



Re-Evaluation and Redevelopment Strategy for Suspended Oil and Gas Fields: Restoration of Production Through Integrated Geological and Reservoir Evaluation and Optimized Drilling and Well Completion Solutions — A Case Study of the Grgan Deniz Field

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Abstract

Three principal approaches play a significant role in sustaining oil and gas production: the exploration of new fields, the implementation of development strategies for producing fields based on their natural geological potential, and the reassessment of the hydrocarbon potential of suspended or abandoned fields with the aim of bringing them back into production.

The exploration of new fields is a long-term process that generally requires substantial capital investment. In Azerbaijan, the current geological and technological development status of producing fields primarily allows the implementation of measures aimed at reducing the rate of production decline or compensating for it to the greatest extent possible.

From the perspective of securing additional production within a relatively short period and at comparatively low cost, the reassessment of the hydrocarbon potential of suspended or abandoned fields and, where economically and technically justified, their redevelopment is of considerable interest. A reliable solution to this challenge requires investigation of the field's natural geological characteristics using modern approaches, including analysis of field- and well-level development and production performance and accurate identification of both objective (geological) and subjective causes of observed changes.

At present, 81 commercially significant oil and gas fields have been discovered in Azerbaijan. Over the years, up to 15 of these fields have either been suspended or taken out of production.

This paper presents the Grgan Deniz Field as a case study for evaluating the hydrocarbon potential of suspended or abandoned fields. It analyzes the investigations conducted to assess the feasibility of returning the field to production, the redevelopment program developed on the basis of these results, the studies and operations performed in the first well drilled under this program, and the corresponding well test results. Recommendations for the subsequent full-scale redevelopment of the field are also presented.

The results of these investigations, together with the project developed on their basis to determine the target location of the appraisal well and initiate drilling operations, were prepared and approved in 2021.

The well was drilled by Glolynx Azerbaijan LLC, while accurate well placement, trajectory steering, and trajectory optimization were carried out by the company's geology and drilling teams. The application of new geological and drilling approaches, together with the subsequent well test results, confirmed the validity of the analytical studies and methodologies used to reassess the field's hydrocarbon potential. These results provided the basis for initiating a new phase of development at the Grgan Deniz Field, which had previously been taken out of production after being considered depleted.

The integrated geological and reservoir evaluation, optimized drilling and well completion solutions, and measurement operations performed by the drilling company's specialists enabled the reassessment of hydrocarbon saturation in intervals previously considered water-bearing or depleted. These activities resulted in the identification of new hydrocarbon-bearing zones, opened new opportunities for subsequent wells, and provided a basis for optimizing the number of future wells as well as their drilling and completion programs.

Through the application of integrated geoscience and drilling engineering solutions, the first well drilled in the Grgan Deniz Field after many years of inactivity was successfully completed and delivered to the Client within a shorter-than-planned timeframe and at a lower-than-planned cost. The well achieved a record in SOCAR's history in terms of both the horizontal section length and the screen-completed interval, with an 848 m screened section.

Within the reservoir interval, the well trajectory was steered, optimized, and proactively adjusted by the geology and engineering teams without the use of additional high-cost technologies such as dedicated geosteering equipment. The well trajectory was successfully steered away from water-bearing zones, and the well was completed at a measured depth of 2,360 m, with the final trajectory positioned 16 m above and 4 m to the right of the originally planned target. The screen completion was successfully performed, and the well was brought on production at an oil production rate approximately 3–4 times higher than the rate originally anticipated in the well design.

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Introduction

At present, most producing fields in Azerbaijan have entered the late stages of development (Stages III and IV). These stages are naturally characterized by declining oil production, increasing water cut, greater operational complexity and workload, and consequently higher costs. Therefore, various geological and technical approaches are applied to reliably determine field potential, correctly identify remaining oil- and gas-bearing zones, select appropriate well targets and interventions, extend the productive life of existing wells, increase production levels, and recover oil and gas reserves with maximum efficiency.

In this context, the paper analyzes optimization measures implemented in the first horizontal well drilled in the Grgan Deniz Field after many years, following investigations aimed at reassessing and refining the field's hydrocarbon potential. The measures covered geological and geophysical evaluation, drilling engineering, and well completion. The impact of the integrated approaches on identification of oil-saturated zones, drilling performance, well quality, and production potential is evaluated, and the resulting geological, technical, and operational performance is presented.

The scope of the study included the following activities:

- Construction of the geological model;
- Analysis of the geological section;
- Determination of optimal casing setting depths;
- Geophysical logging and measurement operations for determination of formation pressure and PPFG;
- Analysis of risk zones and implementation of preventive measures corresponding to identified risks;
- Block-scale facies analysis based on cuttings and log data, including analysis of the relationship between drilling parameters and hydrocarbon saturation of the rocks;
- Use of a 3D geological structural model together with LWD/MWD/PWD and mud-logging data to provide functionality equivalent to geosteering without dedicated geosteering tools and associated additional cost. During drilling, the well trajectory was steered, controlled, and proactively adjusted within the productive reservoir on the basis of real-time geological and geophysical data. Geological

and geophysical interpretation was also used to identify undeveloped zones in the mature field both in advance and in real time;

- Improvement of drilling performance and reduction of well construction time in accordance with the geological section;
- Selection of drill bits and drilling parameters;
- Selection of a more efficient Bottom-Hole Assembly (BHA);
- RSS performance evaluation;
- Application of an integrated Performance Drilling approach for the 12¼-in high-inclination interval;
- Support for well completion through petrophysical evaluation and determination of particle-size distribution under drilling conditions;
- Optimization of well completion.

Application of the approaches demonstrated in the Grgan Deniz Field to other low-producing and suspended oil and gas fields could improve the reliability of remaining reserve estimates and support development strategies based on refined field potential, thereby contributing to increased oil production.

