ABSTRAK

PENENTUAN MODEL MEKANIKA BUMI 1D DAN ANALISIS STABILITAS LUBANG BOR UNTUK SUMUR USULAN P-1

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Sumur usulan P-1 merupakan sumur berarah yang direncanakan akan dibor hingga kedalaman 3155.132 mTVDSS/3218 mMDSS yang terletak di Lapangan "ARI", Cekungan Kutai, Kalimantan Timur. Sumur – sumur terdekat dari sumur usulan P-1 (Jarak kurang dari 2 km) menunjukkan adanya masalah seperti *connection gas, stuck pipe,* dan *wellbore collapse.* Oleh karena itu, diperlukan analisis stabilitas lubang bor pada sumur usulan untuk memastikan operasi pengeboran yang aman dan efisien.

Dengan menggunakan data dari sumur – sumur terdekat dengan jarak kurang dari 2 km, Model Mekanika Bumi 1D dan analisis stabilitas lubang bor dihitung, direncanakan, dan dianalisa. Prediksi *pore pressure* untuk sumur usulan P-1 dilakukan menggunakan metode *anamorph depth-shifted effective stress* yang kemudian dikalibrasi dengan data uji tekanan dari sumur – sumur terdekat. *Fracture gradient* dihitung berdasarkan prediksi *pore pressure*, studi *overburden gradient*, dan data *Leak-off Test* (LOT). Geomekanik pada sumur usulan diprediksi dengan merata – ratakan data log pada surrounding wells berdasarkan data marker.

Hasil menunjukkan bahwa didapatkan *Shear failure gradient* (SFG) berkisar antara 1.16 – 1.46 SG di zona tekanan normal hidrostatik (0 – 2945.15 mTVDSS) dan 1.40 – 1.52 SG di zona tekanan lebih (2945.15 –3155.132 mTVDSS). Rentang tekanan lumpur yang dihitung antara SFG dan tegangan horizontal minimum, memberikan panduan untuk menentukan berat lumpur optimal guna mencegah ketidakstabilan lubang bor, runtuhan, atau kehilangan sirkulasi. Analisis kestabilan lubang bor (*stereonet*) merekomendasikan lintasan sumur ke arah timur laut–barat daya (N 20 – 60º E dan S 20 – 60º W) dengan kemiringan 40 – 70º untuk meningkatkan stabilitas dan mengurangi risiko pengeboran.

Kata kunci: *Wellbore stability, collapse, 1D MEM, mud window, stereonet*

ABSTRACT

DETERMINATION OF 1D MECHANICAL EARTH MODEL AND WELLBORE STABILITY ANALYSIS FOR PROPOSED WELL P-1

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The proposed well P-1 is a directional well planned to be drilled to a depth of 3155.132 mTVDSS/3218 mMDSS located in the "ARI" Field, Kutai Basin, East Kalimantan. The surrounding wells (less than 2 km) from the proposed well P-1 showed problems such as gas connection, stuck pipe, and wellbore collapse. Therefore, a borehole stability analysis is required on the proposed well to ensure safe and efficient drilling operations.

Using data from surrounding wells with a distance of less than 2 km, a 1D Mechanical Earth Model and borehole stability analysis were calculated, planned, and analyzed. Pore pressure prediction for the proposed well P-1 was performed using the anamorph depth-shifted effective stress method which was then calibrated with pressure test data from surrounding wells. Fracture gradient was calculated based on pore pressure prediction, overburden gradient study, and Leak-off Test (LOT) data. Geomechanics of the proposed well were predicted by averaging log data on surrounding wells based on marker data.

The results show that the Shear failure gradient (SFG) ranges from 1.16 – 1.46 SG in the hydrostatic normal pressure zone (0 – 2945.15 mTVDSS) and 1.40 – 1.52 SG in the overpressure zone (2945.15 –3155.132 mTVDSS). The calculated mud pressure range between SFG and minimum horizontal stress provides a guideline for determining the optimal mud weight to prevent borehole instability, collapse, or loss of circulation. The borehole stability analysis (stereonet) recommends a well trajectory to the northeast–southwest (N 20 – 60º E and S 20 – 60º W) with inclination of 40 – 70º to improve stability and reduce drilling risk.

Keywords: Wellbore stability, collapse, 1D MEM, mud window, stereonet