Investigating Lame's Parameters for Identification of Gas Bearing Unayzah Formations at Awali Field, Bahrain

Ravi Kant Pathak *and Masoud Faqihi. Exploration & Development, Bapco, Petex, P.O.Box:25504, Awali, Bahrain, phone: 00973-17753916, fax: 00973-17753322, ravi_kant@bapco.net*

Lame's parameters (λ&μ) derived from P & S wave velocities provide alternative information in identifying gas-bearing formations. λ measures incompressibility of rock formation and is sensitive to fluid within rock fabric whereas μ measures rigidity and is sensitive to rock matrix only.

Hydrocarbon gas has been established in the Unayzah (clastic) Permian formation at Awali field. The Unayzah formation at Awali is about 400 ft thick with facies of Sandstone, Siltstone, Shale and Mudstone and is bounded by unconformities. The porosity of Unayzah sands ranges from 5-20 %. Sonic logs exhibit sudden drop in seismic velocities from carbonate (Khuff) to clastic (Unayzah). Within Unayzah section, clean sand exhibit higher sonic velocity as compared to shaly sand.

Correlation of estimated λ&μ from well P&S velocities with Unayzah gas bearing sands have been investigated and presented in this study. The salient points of the study are summarized as below:

1.Sudden drop in λ&μ values from carbonate to clastic section.

2.Positive λ&μ separation against water bearing formation.

3.λ&μ cross over against gas bearing reservoirs within Unayzah section.

Cross plot of λ&μ separations with Poisson's ratio show distinct trend from carbonates to clastic. The cross plots show low Poisson's ratio against high negative λ&μ separation. When projected on well logs, large negative λ&μ separations correlate with gas bearing reservoir sands (high resistivity & low Gamma ray). The model will used as criteria to delineate Unayzah gas reservoir from Lambda-mu-rho inverted 3D seismic over Awali field.