AAPG Datapages/Search and Discovery Article #90254 ©2016, GEO-2016, 12th Middle East Geosciences Conference & Exhibition, Manama, Bahrain, March 7-10, 2016

Rock Physics Characterization of Shallow Marine Heavy Oil Reservoirs.

Mukarram Ahmed[1], Harianto Soepriatna[1], Ahmed W. Daghistani[1]

[1]Saudi Aramco, Dhahran, SAUDI ARABIA

ABSTRACT

Our target formation, offshore in the Arabian Gulf, contains several layers of sand and shale at a very shallow depth. This shallow formation has four distinct sand units separated by poor-quality reservoir rock. Four wells were drilled at different locations of the shallow structure and they confirmed the presence of heavy oil in these sand units. The overall geometry is understood as lenticular sand deposits which are not in pressure communication and, hence, we recognize the need to treat them as four separate sand reservoirs. Core analysis showed two distinctive rock qualities in these sand units: from very clean, fine-grained friable sands to shaly or sandy limestone of poor- quality rock.

Rock physics analysis revealed that these shallow marine sandstone have very high porosities and very low acoustic velocities, characteristics attributed to their friable texture. The velocity-density data points from the four wells lie close to the Ruess suspension elastic bound and, hence, describe the rock with poor sorting and unconsolidated nature. A friable sand model was developed, therefore, to better understand the elastic behavior of these low-velocity reservoir rocks. Rock physics attribute feasibility was also carried out to predict which one or combination of elastic variables might help differentiate between reservoir and non-reservoir rocks. Due to very high porosity in the reservoir rocks, the initial efforts for mapping these sands were carried out with post-stack acoustic impedance inversion.

Based on the rock physics modeling results, the elastic properties of shallow marine sediments in our target formation can be properly described in correlation with the core findings. The high porous sand intervals can be mapped using the seismic inversion workflows. Due to very shallow depths the current seismic data required reprocessing, to enhance the image for suitability with post-stack and pre-stack seismic inversion workflows.