

ABSTRAK

OPTIMASI PRODUKSI DAN EVALUASI KEEKONOMIAN KONVERSI SRP-ESP PADA SUMUR “DA-25” DI LAPANGAN “DAP”

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Sumur “DA-25” merupakan sumur minyak *mature* dengan karakteristik *water cut* tinggi yang mengalami penurunan laju produksi selama dioperasikan menggunakan metode pengangkatan buatan *Sucker Rod Pump* (SRP). Untuk mempertahankan keberlanjutan produksi, dilakukan konversi metode pengangkatan buatan menjadi *Electric Submersible Pump* (ESP). Penelitian ini bertujuan untuk mengevaluasi kinerja produksi dan keekonomian setelah konversi ESP, serta menganalisis pengaruh optimasi frekuensi operasi ESP terhadap peningkatan produksi dan nilai keekonomian sumur.

Metode yang digunakan meliputi analisis produksi historis, *Decline Curve Analysis* (DCA), analisis nodal menggunakan model *Inflow Performance Relationship* (IPR) Wiggins dan *Vertical Lift Performance* (VLP), serta evaluasi keekonomian berdasarkan parameter *Net Present Value* (NPV), *Internal Rate of Return* (IRR), *Pay Out Time* (POT), *Profitability Index Ratio* (PIR), dan *Discounted Profitability Index Ratio* (DPIR). Analisis sensitivitas dilakukan terhadap parameter harga minyak, produksi, CAPEX, dan OPEX. Optimasi frekuensi ESP dilakukan dengan pendekatan sensitivitas perubahan gradien VLP terhadap variasi frekuensi operasi.

Hasil penelitian menunjukkan bahwa konversi SRP ke ESP meningkatkan *Estimated Ultimate Recovery* (EUR) dari 26,04 Mbbl menjadi 132,94 Mbbl dan meningkatkan NPV dari 0,39 MMUSD menjadi 0,88 MMUSD. Optimasi frekuensi operasi ESP dari 41 Hz menjadi 60 Hz meningkatkan laju produksi *liquid* dari 860 bfpd menjadi 1097 bfpd dan laju produksi minyak dari 43 bopd menjadi sekitar 55 bopd. Pada kondisi optimasi, nilai NPV meningkat menjadi 1,31 MMUSD dengan *incremental* NPV sebesar 0,43 MMUSD dibandingkan kondisi ESP *basecase*. Hasil sensitivitas menunjukkan bahwa parameter harga minyak dan produksi paling mempengaruhi NPV, sedangkan parameter harga minyak dan CAPEX memberikan pengaruh terbesar terhadap IRR. Berdasarkan hasil penelitian, konversi ke ESP dan optimasi frekuensi operasi terbukti mampu meningkatkan performa produksi dan keekonomian Sumur “DA-25”.

Kata kunci: Analisis Nodal, *Decline Curve Analysis*, *Electric Submersible Pump*, Keekonomian, Optimasi Frekuensi

ABSTRACT

ECONOMIC EVALUATION OF SRP-TO-ESP CONVERSION AND PRODUCTION OPTIMIZATION IN WELL “DA-25”

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“DA-25” is a mature oil well characterized by high water cut and declining production performance during operation using a Sucker Rod Pump (SRP) artificial lift system. To maintain production sustainability, the artificial lift method was converted to an Electric Submersible Pump (ESP). This study aims to evaluate the production performance and economic feasibility after ESP conversion, as well as to analyze the effect of ESP operating frequency optimization on production enhancement and well economics.

The methods applied in this study include historical production analysis, Decline Curve Analysis (DCA), nodal analysis using the Wiggins IPR model and Vertical Lift Performance (VLP), as well as economic evaluation based on Net Present Value (NPV), Internal Rate of Return (IRR), Pay Out Time (POT), Profitability Index Ratio (PIR), and Discounted Profitability Index Ratio (DPIR). Sensitivity analysis was conducted on oil price, production, CAPEX, and OPEX parameters. ESP frequency optimization was performed using a sensitivity approach on VLP gradient changes under various operating frequencies.

The results indicate that the conversion from SRP to ESP increased the Estimated Ultimate Recovery (EUR) from 26.04 Mbbl to 132.94 Mbbl and improved the NPV from 0.39 MMUSD to 0.88 MMUSD. Optimization of ESP operating frequency from 41 Hz to 60 Hz increased the liquid production rate from 860 bfpd to 1097 bfpd and the oil production rate from 43 bopd to approximately 55 bopd. Under optimized conditions, the NPV increased to 1.31 MMUSD with an incremental NPV of 0.43 MMUSD compared to the ESP basecase condition. Sensitivity analysis showed that oil price and production are the most influential parameters affecting NPV, while oil price and CAPEX have the greatest influence on IRR. Based on the results, ESP conversion and operating frequency optimization were proven to improve both production performance and the economic value of Well “DA-25”.

Keywords: Decline Curve Analysis, Economic Evaluation, Electric Submersible Pump, Frequency Optimization, Nodal Analysis

