

Reservoir parameters of deeply buried sandstones and their impact on fluid flow – a case study of the Rotliegend Sandstones from the Polish Permian Basin

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Reservoir parameters of rocks determine its ability to accumulate and transport reservoir fluids such as oil and gas. These parameters include, *inter alia*, porosity, permeability, and total pore area. Porosity is the capacity of a sandstone to store fluids. Permeability is the ability to transport them (McDonald & Schmidt 1992) and is controlled mainly by pore – throat size (Pittman 1992). Finally, pore area is the total area of pore space. During burial rocks undergo diagenesis – physical and chemical changes, that affect their primary reservoir parameters (Boggs 2009). The aim of this work was to investigate reservoir parameters of the deeply buried Rotliegend Sandstones, their changes during diagenesis and impact on fluid flow.

Research included petrographic examination of thin sections under transmitted light and petrophysical analysis of rock samples – mercury porosimetry and permeability analysis. For investigation were selected 58 core samples from 13 wells located within the Polish Permian Basin in the area of the Eastern Erg and the Central Basin, from a depth interval of 3415–4312 m. Samples were represented by Saxonian very fine-, fine- and medium-grained quartz and lithic arenites. The samples were divided into three groups, according to the location of wells within the Polish Permian Basin. The first group included samples from the central part of the Eastern Erg, the second – the

westernmost part of the Eastern Erg, and the third – sandstones deposited within the Central Basin.

Samples revealed variability in mineral composition, grain size and reservoir parameters between areas. The best reservoir properties were found within samples from the easternmost part of the Eastern Erg, whereas the weakest in central area of Eastern Erg. The effective porosity of rocks was in the range of 0.5% to 26%. In terms of pore space, the studied samples were classified as porous, in some cases with fractures, very heterogeneous and with small apertures. The increase of total pore area may correspond to the presence of authigenic clay minerals that grew during diagenesis. All those factors contributed to the reduction of potential fluid flow.

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REFERENCES

- Boggs S. Jr, 2009. *Petrology of sedimentary rocks*. Cambridge University Press, New York.
- McDonald D.A. & Schmidt V., 1992. *Porosity evolution of sandstone reservoirs*. IHRDS, Boston, MA.
- Pittman E.D. 1992. Relationship of Porosity and Permeability to Various Parameters Derived from Mercury Injection-Capillary Pressure Curves for Sandstone. *AAPG Bulletin*, 76, 2, 191–198.