Objective

The objective of this study was to reassess the hydrocarbon potential of the Grgan Deniz Field, which had remained suspended for many years, using modern geological, petrophysical, and engineering approaches; determine the technical and economic efficiency of field redevelopment; and demonstrate the feasibility of returning the field to production through integrated geology, drilling, and well completion solutions, while ensuring rapid and high-quality drilling and completion.

The specific objectives of the study were as follows:

- Reassess the geological structure, reservoir properties, and remaining recoverable hydrocarbon reserves of the Grgan Deniz Field;
- Integrate existing geological, geophysical, petrophysical, and production data to develop a new geological concept;
- Identify prospective drilling targets based on 3D seismic data, structural modeling, and petrophysical interpretation;
- Design an optimal horizontal-well trajectory and maximize reservoir contact within the oil-saturated interval;
- Ensure safe and accurate well steering using real-

time geological data and LWD/MWD/PWD and RSS technologies;

- Minimize formation damage and achieve high production through selection of optimal well-completion solutions;
- Optimize drilling duration, project risks, and overall costs;
- Develop, on the basis of the results obtained, an integrated methodology applicable to the redevelopment of other suspended oil and gas fields;
- Select and apply appropriate drilling technologies and BHAs so that the well could be completed 30 days ahead of the planned schedule, reducing drilling costs, improving investment efficiency, and generating additional oil revenue through earlier production start-up;
- Optimize casing setting depths, forecast and manage geological and technical complications in advance, and minimize associated risks;
- Evaluate oil saturation of reservoir rocks through geological and geophysical interpretation, construct more realistic and higher-accuracy geological models, and identify opportunities to optimize field-development decisions.

The successful experience gained in the Grgan Deniz Field can be applied to other fields and prospective areas to identify approaches that strengthen energy security and enable more efficient utilization of the country's hydrocarbon resources through integrated geology, drilling, and completion activities.

Relevance of the Problem and Related Studies

One of the principal causes of production decline in Azerbaijan's onshore and offshore fields is the preference for maximizing recovery from existing reserves that can be produced with relatively low risk. Over time, this approach results in increasingly dense well placement and progressively shorter distances between wells. Consequently, oil reserves that could be produced economically by a single well may be distributed among two or even three wells. Although this can provide higher production rates at an early stage, it may create significant long-term problems. In particular, when water encroachment occurs, not only one well but several wells sharing the same drainage area may experience increasing water cut simultaneously. As a result, oil production declines sharply, water cut rises, and operating costs increase.

Another important problem is that, despite the presence of geological potential, inadequate well planning, target and trajectory selection, insufficient trajectory control during drilling, inappropriate application of investigations required to obtain reliable data, and particularly poor drilling and completion quality may lead to low or even negative well-test results that do not reflect the actual reservoir potential.

This reduces the economic efficiency of capital invested in drilling and well operation, may create a distorted understanding of the field, and significantly reduces the number of viable sources available to sustain production.

Resolution of the problem directly depends on the following technical sequence:

1. Subsurface/geoscience approach, analysis, and planning;
2. Definition of field-specific drilling, completion, and evaluation strategies, together with technology selection and application;
3. Proactive management of the drilling process and well trajectory;
4. Reservoir-potential-based decision-making during well testing and production.

Application of this approach can enable more efficient utilization of existing reserves in Azerbaijan's onshore and offshore fields, extend field life, and significantly increase daily oil production. Subject to geological, technical, and economic justification, some fields may have the potential to increase production by 3–5 times. Appropriate engineering approaches—supported by competent geological and technical teams, accurate data analysis, and, most importantly, field experience—can contribute substantially to resolving these problems. Commercial development of the Grgan Field began in 1947. In 2019, production was suspended after the field was considered depleted and highly water-cut. Nevertheless, comprehensive field analysis was subsequently initiated to reassess its potential and determine whether low production and high operating costs were attributable to geological conditions or to subjective/operational factors. In 2021, a project for drilling new wells and returning the field to development was prepared, and the corresponding field preparations were initiated. At the Grgan Deniz Field, our geology, drilling, and completion teams successfully drilled the

well through oil-bearing reservoir zones by combining accurate data analysis with field experience. The well was brought on production at a rate 3–4 times higher than initially expected. This was made possible by effective and proactive management of both field potential and well trajectory, as well as by the selection and application of high-quality drilling and completion operations, evaluation methods, and technologies appropriate to the natural reservoir conditions. Data analysis and modeling were performed without dedicated geosteering equipment; during drilling, the structural model was continuously updated in real time and the well was successfully geosteered within the reservoir.

Operations During Drilling

Analysis of the Geological Section

Correlations were performed regularly during drilling, enabling accurate identification of the horizons encountered in the section. The 3D structural model was also used to predict the expected depths of other horizons.

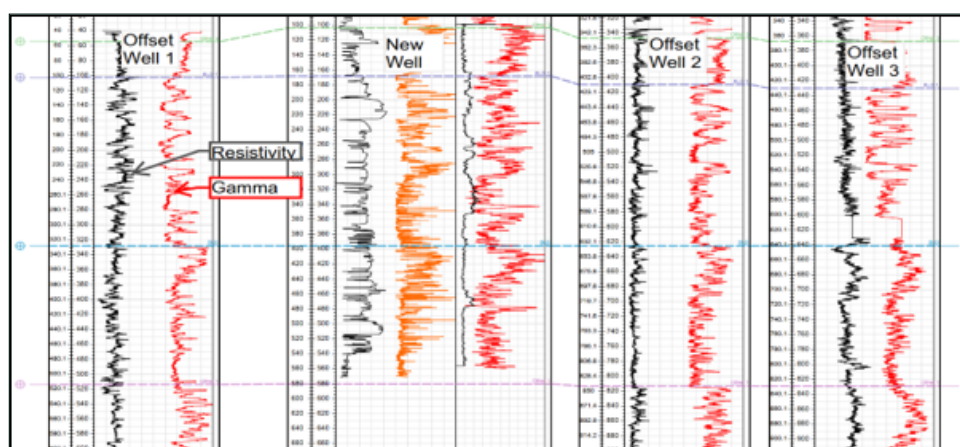


Figure 1: Correlation Scheme

Geophysical Investigations and Measurements for Formation Pressure and PPFG Determination

