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Identification of Brittle and Ductile Zones of Reservoir by Using Well Log Analysis

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1.OBJECTIVE/SCOPE:
Brittleness and ductility play very important role in the stimulation design of unconventional reservoirs as it controls the fracture length and shape of hydraulic fractures. The estimation of mechanical properties of the reservoir rock is very important for the successful execution of reservoir drilling, production, and development operations; selection of bit according to formation strength, wellbore stability analysis, selection of brittle zones for better propagation of hydraulic fracture and subsidence of reservoir strata.
2. METHODS, PROCEDURES AND PROCESS:
Mechanical properties are calculated using well log responses for selected reservoir section. Brittleness is accessed from empirical correlations based on mechanical properties estimated from well logs response, uniaxial compression strength and tensile strength, after sorting the best representative data for the reservoir. Brittle-ductile categorization is done for identification of brittle, less brittle, less ductile and ductile reservoir lithology in each studied well.
3. RESULTS,OBSERVATION,CONCLUSION:
The petrophysical properties used in the estimation of mechanical properties of sandstone reservoir was compared with measured properties of the reservoir. High values of young modulus and corresponding low values of Poison's ratio were indicating the brittle zones in the reservoir. Brittle-ductile zone identification based on Young's modulus, Poison's ratio, tensile strength and uniaxial compression strength were giving consistent results. The workflow of this research study enables us to understand the brittle-ductile behavior of the reservoir rock using mechanical properties and their correlation with such parameters which are easily available from well logging.

Authors: Mr KHAN, ibraheem; Mr ISMAIL, Atif; Mr ALI, Imad

Presenter: Mr KHAN, ibraheem

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