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PREDICTION OF RESERVOIR FRACTURE POTENTIAL AND ITS DISTRIBUTION IN THREE DIMENSIONS IN AN ORDOVICIAN RESERVOIR IN ALGERIA

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Curvature analysis, which is extensively used for predicting fracture distribution in reservoirs, can only predict surface fracture potential. It is the combination of surface curvature and stratigraphic analysis, which allows prediction of reservoir fracture distribution in three dimensions.

Rock accommodates the strain caused by stress during tectonic rock deformation subject to its intrinsic (static) mechanical properties such as grain size, porosity and bed thickness. Thin bedded, fine-grained, and low porosity rocks, or namely brittle rocks, accommodate the strain by natural fracturing. It, therefore, is reasonable to use rock property-based measurements as a predictive tool to assess fracture potential in a reservoir.

This paper describes the stratigraphic (static) fracture potential calculated from well rock mechanical properties such as grain size, porosity, and bed thickness. Grain size and bed thickness were defined using API content of Gamma Ray, and the resulting electro-rock fabric analyses were calibrated to the results of sedimentological analyses of the cored wells. Relationships between fracture density and grain size, porosity and bed thickness in cored wells were established, and formed a basis for evaluation and subsequent prediction of the static fracture potential in the uncored areas of the field.

Curvature analysis utilises; a) first derivative of depth maps to examine folds of different wavelengths, and b) second derivative of depth maps to estimate relative strain distribution. The combination of rock properties and curvature analysis is used to identify areas of fracture potential, and most likely fracture orientation. The analysis was benefited from calibration to the well production test data. This methodology was applied to optimise well locations in the Ordovician sandstone reservoir in Ohanet Field, Algeria.