1. In the 244.5 mm drilling interval, wireline logging was performed in three runs: Run 1—Sonic Dipole + Caliper; Run 2—Neutron Density; Run 3—Pore Pressure Point measurements (33 points).
2. In the 215.9 mm drilling interval, a wash-down BHA with Sonic Dipole and Pore Pressure Point measurements (24 points) was successfully run in a challenging well profile with an inclination of 82°.

Optimization of Casing Setting Depths and Risk Management

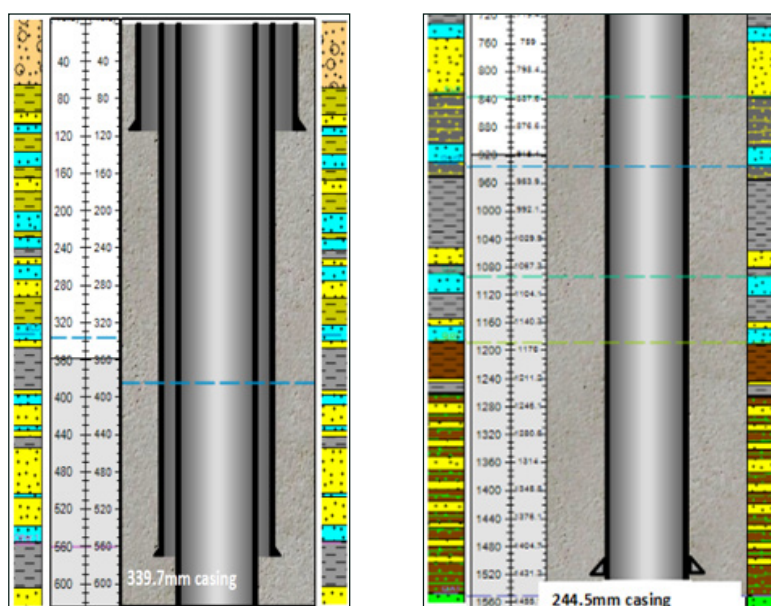


Figure 2: Casing Design

In the 17½-in section, weak gas- and water-bearing zones created a risk of changes in drilling-fluid properties, potentially increasing the risks of losses and washouts. Water influx into the drilling fluid was expected in the 80–320 m interval. The originally planned 17½-in casing setting depth coincided with a highly permeable water-bearing sandstone. Therefore, instead of setting the casing at 500 m, it was proposed to extend the section to the 560–600 m interval and set the casing in an approximately 40 m thick claystone interval. The purpose was to isolate the permeable water-bearing formation behind casing and provide a suitable shoe for a successful FIT in the next section. Setting the casing shoe in clay also minimized loss and washout risks during subsequent drilling. If these formations had not been isolated, application of high-performance drilling technology in the next interval would have been more difficult. In an offset well, losses occurred at 783 m and were difficult to control; in the new Gürgan well, the corresponding formation occurred near 500 m. The casing was therefore successfully set at 570 m. During drilling, an increase in drilling-fluid ECD was expected due to fine clay and sand entering the mud system. The 600–680 m interval comprised permeable water-bearing sands; 680–730 m comprised clayey-silty rocks with a risk of tight-hole conditions; 730–840 m comprised permeable sands susceptible to washout; 840–940 m was an FLD sandy-clayey water-saturated interval; 940–970 m presented a risk of wellbore enlargement and washout; 970–1,090 m comprised silty clays with a potential for tight-hole conditions; 1,090–1,190 m was a permeable water-bearing interval susceptible to losses; and 1,190–1,550 m was a sandy-clayey interval with a risk of wellbore enlargement and a predominance of swelling clays. Because depleted zones were present in the reservoir interval, the proposal to stop drilling at 1,513.5 m was accepted to avoid sudden losses and complications associated with drilling both intervals using high-density mud.

