

Chemostratigraphy as complementary tool for biostratigraphic interpretation at Jurassic strata (Dogger beta) within the Mittelplate Oilfield, Northern Germany

B. Holstein, C. Marchel

Dea Deutsche Erdoel AG, Wietze

Abstract

Ancient deltaic systems often represent well developed reservoir rocks for oil and gas at the present time. They mostly reflect a heterogeneous and complex depositional pattern, consisting of different sandy and clayey sedimentary units (e.g. bars, distributary channels, crevasse splays, interdistributary muddy deposits, ...). Determination and classification of the reservoir rocks as wells as correlation of individual units throughout the deposit is most essential for reservoir assessment and evaluation, but very often a challenging endeavor. An established procedure to subdivide the reservoir is the determination of correlatable horizons that extend throughout the whole deposit. In practice these are often flood surfaces or other marine shale beds during transgressive stages.

The recent study points out the advantage by combining two different techniques to classify and separate typical deltaic deposits within a transgressive stage on the example of the oilfield Mittelplate (North Sea). The Dogger-beta sandstone reservoir exhibits deltaic sandstone deposits separated and enclosed by extensive marine shale beds.

Micropalaeontological analysis is able to classify marine/brackish clayey horizons with a certain degree of accuracy by foraminifera and ostracods. This technique may be limited by poor index microfossil contents in sediment layers with strong terrestrial influx or origin. In addition, a seamless biostratigraphic investigation with small sample intervals is time consuming in preparation and determination.

X-ray fluorescence analysis is used to determine elemental composition of clayey horizons. By using a handheld X-ray fluorescence device at cutting material this method is very fast in qualitative and quantitative analysis. During the last decade, chemostratigraphy established as an applicable tool in selected environments, but often failed without the presence of so called "key"-elements/ratios in the material. In order to be able to use it nevertheless, discriminant analysis has proved as a mathematical tool to use it also without typical "key"-elements/ratios. The classification and distinction of marine shale beds within the deposit is in the same precision than micropalaeontological analysis.

By using both methods to classify and differentiate the clayey horizons in the Dogger-beta of the Mittelplate oilfield, the combination improves the reliability of the predictions and also serves as an additional "Supporting tool" in assignment of stratigraphic horizons. This proves to be both effective and efficient with respect to geosteering of horizontal in stratified reservoirs, whereof an example will be given.