Formulasi dan Analisis Performa Synthetic-Based Mud (SBM) Berbasis Minyak Nabati Terhidrogenasi
Sebagai Drilling Fluid
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# FORMULASI DAN ANALISIS PERFORMA *SYNTHETIC-BASED MUD* (SBM) BERBASIS MINYAK NABATI TERHIDROGENASI SEBAGAI DRILLING FLUID

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## RINGKASAN

Telah dilakukan penelitian mengenai formulasi dan analisis performa *Synthetic-Based Mud* (SBM) berbasis minyak nabati terhidrogenasi sebagai *drilling fluid*. Penelitian ini dilatarbelakangi oleh kebutuhan alternatif *base fluid* yang lebih ramah lingkungan dibandingkan *mineral oil*, tetapi tetap mampu memberikan performa reologi, kontrol filtrasi, dan stabilitas emulsi yang baik. Penelitian ini bertujuan untuk mengkaji karakteristik n-HVO sebagai *base fluid* maupun campuran dengan SF-04, serta mengevaluasi peningkatan fraksi n-HVO terhadap performa SBM sebelum dan setelah proses aging suhu tinggi.

Penelitian ini diawali dengan karakterisasi *base fluid* SF-04, GBF-10, GBF-50, dan n-HVO melalui analisis distribusi fraksi hidrokarbon, parameter fisikokimia, dan distilasi. Formulasi SBM dilakukan dengan *Oil-Water Ratio* 75:25 menggunakan n-HVO sebagai *base fluid* serta campuran n-HVO/SF-04. Pengujian *drilling fluid* dilakukan pada kondisi *Before Hot Roll* (BHR) dan *After Hot Roll* (AHR) setelah perlakuan aging pada 177 °C selama 16 jam. Parameter yang diuji meliputi densitas, reologi, *gel strength*, LSRYP, HPHT *fluid loss*, *filter cake thickness*, *electrical stability* (ES), retort test, *excess lime*, dan *chloride content*.

Hasil penelitian menunjukkan bahwa n-HVO memiliki kandungan n-parafin sebesar 85,9% dan viskositas kinematik tertinggi sebesar 3,309 $mm^2/s$, tetapi menghasilkan respon reologi paling rendah pada kondisi BHR. Perubahan reologi minimum antara kondisi BHR dan AHR diperoleh pada GBF-10, dengan persentase perubahan *gel strength* 10 detik, *gel strength* 10 menit, dan LSRYP masing-masing sebesar 57, 51, dan 75%. Pada pengujian HPHT *fluid loss*, n-HVO menunjukkan nilai tertinggi sebesar 3,2 mL/30 menit pada BHR dan 4,4 mL/30 menit pada AHR, namun seluruh formulasi masih memenuhi spesifikasi <5 mL/30 menit. Nilai ES tertinggi setelah aging diperoleh pada GBF-50 sebesar 963 volt. Secara keseluruhan, n-HVO berpotensi digunakan sebagai *base fluid* SBM, tetapi peningkatan fraksinya tidak menghasilkan peningkatan performa yang linier pada seluruh parameter.

**Kata kunci:** SBM, n-HVO, *drilling fluid*, reologi, *electrical stability*

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# FORMULATION AND PERFORMANCE ANALYSIS OF HYDROGENATED VEGETABLE OIL-BASED SYNTHETIC-BASED MUD (SBM) AS A DRILLING FLUID

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## ABSTRACT

A study on the formulation and performance analysis of hydrogenated vegetable oil-based Synthetic-Based Mud (SBM) as a drilling fluid has been conducted. This research was motivated by the need for a more environmentally friendly alternative base fluid to mineral oil while maintaining good rheological performance, filtration control, and emulsion stability. This study aimed to evaluate the characteristics of n-HVO as base fluid and blended base fluid with SF-04, and to assess the effect of increasing n-HVO fraction on SBM performance before and after high-temperature aging.

The study began with the characterization of SF-04, GBF-10, GBF-50, and n-HVO base fluids through hydrocarbon fraction distribution analysis, physicochemical testing, and distillation analysis. SBM formulations were prepared with an Oil-Water Ratio of 75:25 using n-HVO as base fluid and blended base fluid with SF-04. The drilling fluid performance was evaluated under Before Hot Roll (BHR) and After Hot Roll (AHR) conditions after aging at 177 °C for 16 hours. The tested parameters included density, rheology, gel strength, LSRYP, HPHT fluid loss, filter cake thickness, electrical stability (ES), retort test, excess lime, and chloride content.

The results showed that n-HVO had an n-paraffinic content of 85.9% and the highest kinematic viscosity of 3.309 mm²/s, but produced the lowest rheological response under BHR conditions. The minimum rheological changes between BHR and AHR were obtained in GBF-10, with percentage changes in 10-second gel strength, 10-minute gel strength, and LSRYP of 57%, 51%, and 75%, respectively. In the HPHT fluid loss test, n-HVO showed the highest values of 3.2 mL/30 min under BHR and 4.4 mL/30 min under AHR; however, all formulations remained below the specification limit of <5 mL/30 min. The highest ES after aging was obtained in GBF-50, reaching 963 volts. Overall, n-HVO has potential as an SBM base fluid, but increasing its fraction did not result in a linear improvement in performance across all parameters.

**Keywords:** SBM, n-HVO, drilling fluid, rheology, electrical stability