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Quantitative palynology in the Westphalian of the Dutch on- and offshore; innovations in palynostratigraphy and reservoir characterization

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Recently, renewed interest in the hydrocarbon reservoir potential of Upper Carboniferous (Westphalian) strata of the North Sea basin led to an increasing demand for a high resolution and solid stratigraphical framework for the Westphalian. At the moment the main biostratigraphical tool to provide chronostratigraphical information for wells in NW European Westphalian strata is classic palynostratigraphy based on first and last occurrences of sporomorph taxa (Clayton et al., 1977, Van der Laar and Fermont, 1990, McLean et al., 2005). The application of the classic palynostratigraphical approach is hampered by the observed spatial variation in distribution of sporomorph taxa and the often poor preservation of marker taxa.

A new approach in palynostratigraphy is based on the Sporomorph Ecogroup Model (SEG) concept, which was developed for Jurasic deposits in the North Sea basin (Abbink, 1998, Abbink et al., 2001). With this methodology sporomorphs are linked to the motherplant, which makes a detailed palaeo-ecological interpretation of the quantitative palynological signal possible. The detected changes in environment and/or climate can be used to enhance the stratigraphical correlation of wells. In this study, a SEG model is developed for the Westphalian and applied to the Dutch onshore well Kemperkoul-1 (Westphalian B/C) and several wells in the Cleaver Bank High area (offshore the Netherlands). A comparison between the detailed palaeoenvironmental

and climatic reconstructions based on the SEG model and the sedimentological and paleontological analysis in well Kemperkoul-1 is made to test the outcome of the SEG model results. Furthermore, the SEG model approach enabled the detection of regional changes in facies distribution in the Cleaver Bank High area (offshore the Netherlands) during the Westphalian. Based on this study, it can be concluded that combined application of classical palynostratigraphy with a SEG model approach enhances the stratigraphical resolution and accuracy of Westphalian chronostratigraphical interpretations based on biostratigraphy. Furthermore, the by means of the SEG approach detected changes in the regional facies distribution patterns and the observed climatic and environmental change, provides a new tool for reservoir characterization during the Westphalian.

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