

ANALISIS GEOMEKANIKAL UNTUK REKOMENDASIL TEKNIS  
PEMBORAN DI LAPANGAN “MRFP”, SUB-CEKUNGAN JATIBARANG,  
CEKUNGAN JAWA BARAT UTARA

Maisyarah

13/346778/TK/40626

Penelitian Tugas Akhir mengenai analisis geomekanika untuk rekomendasi teknis pemboran di Lapangan “MRFP” bertujuan untuk meningkatkan efisiensi serta evektivitas pemboran. Lapangan “MRFP” berlokasi di Cekungan Jawa Barat Utara, lebih tepatnya pada sub-Cekungan Jatibarang. Terdapat lima belas sumur produksi dan eksplorasi pada daerah penelitian. Masalah pemboran seperti *kick* dan *lost circulation* sering terjadi selama aktivitas pemboran dilakukan pada 15 sumur tersebut. Oleh karena itu, penting untuk menentukan rentang berat jenis lumpur pemboran, prediksi kondisi tekanan bawah permukaan abnormal, kedalaman penempatan *casing* serta arah sumur pemboran untuk mencegah terjadinya *kick* dan *lost circulation*.

Penentuan rentang berat jenis lumpur pemboran, kondisi tekanan bawah permukaan abnormal, kedalaman penempatan *casing* dan arah sumur pemboran didasarkan atas analisis geomekanika, meliputi tegangan vertikal ( $S_v$ ), tegangan horisontal minimum ( $S_{hmin}$ ), tekanan pori ( $P_p$ ), tegangan horisontal maksimum ( $S_{HMaks}$ ), kekuatan batuan serta struktur geologi yang terdapat pada batuan.

Setelah analisis geomekanika dilakukan, dapat diketahui bahwa rentang berat jenis lumpur pemboran yang digunakan pada Formasi Cibulakan Atas dan Talang Akar berkisar antara 12.6 – 13.8 ppg, sedangkan pada Formasi Parigi, Formasi Baturaja dan Formasi Jatibarang berkisar antara 11 – 12.7 ppg. Selain itu, daerah penelitian telah mengalami kondisi tekanan bawah permukaan abnormal dengan gradien tekanan pori rata-rata mencapai 0.56 psi/ft. *Hard overpressure* terjadi pada Formasi Cibulakan Atas dan Formasi Talang Akar, sedangkan *low-transition overpressure* terjadi pada Formasi Parigi, Formasi Baturaja dan Formasi Jatibarang. Kondisi *overpressure* disebabkan oleh mekanisme *unloading* akibat proses pematangan hidrokarbon dan transformasi mineral.

*Conductor casing* dipasang pada Formasi Parigi dan diikuti oleh *surface casing*. *Intermediet casing* dipasang pada Formasi Cibulakan Atas dan Talang Akar, sedangkan *production casing* dipasang pada Formasi Talang Akar dan Baturaja. Penempatan *casing* pertama kali haruslah menghindari kondisi tekanan pori yang sangat tinggi (*hard overpressure*) guna mengurangi resiko dan bahaya dalam operasi pemboran.

Tegangan horisontal maksimum berarah utara-selatan dan arah tegangan horisontal minimum tegak lurus terhadapnya. Arah sumur pemboran (*wellbore trajectory*) yang paling baik adalah yang memotong  $S_{HMaks}$  serta  $S_{hmin}$ , yaitu berarah barat laut-tenggara. Selain itu, dikarenakan nilai dari  $S_{hmin}$  dan  $S_v$  relatif sama, maka pemboran secara vertikal, horisontal maupun *directional* aman untuk dilakukan.

Kata kunci: Sub-Cekungan Jatibarang, Geomekanika, Tekanan Bawah Permukaan Abnormal,  $S_v$ ,  $S_{HMaks}$ ,  $S_{hmin}$ ,  $P_p$ , Kekuatan Batuan, Rentang Berat Jenis Lumpur Pemboran, Kedalaman Penempatan *Casing*, Arah Sumur Pemboran.

**ABSTRACT**

**GEOMECHANICAL ANALYSIS FOR DRILLING TECHNICAL  
RECOMMENDATIONS IN “MRFP” FIELD, JATIBARANG SUB BASIN,  
NORTHWEST JAVA BASIN**

Maisyarah

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Research about geomechanical analysis for drilling technical recommendations in “MRFP” field aims to improve efficiency and effectiveness of drilling. “MRFP” field located in Northwest Java Basin, more precisely in Jatibarang sub basin. There are fifteen production and exploration wells in the study area. Drilling problems such as kick and lost circulation often occur during drilling activities. Therefore, it is important to determine mud weight window, the prediction of abnormal subsurface pressure conditions (overpressure), the depth of casing placement and wellbore trajectory to prevent kick and lost circulation.

Determination of mud weight window, abnormal subsurface pressure conditions, depth of casing placement and direction of drilling wells (wellbore trajectory) were based on geomechanical analysis, such as overburden pressure ( $S_v$ ), minimum horizontal stress ( $S_{hmin}$ ), pore pressure ( $P_p$ ), maximum horizontal stress ( $S_{HMaks}$ ), rock strength and geological structure found in rocks.

After the geomechanical analysis was done, it can be seen that the range of drilling mud weights used in Upper Cibulakan Formation and Talang Akar Formation ranged from 12.6 - 13.8 ppg, while in Parigi Formation, Baturaja Formation and Jatibarang Formation ranged between 11-12.7 ppg. In addition, the study area has undergone abnormal subsurface pressure conditions with an average pore pressure gradient of 0.56 psi / ft. Hard overpressure occurs in Upper Cibulakan Formation and Talang Akar Formation, while low-transition overpressure occurs in Parigi Formation, Baturaja Formation and Jatibarang Formation. Overpressure conditions are caused by unloading mechanisms (hydrocarbon generation and mineral transformation).

Conductor casing is installed on Parigi Formation and is followed by the surface casing. Intermediate casing is installed in Upper Cibulakan Formation and Talang Akar Formation, while the production casing is installed on Talang Akar and Baturaja Formation. Placement of the casing must first avoid a very high pore pressure condition (hard overpressure) in order to reduce the risk and danger in drilling operations.

The direction of maximum horizontal stress is north-south and minimum horizontal stress direction is perpendicular to it. The direction of wellbore trajectory is best at northwest-southeast. In addition, since the values of  $S_{hmin}$  and  $S_v$  are relatively similar, vertical, horizontal or directional drilling is safe to do.

**Keywords:** Jatibarang sub basin, Geomechanics, Overpressure, ,  $S_v$ ,  $S_{HMaks}$ ,  $S_{hmin}$ ,  $P_p$ , Rock Strength, Mud Weight Window, Casing Placement, Wellbore Trajectory.