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Characterization of the pre-salt, Lower Carboniferous Carbonates Reservoirs in F Block, Northern Pre-Caspian Basin of Kazakhstan: preliminary results

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Pre-Caspian Basin is located in western Kazakhstan with thick successions of sediments that were divided into pre-salt, salt, post-salt strata by pervasive salts precipitated in Permian. F block, anticline structure trapped oil pool, is located in the north part of the Pre-Caspian Basin and contains mainly inner ramp and mid ramp carbonate sediments with thin siliciclastic inter-layers.

The study is based on analyses of 6 cored wells, which 4 wells are along the hinge line of the anticline and other 2 wells are distributed in the limb of the anticline. Reservoir characterization is based on integrated petrography, sequence stratigraphy, well log data and reservoir property. Within F block, 10 different litho-facies were identified in the pre-salt, Lower Carboniferous sediments, including bioclast and oncolite grainstone, bioclast and peloidal pack-grainstone, bioclast packstone, bioclast wackestone-packstone, peloid-bioclast wackestone, bioclast wacke-mudstone, dolomitic limestone, crystalline dolostone, sandy limestone and siltstone. However, only 4 types of lithofacies including grainstone, packstone/grainstone, dolomitic limestone, and dolostone, have considerable porosity (average 6.8%) and permeability (average 7.12 mD). Four types of pore were recognized by thin section examination and SEM-EDS analysis. They are interparticle pore, intraparticle pore (associated with organism, especially foraminifer), dissolution pore, and intercrystalline pore (associated with dolomitization), which are well influenced by the different stages of diagenesis.

Our preliminary results suggest that early, penecontemporaneous dissolution associated with temporary regional sea level fall and late dissolution during deep burial are important processes to improve the reservoir porosity of these carbonate reservoirs. Therefore, the characteristics and nature of the reservoirs are closely related to and/or controlled by depositional environment, sea level changing, and diagenesis.