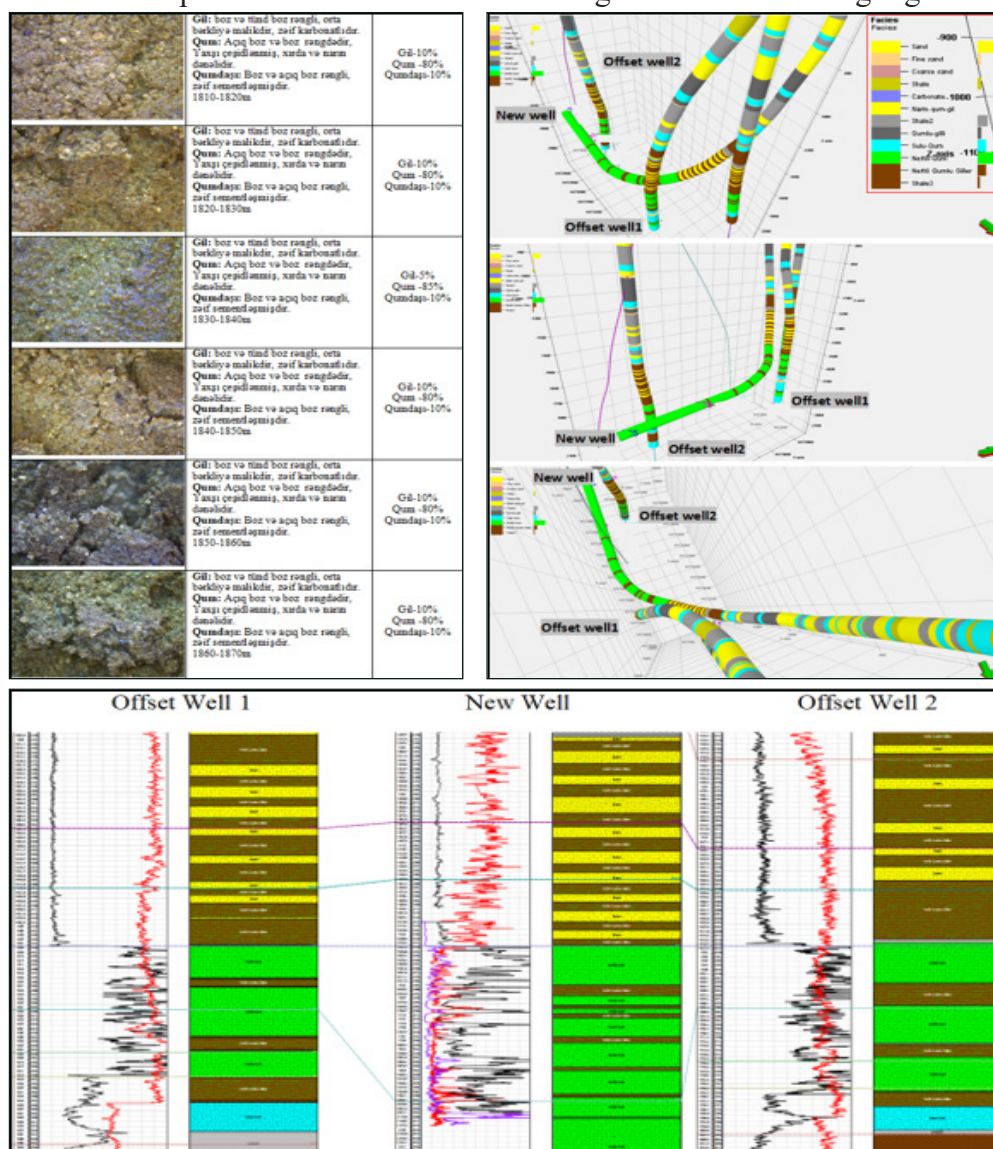


Figure 3: Facies Study, Well-to-Well Correlation Using Logs and Real-Time 3D Monitoring, Confirmation by

Cuttings Analysis, and Geological Risk Zones Along the Planned Well Profile

Construction and Application of the 3D Structural Model

A 3D structural model was integrated with LWD/MWD/PWD and mud-logging data to provide geosteering-equivalent functionality without dedicated geosteering tools. During drilling, real-time geological and geophysical data were used to steer, control, and adjust the well trajectory within the productive reservoir. Interpretation of geological and geophysical data was also used to identify undeveloped zones in the mature field both in advance and in real time.

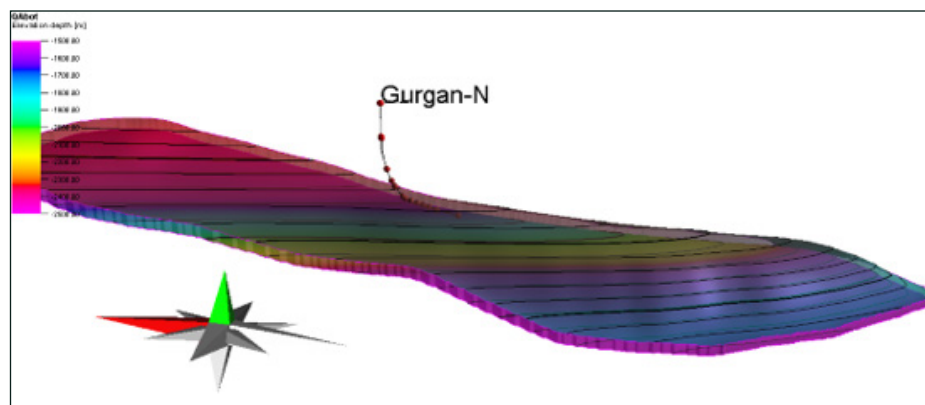


Figure 4: Block Structural Model — QA Zone

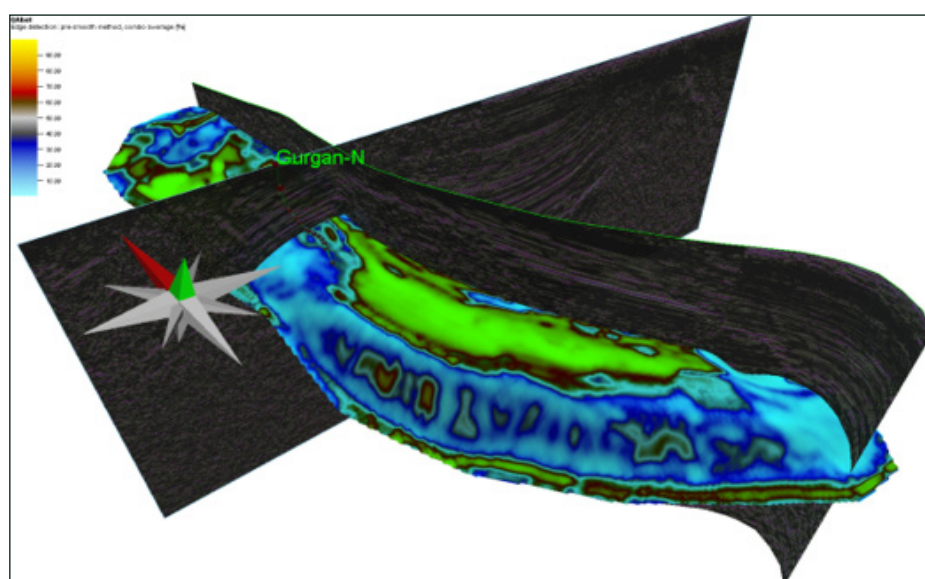


Figure 5: Block Seismic Horizon Interpretation — QA Top

Reservoir navigation was performed using software-based workflows without dedicated geosteering equipment.

