



## **The Effect of Stroke Length and SPM Variations on Production Rate and Economic Profitability of AH-052 Well**

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### **ABSTRACT**

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AH-052 well, which uses a Sucker Rod Pump (SRP), began to experience a decline in productivity over time. The performance of the AH-052 oil well in South Sumatra, which uses a Sucker Rod Pump (SRP) as an artificial lift system. This well has a depth of 289.87 meters with a perforation interval of 236.52–238.05 meters. Before optimization, this well produced 264 BFPD with a 97% water cut and a pump efficiency of only 72.28%. Through variations in the SRP pump system parameters, the available equipment specifications were 1 1/4-inch and 1 1/8-inch rods, rod number 109, a 2-inch plunger, a stroke length (SL) of 140 inches, and a pump speed (n) of 5 spm. The parameters used successfully increased pump efficiency significantly to 91.12% and production rate to 381.2 BFPD. Economic feasibility analysis based on the Production Sharing Model Contract Cost Recovery contract model showed very positive results. This project generated a Net Present Value (NPV) of MU\$202.08, an Internal Rate of Return (IRR) of 1153%, a Payback Time (PBT) of 0.086 years, and a Profitability Index (PI) of 22.56. Based on these indicators, this optimization project is considered highly financially viable and provides substantial benefits.

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## INTRODUCTION

Initially, oil wells can produce through natural flow mechanisms, which occur when the reservoir formation pressure exceeds the hydrostatic pressure in the wellbore. However, over time, a predictable decline in reservoir pressure leads to reduced production rates or, in some cases, a complete cessation of flow. This phenomenon is caused by the depletion of reservoir energy, which renders the reservoir unable to drive fluids from the formation to the surface. Consequently, to sustain production levels in accordance with the well's potential, the implementation of artificial lift methods becomes imperative.

Common artificial lift techniques employed within the oil and gas industry include sucker rod pumps (SRP), hydraulic pumping units (HPU), electric submersible pumps (ESP), progressive cavity pumps (PCP), Gas Lift, and Plunger Elevators. The selection of a specific artificial lift system must take into account reservoir characteristics, wellbore conditions, surface constraints, and other operational variables (Amanda et al., 2019).

Among these methods, the Sucker Rod Pump is widely used to lift oil from the wellbore to the surface (Widiyanto & Syahrial 2022). Over extended operational periods, the productivity of an SRP system may undergo degradation. Such performance declines necessitate a rigorous evaluation to determine the mechanical and volumetric efficiencies of the currently installed pumping unit (Indriani et al., 2025).

Well AH-052 currently utilizes an SRP system as its primary artificial lift method. As of April 1, 2024, the well recorded a gross production rate of 264 BFPD with a 97% water cut (WC), yielding a net oil production of 8 BOPD. To optimize Well AH-052's output, comprehensive reservoir and production data are required, particularly through diagnostic procedures such as sonolog testing. Given the critical role of sonolog surveys in evaluating pump performance, this data is vital for technical redesign. Furthermore, an economic analysis of these well service activities is fundamental to assessing the feasibility and viability of the investment opportunity.

## METHODOLOGY

Well AH-052 is an oil production well situated in South Sumatra, utilizing a SRP system as its artificial lift mechanism. The analytical framework for this well incorporates an integrated dataset encompassing pump specifications, wellbore architecture, reservoir properties, and historical production data. Fundamental metrics, including static reservoir pressure (Ps), bottom-hole flowing pressure (Pwf), and oil production rate (Qo), are utilized to determine the Productivity Index (PI) and the inflow performance relationship (IPR), which are essential for evaluating well productivity and performance (Indriani et al., 2025).

The well is completed at a total depth of 289.87 meters (951.063 ft), with the active perforation interval located between 236.52 and 238.05 meters (776.02 – 781.04 ft). Currently, Well AH-052 exhibits a high water cut (WC) of 97% and a gross fluid production rate (Qprod) of 264 barrels of fluid per day (BFPD).

