GAUSSIAN WELLWORKS
RESERVOIR INTELLIGENCE

HEADQUARTERS
3730 Kirby Drive, Suite 1200
Houston, TX 77098
+1 949 244 1918
Info@GaussianWellworks.com

OFFICES
Houston
Stavanger
Brisbane

PRODUCTION OPTIMIZATION

Gaussian Wellworks shifts production optimization from post-production interpretation to pre-drill engineering. The workflow integrates fracture design, reservoir physics, digital twin modeling, and probabilistic forecasting to improve recovery, stabilize performance, and extend asset life.

WHAT MAKES GAUSSIAN DIFFERENT

CONVENTIONAL WORKFLOW	GAUSSIAN OPTIMIZATION
Post-production decline analysis and historical analogs. Reactive, backward-looking, and often unable to expose the physical causes of underperformance.	Forward-looking physics-based engineering that evaluates completion and reservoir scenarios before capital is committed.

PRE-DRILL PREDICTIVE FRACTURE ENGINEERING

Gaussian enables precise fracture geometry design **prior to drilling**—directly linking stimulation strategy to reservoir behavior.

FRACTURE HALF-LENGTH	STAGE + LATERAL SPACING	STIMULATION PROGRAM	DRAINAGE + CONTACT
Design expected fracture geometry by stage before drilling or completion.	Balance reservoir contact, interference risk, and completion intensity.	Optimize pumping, fluid, and proppant choices against expected reservoir response.	Predict effective drainage area and productive reservoir contact before execution.

By optimizing fracture geometry before stimulation capital is committed, **Gaussian** helps operators avoid over-stimulation, under-stimulation, and ineffective capital deployment—reducing uncertainty in both early production and long-term recovery.

PROBABILISTIC FORECASTING & UNCERTAINTY MANAGEMENT

Gaussian quantifies subsurface and operational uncertainty to deliver statistically robust production forecasts:

P90 (conservative case)	**P50** (expected case)	**P10** (upside case)

Unlike deterministic models, **Gaussian** captures variability in fracture performance, reservoir properties, and operational parameters, providing:

- Confidence-bounded forecasts.
- Risk-adjusted recovery expectations.
- Improved capital allocation decisions.
- Transparent uncertainty disclosure for investors and lenders.

GAUSSIAN WELLWORKS
RESERVOIR INTELLIGENCE

HEADQUARTERS
3730 Kirby Drive, Suite 1200
Houston, TX 77098
+1 949 244 1918
Info@GaussianWellworks.com

OFFICES
Houston
Stavanger
Brisbane

OPERATIONAL AND ECONOMIC IMPACT

INCREASED EUR Improved recovery through better completion and reservoir-contact decisions.	**MORE PREDICTABLE DECLINE** Stable, confidence-bounded production profiles.	**LOWER CAPITAL INEFFICIENCY** Reduced over-stimulation, under-stimulation and ineffective spending.
LOWER LIFTING COST Longer productive life and better operating efficiency.	**BETTER FIELD PLANNING** Scenario-based development decisions across wells and reservoirs.	**RISK-INFORMED PORTFOLIO** Capital allocation based on comparable, uncertainty-aware outcomes.

PREDICTIVE ENGINEERING CONNECTS TECHNICAL DESIGN DIRECTLY TO RECOVERY AND VALUE.

CLIENT DELIVERABLES

OPERATORS

- Pre-drill optimization of fracture half-length and spacing, lateral length, and proppant program.
- History-matched production forecasts with deterministic and P90/P50/P10 EUR.
- Diagnostics of conductivity loss, pressure interference, and water breakthrough.
- Comparative development scenarios for recovery, capital efficiency, and productive life.

INVESTORS & LENDERS

- Risk-adjusted P90/P50/P10 production and EUR outlooks.
- Confidence ranges reflecting reservoir, completion, and operating uncertainty.
- Capital-allocation comparisons across development scenarios.
- Transparent assumptions, sensitivities, and forecast limitations.

AUDITORS & REGULATORS

- Reproducible history matches with documented inputs, assumptions, and operational adjustments.
- Deterministic and probabilistic production and EUR estimates.
- Traceable sensitivities, uncertainty ranges, and forecast-quality metrics.
- Technical evidence supporting reserves and production reporting.

CASE STUDY—SHALE WELL PERFORMANCE OPTIMIZATION USING GAUSSIAN TO IMPROVE PRODUCTION, HISTORY MATCHING, AND FRACTURE DESIGN DECISIONS

Summary

This case study shows that shale-well performance depends not only on fracture spacing and fracture half-length, but also on whether the proppant pack preserves conductivity after pumping. Gaussian makes these trade-offs visible quickly in production terms, without relying on time-intensive numerical simulation workflows.