During drilling of horizontal reservoir sections, the primary objective is to keep the well trajectory within the productive reservoir and as far as possible from water-bearing intervals, thereby improving exposure of oil-saturated zones and increasing production potential. Conventional geosteering operations generally require dedicated geosteering software, high-resolution LWD geonavigation tools, and specialist geosteering personnel. In this project, however, the geosteering function was successfully implemented without such dedicated equipment and services by integrating existing software with real-time data. The basis of reservoir navigation was the dynamic, real-time updating of a three-dimensional structural model built in geological software.

LWD, MWD, and PWD data; drilling parameters including ROP, WOB, RPM, torque, standpipe pressure, flow rate, and Mechanical Specific Energy; lithological analysis of cuttings; offset-well logs; correlations; and new geological information acquired from the well being drilled were analyzed in an integrated manner. This integration enabled continuous refinement of the actual formation position, structural changes, and reservoir boundaries.

The structural model was updated regularly, the reservoir top and base were reinterpreted, and the well trajectory was optimized accordingly. As a result, high-accuracy steering of the well within the productive reservoir was achieved without dedicated geosteering equipment.

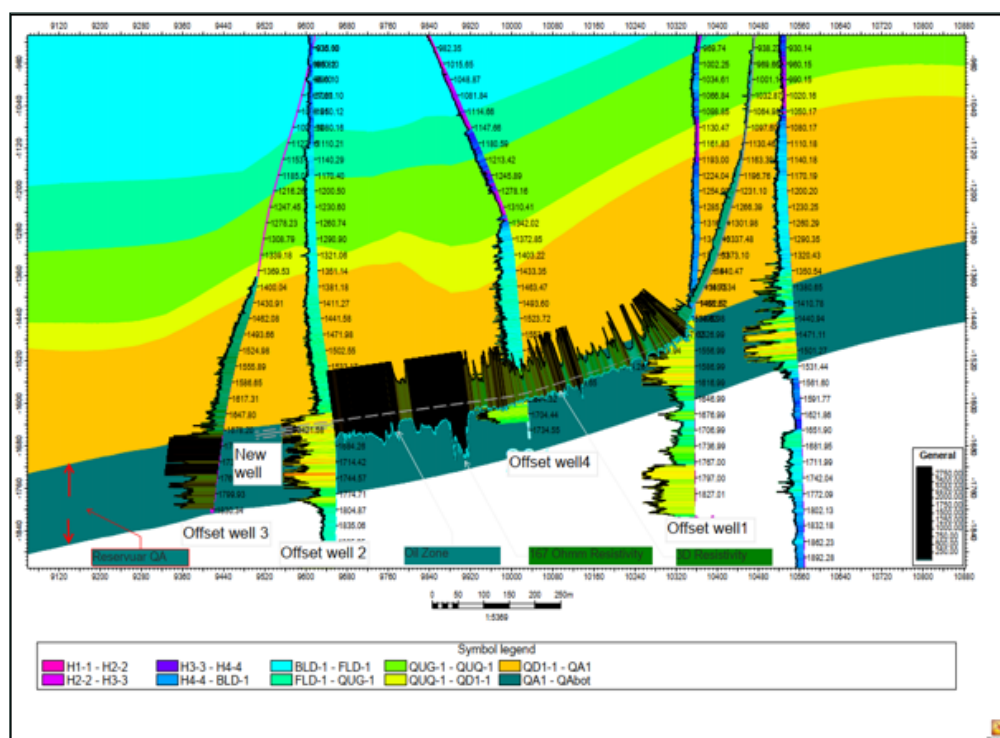


Figure 6: Geosteering Cross-Section

LWD resistivity data were used to evaluate reservoir oil saturation.

This approach demonstrates that high-quality reservoir navigation can be achieved without dedicated geosteering systems through modern geological modeling, real-time structural-model updating, and integration of LWD/MWD/PWD data, drilling parameters, logs, and cuttings information. Maintaining the well within the productive reservoir for 848 m, while achieving significant cost savings, demonstrated the high technical and economic effectiveness of the methodology in a SOCAR-operated field. Comparison of the planned profile with the actual trajectory resulting from reservoir navigation shows that the actual trajectory was shifted 16 m upward and 4 m to the right relative to the plan.

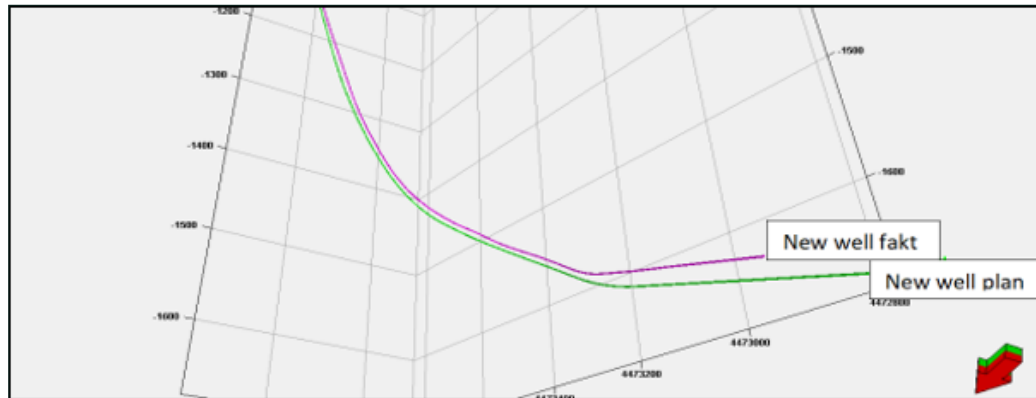


Figure 7: Planned and Actual Well Trajectories

Measures to Improve Drilling Performance and Reduce Well Construction Time

Performance Drilling is an optimized drilling approach aimed at maximizing drilled footage in the shortest possible time and at the lowest cost while maintaining well quality and avoiding complications. This approach was applied in the Gürgen Deniz Field to achieve high drilling performance. For the first time in an area of the field where no drilling had been conducted for many years, a record ROP of 440 m/day was achieved, Non-Productive Time (NPT) was reduced, and the Rotary Steerable System (RSS) was utilized with maximum efficiency.

