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Poster No. 18

PROCEEDINGS INDONESIAN PETROLEUM ASSOCIATION
Twenty Fourth Annual Convention, October 1995

FIELD WIDE FORMATION PRESSURE GRADIENT AND FRACTURE PRESSURE CHARACTERIZATION

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ABSTRACT

Field-wide characterization of formation pore pressure and fracture gradients are being performed using a newly developed analytical technique that integrates seismic geophysics, open hole logs, drilling performance data and a proprietary formation mechanical property program. Interval Transit Time (ITT) data is extracted from surface seismic surveys at calibration wells and at an undrilled location using proprietary and vendor supplied programs. A specialized processing flow is then developed to enhance the signal quality and frequency content of the seismic data necessary to produce optimized pseudo sonic curves according to depth.

Offset well open hole sonic log calibration permits pore pressure overlay construction using the ITT data set at the control well site. This overlay is then used with the ITT trace generated at the undrilled well location to estimate pore pressure at various depths. Additionally, field-wide pore pressure attribute cubes can be generated using 3-D velocity data. Specific pore pressure horizons are used to map equipotential pressure surfaces to optimize well planning and to assess possible fluid migration pathways and barriers.

Formation fracture pressure gradients are estimated at the undrilled well location using the ITT and pressure data coupled with Chevron's proprietary Rock Mechanics Algorithm (RMA) Program. The RMA program estimates formation strength and stress field magnitudes surrounding the borehole to determine wellbore stability attributes.

To date, the technique has been utilized in West Africa, South America, Western Australia, the North Sea and the Gulf of Mexico. A number of these wells are planned to be drilled by the third quarter of 1995. Results from some of these wells will be presented.

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