### Well and pump data

Comprehensive monitoring of Well AH-052 has yielded an extensive dataset of operational parameters essential for evaluating the performance of the SRP system. Table 1 delineates the specific well production parameters that serve as the foundational data for optimizing the currently operating SRP unit. Furthermore, in addition to production metrics, technical specifications for the pump and wellbore equipment are pivotal for strategic optimization and redesign of the SRP system. The detailed specifications for the pump and associated equipment utilized in Well AH-052 are systematically presented in Table 2.

Table 1. Production data of well AH-052

| Parameter             | Result  | Unit      |
|-----------------------|---------|-----------|
| Total Production Rate | 264     | BFPD      |
| Bottom Hole Pressure  | 107,652 | Psi       |
| Static Pressure       | 183,296 | Psi       |
| Fluid Gradient        | 1,43    | psi/meter |
| Oil Production Rate   | 8       | BOPD      |
| Water Production Rate | 256     | BWPD      |
| Water Cut             | 97      | %         |
| Specific Gravity Oil  | 0,85    | -         |

Table 1. Production data of well AH-052, (continued).

| Parameter                 | Result | Unit |
|---------------------------|--------|------|
| Specific Gravity of Water | 1,01   | -    |
| SGmix                     | 1,01   | -    |

Table 2. Pump data of well AH-052

| Parameter                  | Result        | Unit              |
|----------------------------|---------------|-------------------|
| Pump Type                  | Conventional  |                   |
| Pump Unit                  | C-640-305-120 |                   |
| Peak Torque Rating         | 640           | ln/lb             |
| Polished Rod Rating        | 305           | lb                |
| Stroke Length              | 120           | Inch              |
| Diameter Casing            | 7             | Inch              |
| Diameter Tubing 2 7/8 (OD) | 2,875         | Inch              |
| Diameter Tubing 2 7/8 (ID) | 2,441         | Inch              |
| Diameter Plunger           | 2,25          | Inch              |
| Berat Rod 1                | 2,9           | lb/ft             |
| Berat Rod 7/8              | 2,22          | lb/ft             |
| Luas Area Rod 1            | 0,785         | Inch <sup>2</sup> |
| Luas Area Rod 7/8          | 0,601         | Inch <sup>2</sup> |
| Stroke Length              | 120           | Inch              |
| Pumping Speed              | 5             | SPM               |
| Service Factor             | 1             |                   |
| Crank Pitman Rasio         | 0,33          |                   |
| Modulus of Elasticity      | 30000000      |                   |
| Displacement Pompa         | 351,78        | BFPD              |

## RESULT AND DISCUSSION

Performance evaluation dictates that the volumetric efficiency of a pumping unit is considered optimal when it falls within the range of 70% to 80% (Brown, 1980). Should the calculated efficiency fall below this established benchmark, subsequent optimization protocols must be implemented. These corrective measures typically involve modifying the plunger diameter, increasing the Strokes Per Minute (*SPM*), and adjusting the

pump's stroke length. While achieving a volumetric efficiency exceeding 80% signifies favorable well performance, the system may still be subject to further enhancement. Continual optimization can be pursued to maximize production potential, contingent upon the technical discretion and recommendations of the presiding petroleum engineers.

### Evaluation of AH-052 well well production capacity

The determination of the well's productivity begins by calculating the static reservoir pressure ( $P_s$ ) and the bottom-hole flowing pressure ( $P_{wf}$ ) from fluid level measurements. By utilizing the mid-perforation depth relative to the static fluid level (*SFL*) and the dynamic fluid level (*DFL*), multiplied by the gradient fluid (*GF*) of 0.435, the  $P_s$  and  $P_{wf}$  are identified as 183.296 psi and 107.652 psi, respectively.

These pressure values are critical for establishing the Productivity Index (PI), which is calculated at 3.49 BFPD/psi for Well AH-052. Consequently, this index allows estimation of the maximum production potential ( $Q_{max}$ ), yielding a theoretical capacity of 435.22 BFPD. These parameters collectively provide a comprehensive baseline for evaluating the inflow performance and optimizing the subsequent artificial lift redesign.