Selection of Drill Bit and Drilling Parameters

The key factors required to maximize daily drilled footage were analyzed. Bit selection was optimized according to formation lithology, hardness, abrasiveness, and well profile. Wear of the selected PDC bit was monitored in real time using drilling parameters, and changes in ROP after defined drilled intervals were analyzed. Durable bits suitable for abrasive formations enabled high drilling rates, while WOB and RPM were optimized together for the formation. Hydraulic calculations were optimized to ensure effective wellbore and bit cleaning and efficient transport of rapidly generated cuttings to surface. The mass fraction, density, lithology, and particle size of the drilled cuttings were examined in detail.

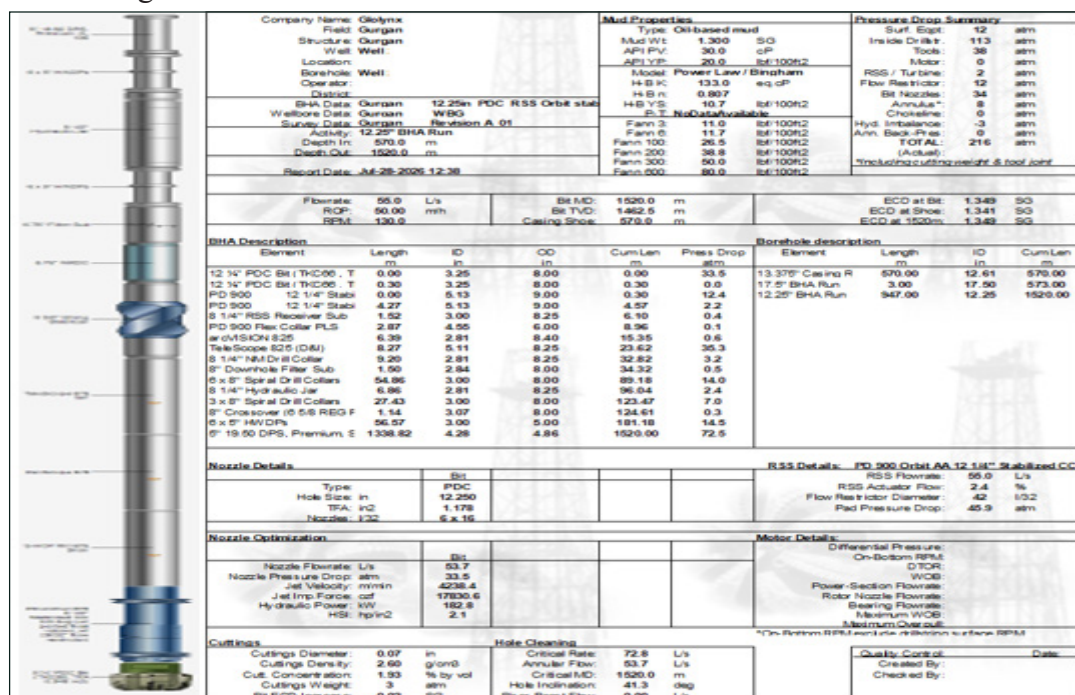


Figure 8: Hydraulic Calculations

Selection of a More Efficient Bottom-Hole Assembly (BHA)

Drilling parameters and BHAs used in offset wells for the target interval were analyzed. Based on this analysis, the conventional BHA was optimized. Drilling simulations were also prepared for the optimized BHA and RSS configuration. The simulations included stick-slip, bit whirl, axial vibration, ROP, torque and drag, SPP, hook load, and Mechanical Specific Energy (MSE). MSE, a particularly important parameter, represents the amount of energy required to break a unit volume of rock. The concept was introduced by Richard Teale and is now widely used in drilling optimization.

