America, Canada, China and Russia. The largest accumulation of heavy oil in the world is in the Orinoco Fold Belt in Venezuela, while in Brazil it is estimated that the offshore heavy oil reserves alone could make the country self-sufficient in oil.

A number of companies have recently been investing much effort and large amounts of money in developing this resource, but Nautical Petroleum is the only company in the North Sea which deals

Heavy oil is a type of crude oil which is very viscous and does not flow easily. Excluding extensions and prospects, there are 19 UK Sector North Sea heavy oil fields. These range in size up to around a billion barrels of oil-in-place, although the majority are below half a billion barrels. The fields are located in water depths of around 100m, with the reservoirs themselves at depths of 600 - 1,800m subsea.





Drilling for oil in the North Sea: most North Sea crudes have a heavy oil fraction, but Nautical Petroleum is concentrating on fields where heavy oil makes up the bulk of the hydrocarbons.

and listed on AIM (the London based Alternative Investment Market) in April 2005. By August of the same year we had purchased Alba Resources, giving us a 26.7% stake in the Mariner Field, which is operated by Chevron and due to have a Field Development Plan submitted next year, with first oil in 2009."

As part of our plan to become the major heavy oil specialist in the North Sea we applied for and were awarded a number of blocks on the East Shetland Platform, all of which hold good prospects and discoveries. We then bought a majority operating interest in the Skipper and Bluebeard discoveries, also on the East Shetland platform, and hope to start developing these in the near future."

"Our ambition to be recognised as the major heavy oil company in Europe was taken a step further when we were invited as heavy oil experts to prove the commerciality of discoveries on the St. Laurent permit in southern France."

Nautical have an unusual company philosophy for progress. "We outsource everything" says Steve. "There are only 3 actual employees of the company – myself, my PA and the Finance Manager. However, we always use the same companies or consultants for our G&G work, our engineering tasks, operating contracts and the rest. In this way we always have access to the experts in each field, but don't lose corporate memory."

"We also actively study our markets to find the best outlets for our oil at any one time. We sell the heavy oil throughout the world, not just to our sister company Quadrise. Milford Haven is actually the only place in mainland Britain which can refine these hydrocarbons, but heavy oil is coming 'off plateau' in Europe, so there is spare refining capacity in many places. And there is a huge market for it in the Far East."

Technology plays a part

Advances in technology have played their part in the development of the production of heavy oil. "One of the major improvements in recent years has been in the stability and reliability of pumps," explains Steve. "Because of the thick nature of the oil, very strong subsea pumps are required, but in the past these broke down regularly. Nowadays, pumps in the Captain Field continue working for years without even routine stops for maintenance. We are able to pump progressively more viscous crude with these pumps."

A feature of heavy oil production is an early water cut, because of the nature of the hydrocarbons. This results in a lower recovery factor, typically less than 25%, although there are exceptions like Captain, which has a 32% recovery rate. "Onshore, steam lift is useful in shallow fields, but this is obviously of limited use offshore, as it is very difficult to keep the steam at the required temperature. However, we have

Heavy oil in the UK

Although a number of heavy oil fields were identified in the North Sea in the 70's and 80's, technological limitations meant that these were not commercial at the time. Heavy oil has, however, been produced as a by-product from otherwise light oil fields in the North Sea for a number of years.

Heavy oil is found in large, but mostly unexploited quantities on the UK Continental Shelf – in fact, it is estimated that there are six or even as much as ten billion barrels in place in the region. The largest accumulations are on the East Shetland Platform, but it is also found in the North Moray Firth, the Viking Graben, West of the Central Graben, as well as west of the British Isles.

Excluding extensions and prospects, there are 19 UK Sector North Sea heavy oil fields. These range in size up to around a billion barrels of oil-in-place, although the majority are below half a billion barrels. The fields are located in water depths of around 100m, with the reservoirs themselves at depths of 600 – 1,800m subsea. The Captain Field in the Moray Firth, which went on stream in 1997, was the first exclusively heavy oil field in the North Sea. Alba, Gannet E, Gryphon and Harding have all followed and there are plans for a number of other fields to start producing in the next few years.

been investigating using hot water flood to increase the temperature and therefore the viscosity of the oil, in order to aid recovery, and this is looking promising."

"The development of extended horizontal wells has also been very important in the economic viability of heavy oil," Steve adds. "They assist recovery, as they permit minimal pressure reduction while maximising access to the oil without the water cut."

Promising future

Steve Jenkins thinks that Nautical has a

promising future ahead. "We intend staying exclusively in heavy oil, investing in the North Sea and possibly elsewhere in Europe. We now have 10 blocks in the North Sea, including five discoveries, plus our French licence. We are actively seeking out further assets containing known heavy oil resources, while moving towards appraisal and production from our existing blocks."

"With the correct technology and planning, we consider that the production of heavy oil can be very lucrative, Steve says.

"We reckon it costs between US \$15 and \$20 to get it out of the ground, so with present prices this is profitable. There is plenty of heavy oil available in the North Sea; for example, the Captain Field is already pumping about 60,000 barrels a day, while Alba is at 50,000."

"We estimate that 250,000 bopd could be added to North Sea production from heavy oil alone. This is a substantial figure and would be good for 'UK plc,' as well as for ourselves. The Cinderella of the North Sea has finally come of age."

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What is heavy oil?

Heavy oil is a type of crude oil which is very viscous and does not flow easily. It has a viscosity of more than 5 centipoises (water is 1, cream about 20, motor oil is 100, corn syrup is 10,000) and low API gravity of between 10 and 22° (Brent crude is 38-39° API). The oil usually has low hydrogen to carbon ratios, high carbon residues, and large amounts of 'heavy' hydrocarbon fractions such as asphaltenes, heavy metal, sulphur and nitrogen, although the North Sea is exceptional in having low sulphur and low heavy metals.

The high density and low viscosity of heavy oil are very significant, as these present special problems in the production of the hydrocarbons, requiring different types of enhanced oil recovery methods. Steve Jenkins explains this further: "Although the API figure is the most often quoted way of describing heavy oil, viscosity is the most significant factor when considering production. The important aspect is the viscosity of the oil in the reservoir, which is often a function of reservoir temperature and the gas-to-oil ratio. Oils with similar APIs can have very different viscosities."

The specific characteristics of heavy oil are due to the source and its migration through time. As Steve explains, "As the oil migrates to shallower depths it is washed by meteoric waters. Once it has attained these shallow depths and consequent lower temperatures, bacteria are much more active, leaving behind the lower molecular weight alkenes. Heavy oil is therefore a result of biodegradation."