Heavier Oils – Moving from Unloved Resources to Reserves

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Heavy oil fields, (less than 20° API and viscosity greater than 5cp) such as Captain, Alba, Clair and Grane already contribute significantly to North Sea oil production.

Most of these oils are 20cp or less and API around 19°. The exception is the prolific Captian field which although being 19° API is the most viscous oil currently being produced in the North Sea ranging from 88-150 cp.

The discovered heavy oil accumulations are distributed through 4 main areas of the North Sea; the east of the East Shetland Platform (Mariner, Bressay and Kraken) and West Central Platform, Moray Frith (around the Halibut Horst) and West of Shetland. Elsewhere, heavy oil may be found in shallow horizons in the Viking Graben (Harding, Gryphon, Leadon and Grane). There are numerous undeveloped discoveries including Mariner, Bressay and Kraken on the East Shetland Platform. Further upside is evident on the West Central Platform in Pilot / Harbour and Fyne and Dandy.

The oils suffer biodegradation by bacteria in meteoric water both during migration and in situ especially where there is pervasive bottom water.

Most heavy oil is reservoired in Cretaceous and Tertiary clastics. All the reservoirs are shallow, exhibiting excellent reservoir characteristics. Due to the low gas : oil ratio considerable columns of oil can be sealed by thin shales or even lignites.

Large traps usually have a stratigraphic element due to sands pinching out on the flanks of a central structurally controlled core (Mariner) or shale encased sand channels backfilling slope canyons which are enhanced due to differential compaction of the surrounding shales.

Such channelised reservoirs are difficult to image by conventional seismic (which was often targeted at deeper horizons), due to lack of acoustic impedance contrast between the sands and shales. Often modern reprocessing or the acquisition of high resolution data with high frequency sampling allows greater clarity.

The current portfolio of undeveloped discoveries could contribute 250 000 bopd to UKCS production with further upside from large adjacent undrilled prospects.