### Installed pump performance

The mechanical evaluation of the SRP installation begins with a detailed assessment of the rod string and subsurface components. By determining the tubing and plunger areas and rod string percentages for the 1" and 7/8" sections, the total rod weight in the air ( $W_{ra}$ ) is calculated to be 1,934.96 lb. This data, when integrated with acceleration and impulse factors of 0.0426 and 1.0426, respectively, allows precise determination of the Peak Polished Rod Load (PPRL) at 3,132.05 lb and the Minimum Polished Rod Load (MPRL) at 1,604.42 lb.

Furthermore, the analysis assesses structural integrity through stress calculations, where the maximum stress ( $\sigma_{max}$ ) of 3,989.87 psi remains safely below the allowable stress ( $\sigma_a$ ) of 29,899.67 psi. Dimensional adjustments, including plunger overtravel (*ep*) and the combined elastic stretch of

the rods and tubing (0.9223 inch), are utilized to determine the effective plunger stroke ( $Sp$ ) of 119.12 inches.

These mechanical variables are essential to calculate the peak torque and counterbalance requirements for operational stability. Ultimately, the pump displacement ( $PD$ ) is computed at 351.42 BFPD based on the effective stroke and plunger area. Comparing this theoretical capacity to the actual production rate yields a volumetric efficiency ( $E_v$ ) of 72.28%. This baseline efficiency indicates that, while the system is functional, there is significant potential to optimize fluid recovery and overall pumping performance.

### Optimizing the AH-052 well pump by changing other pump parameters

The optimization process involved re-engineering the Sucker Rod Pump ( $SRP$ ) configuration, using a refined rod string design with 1 ¼-inch and 1 ⅝-inch diameters (Rod No. 109). By reducing the plunger size to inches while simultaneously increasing the stroke length ( $SL$ ) to inches at a constant speed of SPM, the system's volumetric efficiency ( $E_v$ ) improved significantly to 92%.

Subsequent nodal analysis performed via PIPESIM software validated these adjustments, demonstrating a substantial increase in the production rate to 381.2 BFPD, as illustrated in Figure 1. This technical reconfiguration effectively balances mechanical loads with fluid displacement, ensuring the redesigned system operates at peak performance while maximizing the well's recovery potential.

### Analysis of the results of the redesign of the sucker rod pump for well AH-052

The optimization results demonstrate that Well AH-052 achieved a remarkable volumetric efficiency of 91.12%, a significant improvement over the baseline of 72.28%. This technical refinement ensures that the actual production rate ( $Q_{prod}$ ) remains above 80% of the well's maximum theoretical capacity while stabilizing the initial flow parameters to maintain reservoir integrity. By maximizing the displacement efficiency through

the redesigned Sucker Rod Pump ( $SRP$ ) configuration, the system effectively bridges the gap between mechanical potential and fluid recovery. Consequently, the transition from 72.28% to over 91% efficiency underscores the success of the optimization strategy, confirming that the adjusted operational parameters provide a superior balance between pump performance and sustainable production output for Well AH-052.

Table 3. Initial Parameter Data and Pump Optimization

| Parameter     | Initial Data | Optimization Data |
|---------------|--------------|-------------------|
| Tubbing       | 2 7/8 inch   | 2 7/8 inch        |
| Rod           | 1 1/8        | 1                 |
| Plunger       | 2 inch       | 2 ¼ inch          |
| Stroke Length | 120 inch     | 140 inch          |
| Pumping Speed | 5 SPM        | 5 SPM             |

### Economic analysis

The economic viability of the AH-052 well optimization is evaluated using key performance indicators within the Production Sharing Contract ( $PSC$ ) Cost Recovery framework, specifically Net Present Value ( $NPV$ ), Internal Rate of Return ( $IRR$ ), Payback Time ( $PBT$ ), and Profitability Index ( $PI$ ). The capital expenditure for the well service and Sucker Rod Pump ( $SRP$ ) reconfiguration is estimated at US\$ 9,375.

