

Source Facies Variations within the Late to Middle Jurassic Source Rock System in the South Viking Graben, Norway

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A large regional data set of 1286 source rock samples was used to map variations in source facies and hydrocarbon potential within the Jurassic source rock system of the South Viking Graben between 60° 15' and 58° N. Although this is a mature exploration area, there remains a number of undrilled leads and prospects with considerable reserve potential. An improved, quantified understanding of the active hydrocarbon system provides an important tool in solving exploration and production problems, uncover new plays and bring new life to exploration in the area.

The variation of organofacies and source rock potential in the Greater Balder Area is investigated by detailed source rock analysis and subsequent mapping and interpretation in this paper. Earlier studies (e.g. Justwan & Dahl, in press) have shown significant differences in organic facies and petroleum potential between the upper (post-rift) and the lower (syn-rift) section of the Draupne Formation.

In this study the Upper Jurassic Draupne Formation was also subdivided in a post- and a syn-rift section. Isochore maps of the syn- and post-rift horizons of the Draupne Formation as well as of the Heather Formation have been generated using a combination of subdivision from wells and statistical techniques. The maturity of the section was assessed using vitrinite reflectance and bulk Rock Eval data. The original prematuration values for TOC and S₂ have been restored using an empirical method based on depths plots of Hydrogen Index, S₁/TOC and Production Index (Justwan & Dahl, in press). The transformation ratios established in this process have been compared with results from published kinetic models for various kerogen types (Waples & Marzi, 1998).

Detailed quantitative hydrocarbon potential and source facies mapping along side with analysis of well log character helps to reveal the lateral and vertical variations in the type of organic matter and hydrocarbon potential of the Upper Jurassic source rock section and its development through time. The improved understanding of the source rock system allows prediction of source rock qualities in areas without well control.

Together with the isochore maps and the information on the state of thermal maturity this forms the base for basin modeling and calculation of generated hydrocarbon volumes.

References

Justwan, H. & Dahl, H. in press. Quantitative Hydrocarbon Potential Mapping and Organofacies Study in the Greater Balder Area, Norwegian North Sea *In: Doré, T. & Vining, B. (eds) North-West Europe and Global Perspectives. Proceedings of the 6th Conference.* Geological Society, London.

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Oil-Source Correlation in the South Viking Graben, Norway

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The Norwegian South Viking Graben is a mature area for oil and gas exploration and with 255.2 mill. Sm³ oil and 429.7 bill. Sm³ gas recoverable it is a very prolific hydrocarbon province. The major source rock in the area is the Late Jurassic Draupne Formation which has a predominance of marine algal organic matter. The Draupne Fm however exhibits a large variability in source facies laterally as well as vertically. The upper section is more marine dominated while the lower section of the Draupne Formation together with the Heather Formation contains a mixture of marine algal and terrigenous organic matter resulting in a potential to generate both oil and gas (Justwan & Dahl, in press). Also the humic coals and coaly shales of the Middle Jurassic Hugin and Sleipner Formations exhibit potential to generate gas and some liquids (Isaksen et al. 1998, 2002).

Mapping of lateral and vertical molecular and isotopic facies changes within the Jurassic source rock system is carried out in order to establish an oil-source correlation model for the South Viking Graben. For this purpose the molecular and isotopic characteristics of a total of 76 oil samples from 33 fields and discoveries in the South Viking Graben and 183 source rock extracts from 8 wells in the area were studied in order to establish genetic relationships. The subtle differences in organic- and molecular facies of the Upper Jurassic source rock section are reflected in various hydrocarbon families and subfamilies in the project area.

References

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