GAUSSIAN
WELLWORKS
RESERVOIR INTELLIGENCE

HEADQUARTERS
3730 Kirby Drive, Suite 1200
Houston, TX 77098
+1 949 244 1918
Info@GaussianWellworks.com

OFFICES
Houston
Stavanger
Brisbane

Objective

To show how Gaussian can rapidly quantify the production impact of three key completion variables: fracture spacing/half-length, proppant-pack conductivity, and proppant pump schedule.

Provided solution

Gaussian is used as a fast, physics-based production-forecasting framework for comparing completion scenarios. In this study, it quantifies how cumulative production changes when fracture spacing changes (**Figure 1**) and when proppant-pack permeability changes (**Figure 2**). The same framework also links pressure loss in the fracture system to real production loss, which is why it is especially useful for diagnosing fracture conductivity damage.

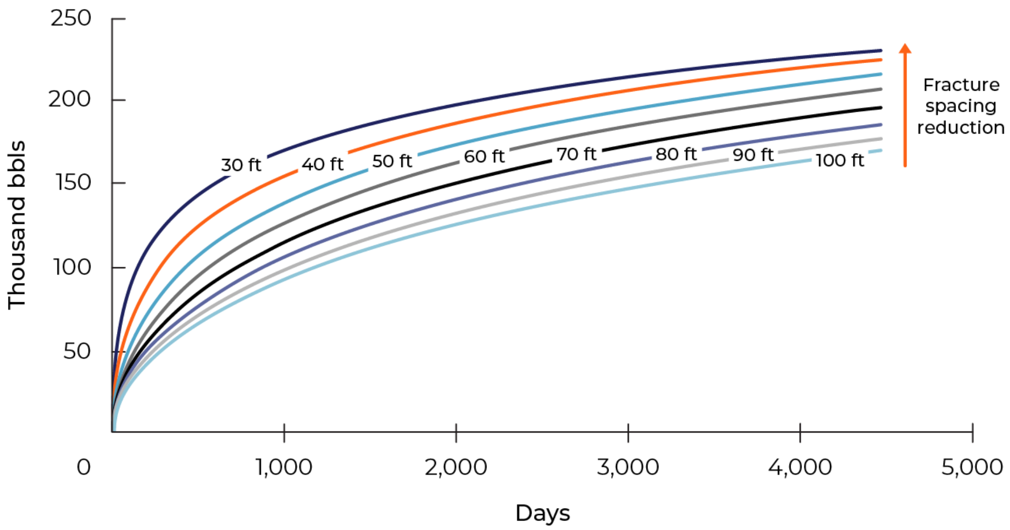

Figure 1 – Gaussian rapidly quantifies the EUR impact of fracture spacing.

Results and Findings

Figure 1 highlights Gaussian's ability to quantify the impact of fracture spacing on EUR. After 3,000 days, optimal production is approximately 220,000 bbl at 30 ft spacing, declining to about 150,000 bbl at 100 ft spacing. This clearly shows how fracture spacing—and the related effective fracture half-length design—can materially influence well performance.

Figure 2 demonstrates that proppant-pack conductivity is equally important. Over the same 3,000-day period, cumulative production rises from about 170,000 bbl with Texas Regional Sand (TRS) to approximately 230,000 bbl with Intermediate Strength Ceramic proppants (ISP), a gain of roughly 26%.

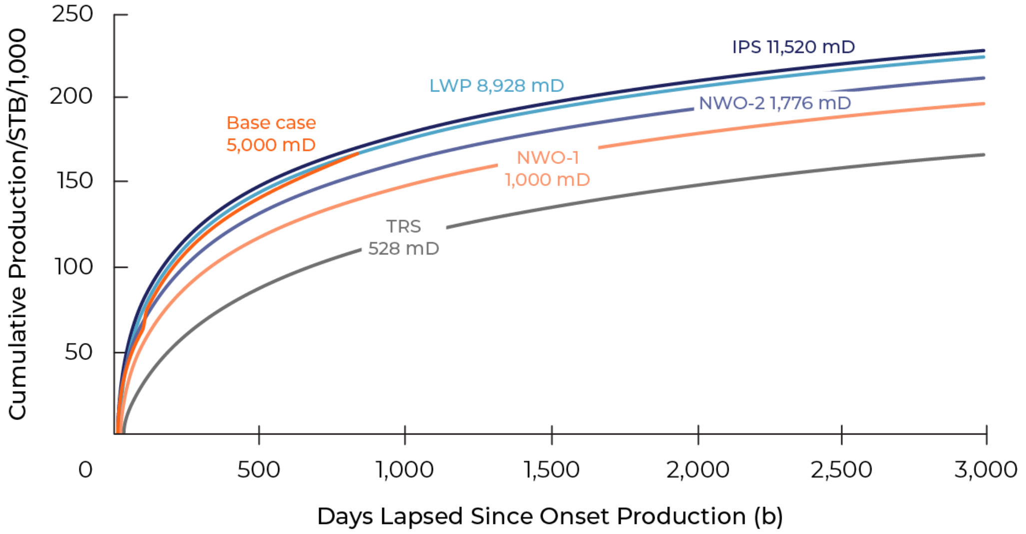

Figure 2 – EUR sensitivity to proppant-pack permeability.