Revenue projections are derived from an incremental oil gain of 11.43 BOPD, calculated under the assumption of a US\$ 90 per barrel oil price and a 10% annual decline rate over a two-year monitoring period. Commencing in April 2024, the financial analysis incorporates a 10% annual discount rate (Rate of Return) to determine the present value of future cash flows.

This comprehensive tabulation of the NPV accounts for the fiscal dynamics of the Indonesian petroleum industry, ensuring that the investment reflects both operational costs and the time value of money. The following calculations provide a quantitative basis for assessing whether the production enhancements translate into a robust and sustainable investment opportunity. Based on the financial

The Effect of Stroke Length and SPM Variations on Production Rate and Economic Profitability of AH-052 Well (Pamungkas et al).

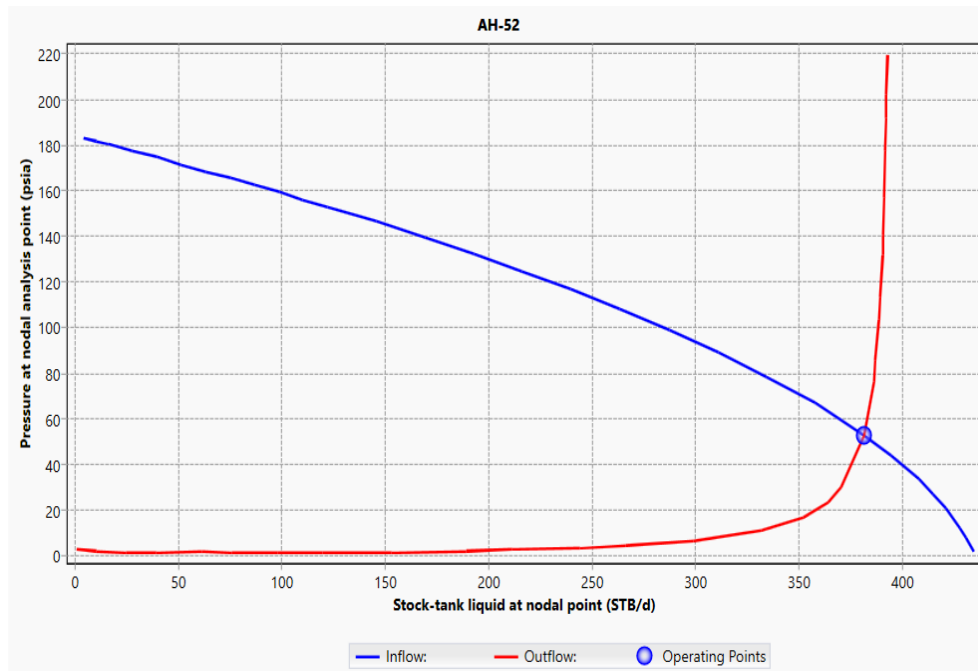


Figure 1. Nodal curve analysis after AH-052 well

Table 4. Economic calculation results

| Parameter                        | Unit     | Result |
|----------------------------------|----------|--------|
| <b>Production</b>                |          |        |
| - Oil Production                 | bopd     | 11,43  |
| <b>Price</b>                     |          |        |
| - Oil Price                      | USD/bbls | 90     |
| - Condensed Price                | USD/bbls | 90     |
| <b>Cost Production</b>           |          |        |
| - Oil Cost Production            | USD/bbls | 20     |
| - Condense Cost Production       | USD/bbls | 20     |
| <b>GROSS REVENUE</b>             | MUS\$    | 751    |
| - Oil Gross Revenue              | MUS\$    | 751    |
| <b>FTP</b>                       | MUS\$    | 38     |
| <b>Gross Revenue - FTP</b>       | MUS\$    | 713    |
| <b>EXPENDITURE</b>               | MUS\$    | 177    |
| - Investment Cost                | MUS\$    | 9      |
| - Investment Capital Cost        | MUS\$    | 9      |
| - Investment Non-Capital Cost    | MUS\$    | 0      |
| - Abandonment & Site Restoration | MUS\$    | 1      |
| - Operating Cost                 | MUS\$    | 167    |
| - Depreciation                   | MUS\$    | 10     |
| <b>Cost Recovery</b>             | MUS\$    | 173    |
| <b>EQUITY TO BE SPLIT</b>        | MUS\$    | 541    |
| <b>Government Take</b>           | MUS\$    | 347    |
| <b>Contractor Take</b>           | MUS\$    | 231    |
| <b>NPV</b>                       | MUS\$    | 202,08 |
| <b>ROR</b>                       | %        | 1153   |
| <b>POT</b>                       | Years    | 0,086  |
| <b>Net Profit</b>                | MUS\$    | 227    |
| <b>Net Profit Margin</b>         | %        | 128,05 |
| <b>PI</b>                        |          | 22,56  |