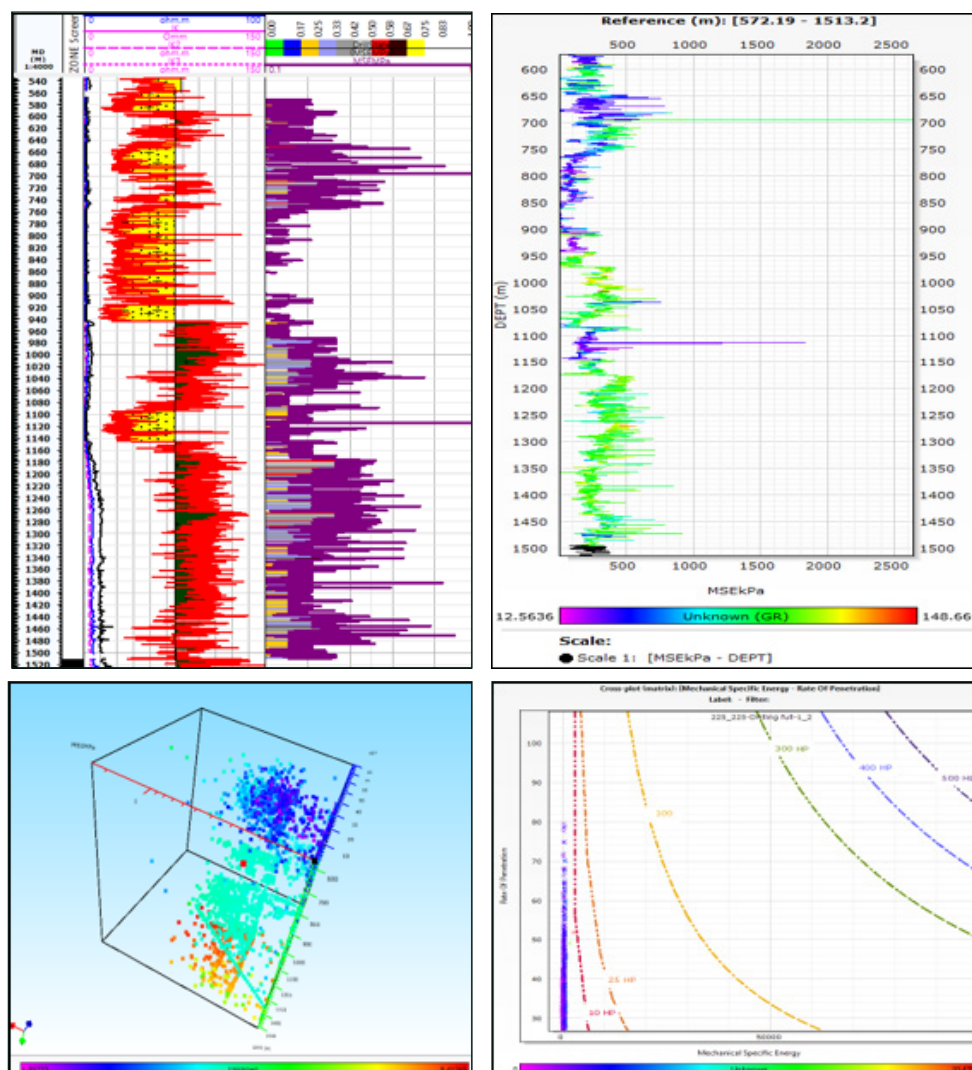


Figure 9: MSE Analysis Crossplots

A high MSE indicates that more energy than necessary is being consumed and that drilling is inefficient, whereas a low MSE indicates that the rock is being cut with minimum energy. Causes of elevated MSE were analyzed in real time during drilling and the parameter was maintained at a low level. During drilling of the Grgan Deniz well, the appropriate bit-change point was identified, suitable WOB and RPM values were selected, ROP was increased, bit life was extended, drilling days and costs were reduced, and damage to formations and horizons was minimized. MSE was monitored in real time.

RSS Performance Evaluation (Performance Drilling Technology)

The integrated Performance Drilling approach for the 12¼-in high-inclination interval combined Extended Reach Drilling (ERD) principles, Rotary Steerable System (RSS) technology, real-time drilling optimization, and continuous engineering support. The drilling strategy was designed to maximize drilling efficiency while

maintaining a high-quality wellbore through the following measures:

1. Application of ERD drilling principles for high-inclination and extended-reach well intervals.
2. Continuous optimization of drilling parameters (WOB, RPM, flow rate, differential pressure, and ROP) using real-time data.
3. Real-time Torque & Drag (T&D) modeling to predict and minimize friction, reduce mechanical risks, and support successful running of casing and completion equipment.
4. Optimization of hydraulics and hole cleaning, particularly in high-inclination intervals, using real-time cuttings-transport analysis.
5. Continuous monitoring of Equivalent Circulating Density (ECD) to maintain a safe drilling window and minimize formation-related risks.
6. Optimization of BHA design and drilling practices to reduce vibration, stick-slip, whirl, and bit dysfunction.
7. Use of RSS technology to maintain an accurate well trajectory, enable continuous rotation, reduce torque and drag, improve wellbore quality, and increase ROP.
8. Daily engineering analysis of drilling performance and preparation of recommendations for continuous optimization and reduction of operational risks.
9. Comparative analysis of lessons learned and offset-well performance to continuously improve drilling efficiency.

This integrated Performance Drilling methodology is intended to maximize ROP, minimize Non-Productive Time (NPT), improve wellbore quality, reduce overall well-construction costs, and safely complete the well ahead of schedule. Application of the Torque & Drag methodology can eliminate the need for additional backreaming, wiper trips, and similar operations. A graphical method for actual real-time monitoring is presented.

