Poza Rica Field Facies/Fluid Modeling

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The objective of this study was to construct a 3D facies/fluid type model in the Poza Rica field constrained by seismic inversion data (post stack and prestack), AVO data, structural interpretation, and facies interpretations from logs and core data. Fifteen wells and 120 km² of seismic data were used in this study. Core from fifteen wells were interpreted, and three facies were identified (two reservoir, one non-reservoir). The sonic and density log curves from fifteen wells were edited for tying wells to the seismic data. Shear logs were created, and three fluids (gas, oil, and brine) were substituted using Gassman’s equations. In addition, a number of seismic attributes were calculated from the sonic, density, and synthetic shear logs. We determined that fluids could optimally be separated based on a lambda-rho, mu-rho crossplot. The pre-stack seismic data was processed to produce Rp and Rs seismic volumes, and three seismic horizons were interpreted from the Rp volume based on the well to seismic ties. The Rp seismic volume was deterministically inverted to acoustic impedance, which then was used as input into a joint stochastic inversion algorithm that simultaneously cogenerated multiple models of Vp, Vs, and density. These volumes were converted to depth and then analytically recombined to produce lambda-rho, mu-rho seismic volumes, which were then analyzed to determine the probability of encountering the facies/fluid types at various locations in the reservoir. An indicator estimation method developed by Soares was used to assign the fluid types honoring the global fluid proportions estimated by production data. This resulted in 25 models of brine, oil, gas, and shale. These models can then be analyzed to determine the probability of encountering the facies/fluid types at various locations in the reservoir.

* Now with Halliburton.