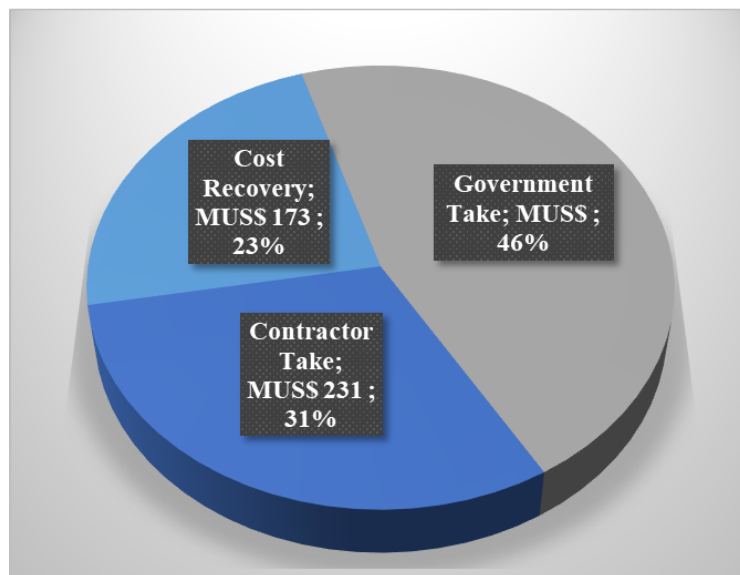


Figure 2. Skema production sharing contract cost recovery

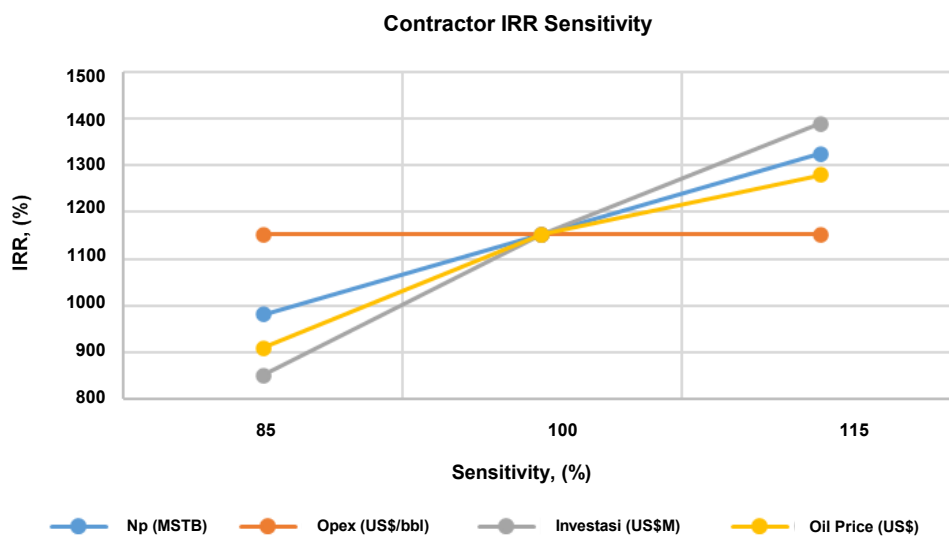


Figure 3. Contractor IRR sensitivity analysis

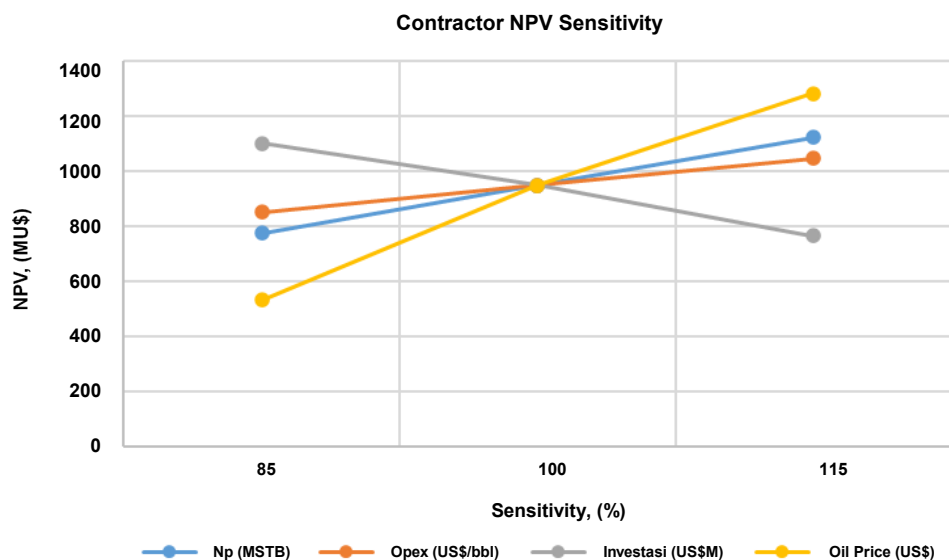


Figure 4. Contractor NPV Sensitivity Analysis

data presented in Table IV, the optimization of Well AH-052 yields a net present value (NPV) of MUS\$ 202.08. The internal rate of return (IRR) is calculated at an exceptional 1153%, far exceeding the minimum attractive rate of return, thereby confirming the project's robust feasibility. Furthermore, the pay out time (POT) is remarkably brief at 0.086 years, or less than one month, indicating that the initial capital expenditure is recovered almost immediately, effectively minimizing investment risk.

The project generates a Net Profit of MUS\$ 227 with a Net Profit Margin of 128.05%. This substantial margin, exceeding 100%, indicates that net gains significantly outweigh initial investment costs, reflecting extraordinary operational efficiency and low-cost well service execution. Such figures underscore the intervention's high profitability relative to the capital employed.

Finally, the profitability index (PI) is 22.56. Since this value is considerably greater than 1.0, the project is classified as highly attractive from a financial perspective, implying that every dollar invested generates a present value of \$22.56. The detailed fiscal distribution under the production sharing contract (PSC) Cost Recovery scheme is further illustrated in Figure 2, providing a clear overview of the revenue sharing between the contractor and the state.

The sensitivity of the Contractor's Internal Rate of Return (IRR) in Figure 3 relative to fluctuations in key operational and economic variables. The data reveal that Capital Investment (Investasi) and Cumulative Production (Np) exert the most profound influence on project profitability, as evidenced by the steep gradients of their respective trajectories. Conversely, Operating Expenditure (Opex) shows a negligible impact, maintaining a nearly horizontal trend, while Oil Price variations show a moderate positive correlation with the IRR, albeit less volatile than investment costs.

Net Present Value (NPV) highlights the critical roles of Oil Price and Capital Investment as the primary drivers of project value. The steep slope of the Oil Price curve in Figure 4 suggests that the project's net valuation is highly sensitive to market volatility, while Investment costs show a

significant negative relationship with NPV. In contrast, the impacts of Cumulative Production (Np) and operating expenditure (Opex) are relatively marginal, indicating that these factors have a lower marginal effect on the overall net present value than price and investment.

