

Permo-Triassic Evaporites of the Polish Basin and Their Bearing on the Tectonic Evolution and Hydrocarbon System

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ABSTRACT

The Permian-Cretaceous Polish Basin belonged to the system of epicontinental depositional basins of Western and central Europe and was filled with several kilometers of siliciclastics, carbonates, and also thick Zechstein (Upper Permian) evaporites. The Polish Rotliegend basin is located between the western edge of the East European Craton and the northeast margin of the external part of the Variscan orogen. The distribution of Rotliegend siliciclastic deposits (up to 1500 m thick) of continental origin was controlled by the asymmetric basin shape. With onset of Zechstein deposition, the basin widened further toward the east and northeast over an East European Craton. In the axial part the Zechstein basin up to 2000 m thick salts of all Zechstein cycles were deposited. The lithofacies systems of both the Rotliegend and Zechstein were strongly controlled by differentiated subsidence and paleoclimatic changes. Upper Triassic evaporites have been also deposited within the large part of the basin, and played important role during its tectonic evolution as a secondary detachment level. The Polish Basin was inverted in Late Cretaceous–Paleocene times. Presence of the Zechstein evaporites gave rise to formation of various salt and salt-related structures. These are either peripheral structures such as salt rollers, thin-skinned half-grabens, and low-relief salt pillows located within flanks of the Polish Basin, or complex salt diapirs and high-relief salt pillows located within its axial part, called the Mid-Polish Swell. Late Cretaceous inversion caused significant compressional reactivation of salt structures that were initially formed in Triassic – Jurassic times, during basin extension and subsidence. Their inversion-related growth strongly influenced Late Cretaceous depositional systems characterized by localized unconformities and thickness reductions. The main petroleum system of the Polish Basin is related to hydrocarbon accumulations within the Carboniferous and Rotliegend reservoirs sourced by the Carboniferous shales. The secondary Zechstein Main Dolomite petroleum system contains source and reservoir rocks, and the regional seal. The evaporite seals (anhydrite and rock salt) for hydrocarbons traps are exceptionally effective as they allowed for preservation of traps for hydrocarbons during ca 250 million years, even after relatively strong tectonic reactivation.