

Brent Group Petrography and Diagenesis: Implications for Reservoir Quality and Enhanced Oil Recovery

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ABSTRACT

Despite many decades of exploration and oil production there has been no regional assessment of detrital and diagenetic mineralogy and controls on reservoir quality of the prolific Middle Jurassic Brent Group, Viking Graben, UK. Here we have integrated, evaluated and synthesised a combination of proprietary and publically-available core analysis data and petrographic mineralogical data from the Brent Group. The aim to better understand the regional mineral and petrographic properties of the Brent reservoir units, the distribution of detrital and diagenetic minerals, and how these influence reservoir quality and options for enhanced and improved oil recovery. Despite the Brent Group being the focus of many studies into sandstone diagenesis in the 80's and 90's, there have been no published reviews of the regional patterns of diagenesis. Furthermore little effort has been made to develop an overview of how the Brent Group changes both spatially and with depth. Using data supplied by four industry partners, together with published data, a data set of over 2500 samples was collated from 169 wells, representing 27 fields that are producing or have produced oil from Brent Group reservoirs over the last 40 years. This data set, the largest produced on the Brent, has allowed us to generate and analyse maps of the distribution of key diagenetic minerals that control reservoir quality. We have also compared cement abundances in the five formations, and examined the effects of burial depth and fluid type on cement abundance patterns. A greater understanding of how the Brent Group varies, spatially, with depth, and between formations, will help in the management of existing assets, and in any potential exploration on deeper or satellite structures in the area. A regional understanding of Brent mineralogy will help in appraising the effectiveness of EOR approaches such as low salinity water injection. The results of this study suggest that this method is likely to be most effective in the Brent Group as a primary water-flood in favourable reservoir conditions, but in general is not a promising candidate due to the low salinity of formation water and low abundance and type of kaolinite. With a drive to reduce costs and maximise economic recovery from the UKCS, the encouragement of operators to share information with one another and work more closely with academia, along with the re-examining of legacy data may be the key to future success both in this basin and elsewhere.