## CONCLUSION

The redesign and optimization of the SRP system in Well AH-052 have yielded a substantial improvement in operational performance, with volumetric efficiency increasing from 72.28% to 91.12%. By utilizing available workshop inventory, specifically a tapered rod string of 1 ¼-inch and 1 ½-inch (Rod No. 109), a 2-inch plunger, a 140-inch stroke length, and a speed of 5 SPM, the gross production rate rose from 264 BFPD to 381.2 BFPD. Economic evaluation under the production sharing contract (PSC) Cost Recovery framework further validates this intervention, as evidenced by a net present value (NPV) of MUS\$ 202.08, an exceptional internal rate of return (IRR) of 1153%, a rapid pay out time (POT) of 0.086 years, and a profitability index (PI) of 22.56. Collectively, these indicators confirm that the well intervention is not only technically feasible but also represents a highly attractive investment opportunity with minimal financial risk and superior capital efficiency.

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## GLOSSARY OF TERMS AND SYMBOLS

| Terms & Symbols   | Definition          | Unit |
|-------------------|---------------------|------|
| Inch <sup>2</sup> | Plunger Area        | Ap   |
| Inch <sup>2</sup> | Rod String Area     | Ar   |
| Inch <sup>2</sup> | Area of Tubbing     | At   |
|                   | Barel fluid per day | BFPD |
|                   | Barel oil per day   | BOPD |
|                   | Barrel water day    | BWPD |

|        |                                |                 |
|--------|--------------------------------|-----------------|
| lb     | Counter Balance                | Cb              |
| ft     | Dynamic fluid level            | DFL             |
| Inch   | Plunger Overtravel             | ep              |
| Inch   | Rod Stretch 1                  | er <sub>1</sub> |
| Inch   | Rod Stretch 2                  | er <sub>2</sub> |
| Inch   | Tubing Stretch 1               | et <sub>1</sub> |
| Inch   | Tubing Stretch 2               | et <sub>2</sub> |
| %      | Volumetric Efficiency of Pumps | Ev              |
|        | Feet                           | ft              |
| US\$   | First Trache Petroleum         | FTP             |
| psi/ft | Fluid Gradient                 | GF              |
| %      | Internal Rate of Return        | IRR             |
|        | Konstanta                      | K               |
| ft     | Rod Length 1                   | Lr1             |
| ft     | Rod Length 2                   | Lr2             |
| lb     | Minimum Polished Rod Load      | MPRL            |
| US\$   | Net Present Value              | NPV             |
| BFPD   | Pump displacement              | PD              |
|        | Profitability Index            | PI              |
| year   | Payback Period                 | POT             |
| lb     | Peak Polished Rod Load         | PPRL            |
|        | Static pressure                | Ps              |
|        | Well flowing pressure          | Pwf             |
|        | Maximum Flow Rate              | Qmax            |
|        | Production Flow Rate           | Qprod           |
| ft     | Static fluid level             | SFL             |
| Inch   | Plunger Stroke                 | Sp              |
|        | Strokes per minute             | SPM             |
|        | Sucker rod pump                | SRP             |
| %      | Water Cut                      | WC              |
| lb     | Weight fluid                   | Wf              |
|        | Total Weight of Rod            | Wr total        |
|        | Weight of Rod in Air           | Wra             |
| psi    | Stress allowable               | σa              |
| psi    | Stress maximum                 | σmax            |
| psi    | Stress minimum                 | σmin            |

