ABSTRAK

OPTIMASI DESAIN *ELECTRIC SUBMERSIBLE PUMP* UNTUK MENINGKATKAN PRODUKSI MELALUI UJI SENSITIVITAS PARAMETER PADA SUMUR "N"

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Sumur "N" di Lapangan "A" merupakan sumur produksi yang menggunakan sistem pengangkatan buatan (*artificial lift*) berupa *Electric Submersible Pump* (ESP). Pompa yang digunakan adalah tipe REDA S8000N/35 Hz/42 *stages* yang dipasang pada kedalaman 5788 ft MD. Laju produksi aktual mendekati batas atas *recommended operating range*, sehingga berisiko menimbulkan gejala *upthrust*. Selain itu, *total dynamic head* (TDH) yang dibutuhkan tidak terpenuhi oleh *head* yang dihasilkan pompa, dengan efisiensi sebesar 64%. Ketidaksesuaian ini meningkatkan potensi terjadinya *flumping* (*flowing and pumping*) yang dapat menurunkan efisiensi produksi.

Penelitian ini dilakukan dengan mengumpulkan data sumur, data produksi, data reservoir, data PVT, dan data ESP terpasang. Analisis produktivitas formasi dilakukan melalui *Inflow Performance Relationship* (IPR) menggunakan metode Wiggins. Evaluasi performa ESP dilakukan terhadap kinerja pompa terpasang untuk mengidentifikasi potensi permasalahan, kemudian dilanjutkan dengan optimasi desain melalui uji sensitivitas terhadap parameter frekuensi, kedalaman pemasangan pompa, jumlah *stage*, dan pemilihan motor.

Hasil analisis IPR menunjukkan bahwa nilai laju alir maksimum sebesar 47.291,22 BFPD. Optimasi desain ESP menghasilkan konfigurasi dengan tipe pompa REDA S8000N/51 Hz/59 *stages* yang dipasang pada kedalaman 5264,70 ft MD. Desain ini mampu meningkatkan laju produksi hingga 6576,85 BFPD dengan produksi minyak mencapai 540,77 BOPD. Pompa menghasilkan *head* sebesar 2.165,60 ft yang sesuai dengan kebutuhan *total dynamic head* (TDH) sebesar 2.165,58 ft, serta peningkatan efisiensi pompa menjadi 76%. Selain itu, Motor REDA Maximus 562/150 HP/1486 V/61 A tetap dapat digunakan karena masih mampu memenuhi kebutuhan daya operasi pompa.

Kata kunci: *Electric Submersible Pump*, evaluasi pompa, *upthrust*, *flumping*, perencanaan ulang.

ABSTRACT

OPTIMIZATION OF ELECTRIC SUBMERSIBLE PUMP DESIGN TO INCREASE PRODUCTION THROUGH PARAMETER SENSITIVITY ANALYSIS IN WELL "N"

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Well "N" in Field "A" is a production well that utilizes an artificial lift system in the form of an Electric Submersible Pump (ESP). The pump used is a REDA S8000N/35 Hz/42 stages, installed at a depth of 5,788 ft MD. The current production rate approaches the upper limit of the recommended operating range, which poses a risk of upthrust. In addition, the required total dynamic head (TDH) is not met by the head generated by the pump, with an efficiency of only 64%. This mismatch increases the potential for flumping (flowing and pumping), which can reduce overall production efficiency.

This study was conducted by collecting well data, production data, reservoir data, PVT data, and specifications of the installed ESP. Formation productivity was analyzed using the Inflow Performance Relationship (IPR) curve generated with the Wiggins method. An evaluation of the installed ESP's performance was carried out to identify potential issues, followed by design optimization through sensitivity analysis of parameters such as operating frequency, pump setting depth, number of stages, and motor selection.

The IPR analysis showed that the maximum flow rate was 47,291.22 BFPD. The optimized ESP design resulted in a configuration using a REDA S8000N/51 Hz/59 stages, installed at a depth of 5,264.70 ft MD. This configuration was able to increase production to 6,576.85 BFPD, with an oil production rate of 540.77 BOPD. The pump produced a head of 2,165.60 ft, which matches the required total dynamic head (TDH) of 2,165.58 ft, and improved pump efficiency to 76%. Furthermore, the REDA Maximus 562 motor with specifications of 150 HP, 1,486 V, and 61 A remained suitable for operation, as it was still capable of meeting the power requirements of the optimized pump system.

Keywords: Electric Submersible Pump, pump evaluation, optimum production rate, Wiggins IPR, pump redesign