

ABSTRAK

OPTIMASI GEOMETRI REKAHAN MELALUI PENGENDALIAN *TIP SCREENOUT* (TSO) PADA *HYDRAULIC FRACTURING* SUMUR WPP-02

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Sumur WPP-02 pada Lapangan NHR, Kabupaten Indramayu, Jawa Barat, telah dilakukan kerja ulang pindah lapisan (KUPL) dari Lapisan J ke Lapisan H Formasi Upper Cibulakan dengan permeabilitas 5,7 mD. Untuk meningkatkan produktivitas sumur, dilakukan stimulasi *hydraulic fracturing* yang berhasil meningkatkan laju produksi menjadi 252 BOPD dan 0,57 MMSCFD. Meskipun target produksi tercapai, evaluasi profil *net pressure* menunjukkan indikasi *tip-screenout* (TSO) yang tidak disengaja pada akhir pemompaan berdasarkan analisis Nolte-Smith, yang mengindikasikan desain *existing* belum optimal.

Penelitian ini bertujuan mengevaluasi desain *existing* dan mengoptimalkan geometri rekahan melalui pengendalian TSO menggunakan *software* dengan model geometri *Pseudo Three-Dimensional* (P3D). Tahapan penelitian meliputi pemodelan ulang desain *existing* sebagai model *basecase*, analisis sensitivitas terhadap PAD volume, *pump rate*, *proppant schedule*, dan distribusi volume fluida menggunakan metode *one-at-a-time* (OAT), serta kombinasi parameter terbaik untuk memperoleh desain optimum. Evaluasi produktivitas dilakukan melalui perhitungan permeabilitas rekahan rata-rata (K_{avg}) dan *Folds of Increase* (FOI).

Hasil validasi menunjukkan model *basecase* memiliki *error* geometri rekahan di bawah 10% dan mampu merepresentasikan kondisi lapangan. Analisis sensitivitas menunjukkan bahwa penambahan PAD volume dan peningkatan *pump rate* merupakan parameter paling efektif untuk mengendalikan TSO, sedangkan modifikasi *proppant schedule* menurunkan konduktivitas rekahan. Desain optimum diperoleh melalui penambahan PAD volume 20% dan peningkatan *pump rate* menjadi 13 BPM, menghasilkan panjang rekahan 325,2 ft dan konduktivitas rekahan 6.180 mD-ft. Optimasi tersebut meningkatkan K_{avg} dari 38,84 mD menjadi 44,04 mD dan FOI dari 4,196 menjadi 4,386, sehingga berhasil meningkatkan performa stimulasi *hydraulic fracturing* pada Sumur WPP-02.

Kata kunci: *folds of increase*, *hydraulic fracturing*, optimasi geometri rekahan, *pseudo three-dimensional*, *tip-screenout*.

ABSTRACT

OPTIMIZATION FRACTURE GEOMETRY THROUGH TIP SCREENOUT (TSO) CONTROL IN HYDRAULIC FRACTURING OF WELL WPP-02

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Well WPP-02 in the NHR Field, Indramayu Regency, West Java, underwent a workover for a zone change from Layer J to Layer H of the Upper Cibulakan Formation, which exhibits a permeability of 5.7 mD. To enhance well productivity, a hydraulic fracturing stimulation was executed, successfully increasing the production rate to 252 BOPD and 0.57 MMSCFD. Although the target production was achieved, evaluation of the net pressure profile revealed indications of an unintentional tip-screenout (TSO) at the end of the pumping phase based on Nolte-Smith analysis, implying that the existing design was sub-optimal.

This study aims to evaluate the existing design and optimize fracture geometry through TSO control utilizing software with a Pseudo Three-Dimensional (P3D) geometry model. The research stages comprised remodeling the existing design as a basecase model, conducting sensitivity analysis on PAD volume, pump rate, proppant schedule, and fluid volume distribution using the one-at-a-time (OAT) method, and combining the best parameters to obtain the optimum design. Productivity evaluation was performed by calculating the average fracture permeability (K_{avg}) and Fold of Increase (FOI).

The validation results demonstrate that the basecase model has a fracture geometry error of below 10%, effectively representing field conditions. Sensitivity analysis indicates that expanding the PAD volume and increasing the pump rate are the most effective parameters to control TSO, whereas modifying the proppant schedule reduces fracture conductivity. The optimum design was achieved by increasing the PAD volume by 20% and raising the pump rate to 13 BPM, which yielded a fracture half-length of 325.2 ft and a fracture conductivity of 6,180 mD-ft. This optimization increased K_{avg} from 38.84 mD to 44.04 mD and the FOI from 4.196 to 4.386, thereby successfully enhancing the hydraulic fracturing stimulation performance in Well WPP-02.

Keywords: folds of increase, fracture geometry optimization, hydraulic fracturing, pseudo three-dimensional, tip-screenout.