## REFERENCES

- Amanda, Efa D., H. T. Ronaldo, N. D. Wijoyo, Steven Chandra, and A. A. Prasandi., (2019), Progressing Cavity Pump As a Solution To Increase Productivity of Highly Viscous Oil Wells With Sand Production: A Case Study of Field X. *Scientific Contributions Oil and Gas* 42 (3): 59–63. doi:10.29017/SCOG.42.3.376.
- Brown, K. E., (1980), *The Technology of Artificial Lift Method*. Vol 2A. Tulsa, Oklahoma: Penn Well Publishing Company.
- Indriani, Erdila, Sitti Nurul Septyani Rasako, and Erwin B. Pattikayhatu., (2025), Evaluasi Penggantian Artificial Lift Sucker Rod Pump (SRP) Menjadi Electrical Submersible Pump (ESP) Untuk Meningkatkan Produksi Minyak Sumur S Lapangan Kawengan. *Lembaran Publikasi Minyak dan Gas Bumi* 58(3): 163–71. doi:10.29017/lpmgb.58.3.1697.
- Pamungkas, M. W. P., Hasan, M. F., Lestari, V., Budiman, H., & Setiawan, A., (2025), Impact assessment of wax gelation fluid pressure and temperature: Designing long-term preventive solutions. *Scientific Contributions Oil and Gas*, 48(4), 95–104. doi:10.29017/scog.v48i4.1932.
- Pamungkas, Mohd Wirawan Putra., (2024), Hydraulic Fracturing Evaluation Of Well Zaa-011 *Journal Of Petroleum And Geothermal Technology*. 5(2): 58–66.
- Pandit, Akchay L., Abdelaziz, Issa Yasser, Khamis, Mahmoud Bakr, Quttainah, Riyad, and Rakan N Al-Ajmi., (2015), Economic Comparison Between ESP and Rod Pump for Same Rate Wells. Paper presented at the SPE/IATMI Asia Pacific Oil & Gas Conference and Exhibition, Nusa Dua, Bali, Indonesia. doi: <https://doi.org/10.2118/176386-M>.
- Putra, W., (2024), Redesain Pompa Sucker Rod Pump Untuk Optimalisasi Produksi Menggunakan Software Prosper Pada Sumur WP-219. PT Pertamina Hulu Roakan Regional 1 Zona 4 Field Limau.
- Suryantoro, Rahma Wisnu, Oktoviyanto, Yusuf, Dewanata, Dionisius, Arif, Luqman, and Despredi Akbar., (2023), Increasing Run Life by Using Multiple Preventive Downhole Pump (MPDT) to Overcome Gas Interference and Sand Problem on Sucker Rod Pump Well. Paper presented at the International Petroleum Technology Conference, Bangkok, Thailand. doi: <https://doi.org/10.2523/IPTC-23058-E>
- VanNatta, John, Logan, Phillip, Stieg, Alyssa, Gonzalez, Gustavo, and Luis Guanacas., (2019), Improved Rod-Pump Run Time in Sandy Wells



Two-Stage Filtration. Paper presented at the SPE Oklahoma City Oil and Gas Symposium, Oklahoma City, Oklahoma, USA. doi: <https://doi.org/10.2118/195186-M>.

Varma, Nakul, Negi, Avdesh, Kumar, Manish, Chauhan, Shailesh, Bohra, Avinash, and Manish Kothiyal., (2023), Tight Oil Field Development Challenges, Lessons Learnt and Successful Implementation of Selected Artificial Lift (SRP) Along with Operational & Digital Solutions: ABH Field, Rajasthan, India. Paper presented at the International Petroleum Technology Conference, Bangkok, Thailand. doi: <https://doi.org/10.2523/IPTC-23079-M>.

Widiyanto, Gathuk, and Ego Syahrial., (2022), Optimasi Pompa pada Dewatering Sumur CBM. Lembaran Publikasi Minyak dan Gas Bumi 44(2): 144–53. doi:10.29017/lpmgb.44.2.160.

Widodo, Aris., (2024), Evaluation of The Use of Diptube and Cyclone on The HPU Pump Downhole to Address The Sand Problem and Gas Interference in The ARD-22 Pangkalan Susu Field. Journal of Petroleum And Geothermal Technology. 5(2).

Yang, Dingding, Han, Guoqing, Ma, He, Chen, Huapeng, Wu, Qingxia, and Zhiyong Zhu., (2025), Oil Production Measurement Method for Pumping Wells Based on Multi-Source Information Fusion. Paper presented at the GOTECH, Dubai City, UAE. doi: <https://doi.org/10.2118/224486-MS>.