Across multiple wells, including those in the Eagle Ford and Wolfcamp formations of Texas, Gaussian generated insights from historical data that were previously achievable only through numerical simulation. These analyses can now be completed quickly through a closed-form workflow, significantly accelerating evaluation.

READ THE FULL CASE STUDY

ADDITIONAL EVIDENCE

Peer-reviewed studies further demonstrate the reliability and technical validity of Gaussian technology in production optimization.

[1]. Tian, Y. and Weijermars, R., 2026. Computation of pressure depletion and productivity of multi-fractured wells with variable fracture spacing using fast and accurate solution method. Petroleum Research. DOI

[2]. Weijermars, R., 2024. Fast Production and Water-Breakthrough Analysis Methods Demonstrated Using Volve Field Data. Petroleum Research. DOI

[3]. Afagwu, C., Al-Afnan, S., Abdalla, M. and Weijermars, R., 2024. Gaussian Pressure-Transients: A Toolkit for Production Forecasts and Optimization of Multi-Fractured Well Systems in Shale Formations. Arabian Journal of Science and Engineering. DOI

[4]. Pratama, M.A. Al Qoroni, O., Rahmatullah, I.K., Jameel, M.F., and Weijermars, R., 2024. Probabilistic Production Forecasting and Reserves Estimation: Benchmarking Gaussian Decline Curve Analysis Against the Traditional Arps Method (Wolfcamp Shale Case Study). Geoenergy Science and Engineering. DOI

HEADQUARTERS
3730 Kirby Drive, Suite 1200
Houston, TX 77098
+1 949 244 1918
Info@GaussianWellworks.com

OFFICES
Houston
Stavanger
Brisbane

[5]. Weijermars, R., 2023. Production Forecasting of Unruly Geoenergy Extraction Wells Using Gaussian Decline Curve Analysis, Geofluids, vol. 2023, Article ID 5534305, 18 pages, 2023. DOI

[6]. Weijermars, R., 2023. Potential Production Gains of Multi-Stage Fractured Wells in Shale Plays: Sensitivity of Well Performance to Changes in Design Parameters Assessed with Fast and Accurate Gaussian Solutions. First Break, 41 (4), 63-70. DOI

[7]. Afagwu, C., Al-Afnan, S., Weijermars, R., and Mahmoud, M. 2023, Multiscale and multiphysics production forecasts of shale gas reservoirs: New simulation scheme based on Gaussian pressure transients. Fuel, 336, 127142. DOI

[8]. Tian, Y., Zhou, F., Weijermars, R., Li, B., 2023. Quantifying micro-proppants crushing rate and evaluating propped micro-fractures. Gas Science and Engineering, 110, 204915. DOI

[9]. Weijermars, R., 2022. Gaussian Decline Curve Analysis of Hydraulically Fractured Wells in Shale Plays: Examples from HFTS-1 (Hydraulic Fracture Test Site-1, Midland Basin, West Texas). MDPI Energies,15, 6433. DOI

[10]. Tian, Y., Zhou, F., Aljawad, M.S., Weijermars, R., Wu, M., Li, B., 2022. Laboratory Tests and Well Rate Models of Crushed Micro-Proppants to Improve Conductivity of Hydraulic Microfractures, 22IPTC-22209-MS. DOI

[11]. Weijermars, R., 2021. Diffusive Mass Transfer and Gaussian Pressure Transient Solutions for Porous Media. MDPI Fluids. 6(11):379. DOI

[12]. Weijermars, R., 2020. Improving Well Productivity – Ways to Reduce the Lag between the Diffusive and Convective Time of Flight in Shale Wells. Journal of Petroleum Science and Engineering. DOI

[13]. Tugan, M.F., and Weijermars, R., 2020. Variation in b-sigmoids with flow regime transitions in support of a New 3-Segment DCA Method: Improved Production Forecasting for tight oil and gas wells. Journal of Petroleum Science and Engineering, online 2 April 2020, 107243. DOI

[14]. Hu, Y., Weijermars, R., Zuo, L. and Yu, W., 2018. Benchmarking EUR Estimates for Hydraulically Fractured Wells With and Without Fracture Hits Using Various DCA Methods. Journal of Petroleum Science and Engineering, v. 162, p. 617-632. DOI

[15]. Weijermars, R., 2014. US shale gas production outlook based on well roll-out rate scenarios. Applied Energy, vol. 124, p. 283-297. DOI

