ABSTRAK

PERENCANAAN PENERAPAN *MANAGED PRESSURE DRILLING* METODE *CONSTANT BOTTOM HOLE PRESSURE* PADA *SECTION* 8 1/2" DAN 6 1/8" SUMUR MSDF-25 LAPANGAN HNF

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Pada kegiatan pengeboran sumur sebelumnya, yaitu sumur MSDF-24, ditemukan kondisi *narrow pressure window,* dimana perbedaan antara tekanan pori dan gradien rekah hanya sebesar 2 ppg. Kondisi ini menyebabkan terjadinya permasalahan *kick* dan *lost circulation* akibat fluktuasi tekanan yang melebihi batas aman ketika pengeboran dilakukan secara konvensional. Untuk mengatasi potensi permasalahan serupa pada pengeboran sumur MSDF-25, penelitian ini merancang penerapan metode *Managed Pressure Drilling* (MPD) dengan tipe *Constant Bottom Hole Pressure* (CBHP). Metode ini memungkinkan pengebdalian tekanan annulus secara real-time, sehingga tekanan dasar sumur dapat dipertahankan berada dalam rentang jendela tekanan aman selama proses pengeboran berlangsung.

Serangkaian analisis dilakukan dalam penelitian ini, yang mencakup penentuan zona *narrow pressure window*, perhitungan parameter hidrolika lumpur pengeboran, serta evaluasi karakteristik aliran melalui perhitungan nilai *Reynolds Number* (Nre) dan *Critical Reynolds Number* (cNre). Selanjutnya, dilakukan perhitungan *Annular Friction Pressure* (AFP) untuk menentukan nilai *Equivalent Circulating Density* (ECD) pada masing-masing section pengeboran. Selain itu, efisiensi pembersihan lubang dianalisis melalui parameter *Cutting Transport Ratio* (CTR) dan *Cutting Concentration* (CC). Pada tahap akhir, dilakukan perhitungan nilai minimum *Surface Back Pressure* (SBP) yang diperlukan pada masing-masing section saat lumpur tidak tersirkulasi, guna menggantikan nilai *Annular Friction Pressure* (AFP) yang hilang dan memastikan tekanan dasar sumur tetap berada dalam jendela tekanan yang aman.

Hasil analisis menunjukkan nilai *Equivalent Circulating Density* (ECD) sebesar 14–15 ppg, masih di bawah gradien rekah. Efisiensi pembersihan lubang tercapai dengan *Cutting Transport Ratio* (CTR) > 90% dan *Cutting Concentration* (CC) < 5%. Nilai minimum *Surface Back Pressure* yang dibutuhkan masing-masing sebesar 718,86 psi dan 628,98 psi. Berdasarkan hasil tersebut, metode *Managed Pressure Drilling* (MPD) tipe *Constant Bottom Hole Pressure* (CBHP) dinilai paling sesuai diterapkan pada pengeboran sumur MSDF-25.

Kata kunci: *Constant Bottom Hole Pressure, Equivalent Circulating Density, Hole Cleaning, Managed Pressure Drilling, Surface Back Pressure.*

ABSTRACT

PLANNING FOR THE IMPLEMENTATION OF MANAGED PRESSURE DRLLING USING THE CONSTANT BOTTOM HOLE PRESSURE METHOD IN THE 8 1/2" AND 6 1/8" SECTIONS OF WELL MSDF-25, HNF FIELD

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In the previous drilling operation at well MSDF-24, a narrow pressure window condition was encountered, where the difference between pore pressure and fracture gradient was only 2 ppg. This condition led to kick *and* lost circulation *incidents due to pressure fluctuations exceeding the safe operational limits when conventional drilling techniques were applied. To address the potential occurrence of similar issues in the drilling of well MSDF-25, this study designs the application of the Managed Pressure Drilling (MPD) method using the Constant Bottom Hole Pressure (CBHP) technique. This method enables real-time control of annular pressure, thereby maintaining bottom hole pressure within the safe pressure window throughout the drilling process.*

A series of analyses were conducted in this study, including the determination of the narrow pressure window zone, calculation of drilling mud hydraulic parameters, and evaluation of flow characteristics through the calculation of Reynolds Number (Nre) and Critical Reynolds Number (cNre). Subsequently, Annular Friction Pressure (AFP) was calculated to determine the Equivalent Circulating Density (ECD) for each drilling section. In addition, hole cleaning efficiency was analyzed based on the parameters of Cutting Transport Ratio (CTR) and Cutting Concentration (CC). In the final stage, the minimum required Surface Back Pressure (SBP) for each section during non-circulating conditions was calculated to compensate for the loss of Annular Friction Pressure (AFP) and ensure that bottom hole pressure remains within the safe pressure window.

The analysis results indicate that the Equivalent Circulating Density (ECD) ranges from 14 to 15 ppg, remaining below the fracture gradient. Hole cleaning efficiency was achieved with a Cutting Transport Ratio (CTR) of over 90% and Cutting Concentration (CC) below 5%. The minimum Surface Back Pressure (SBP) required was 718.86 psi and 628.98 psi, respectively. Based on these findings, the Managed Pressure Drilling (MPD) method using the Constant Bottom Hole Pressure (CBHP) technique is considered the most appropriate approach for the drilling operation of well MSDF-25.

Keywords: Constant Bottom Hole Pressure, Equivalent Circulating Density, Hole Cleaning, Managed Pressure Drilling, Surface Back Pressure.