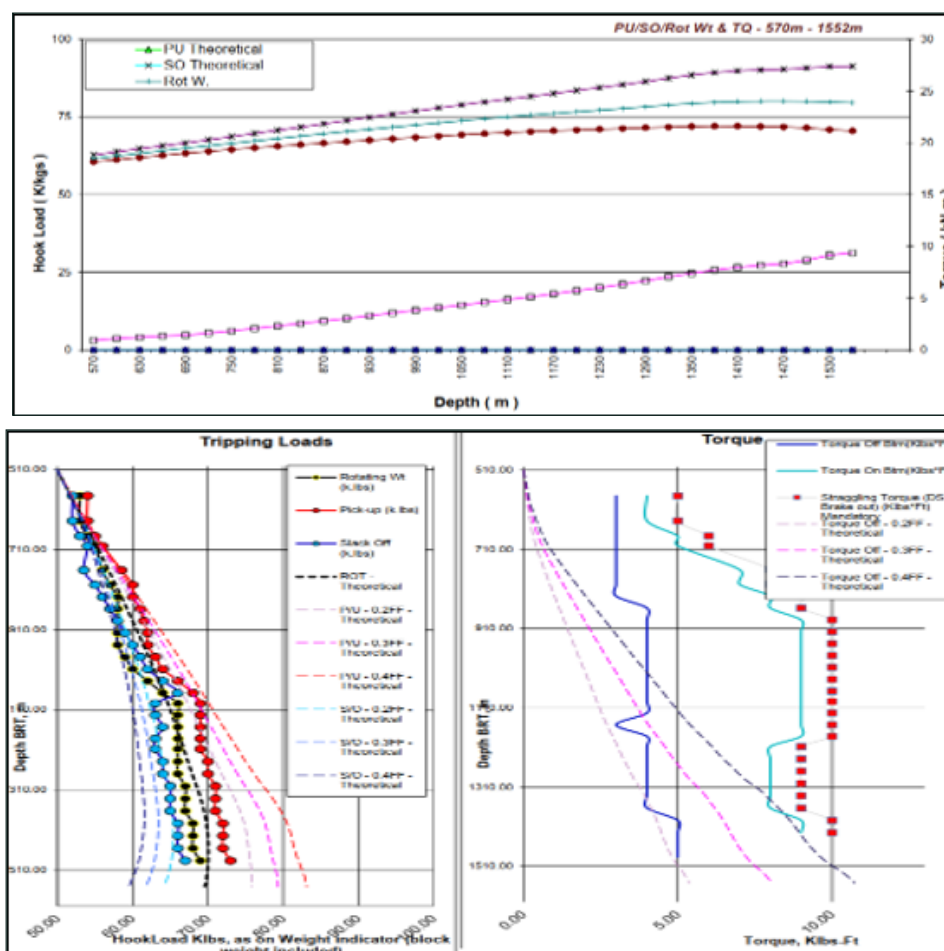
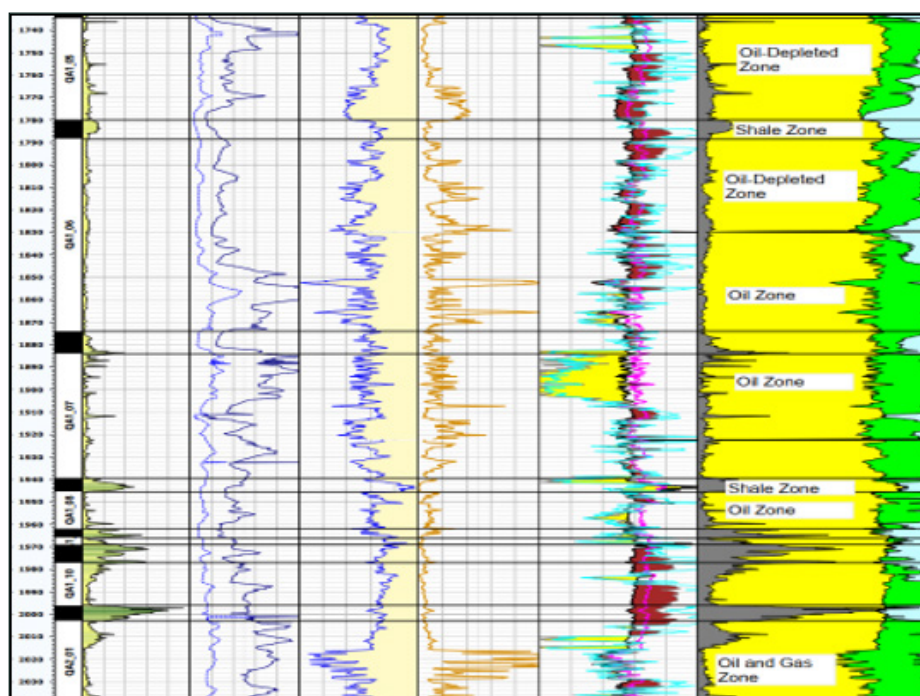
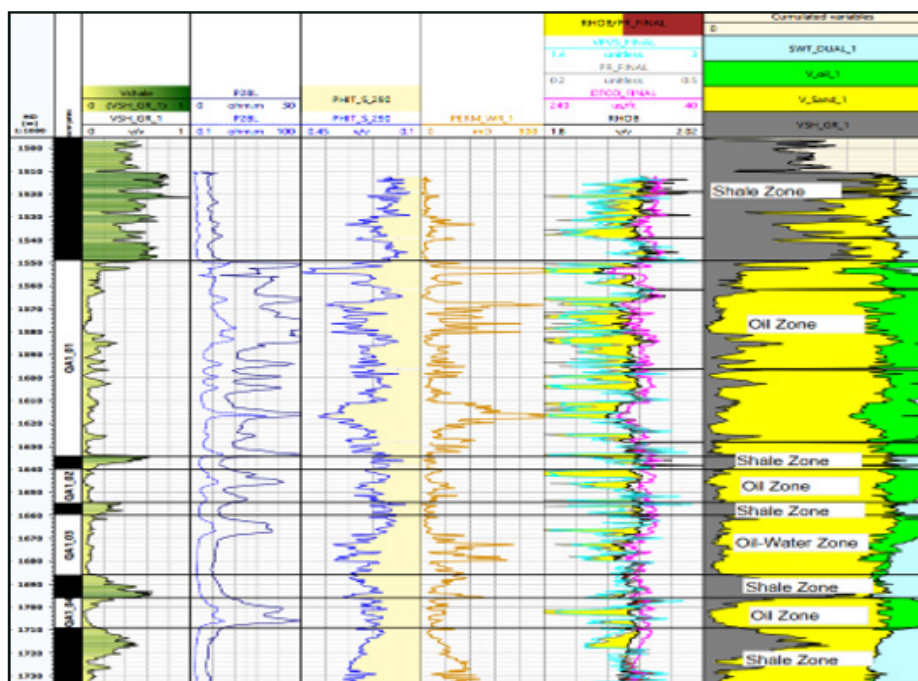


Figure 10: Real-Time RSS Performance Evaluation

Petrophysical Evaluation in Support of Well Completion

Sonic Dipole, density logging, and formation-pressure measurements were performed in the well. The logs were interpreted to identify oil-, gas-, and water-bearing intervals.



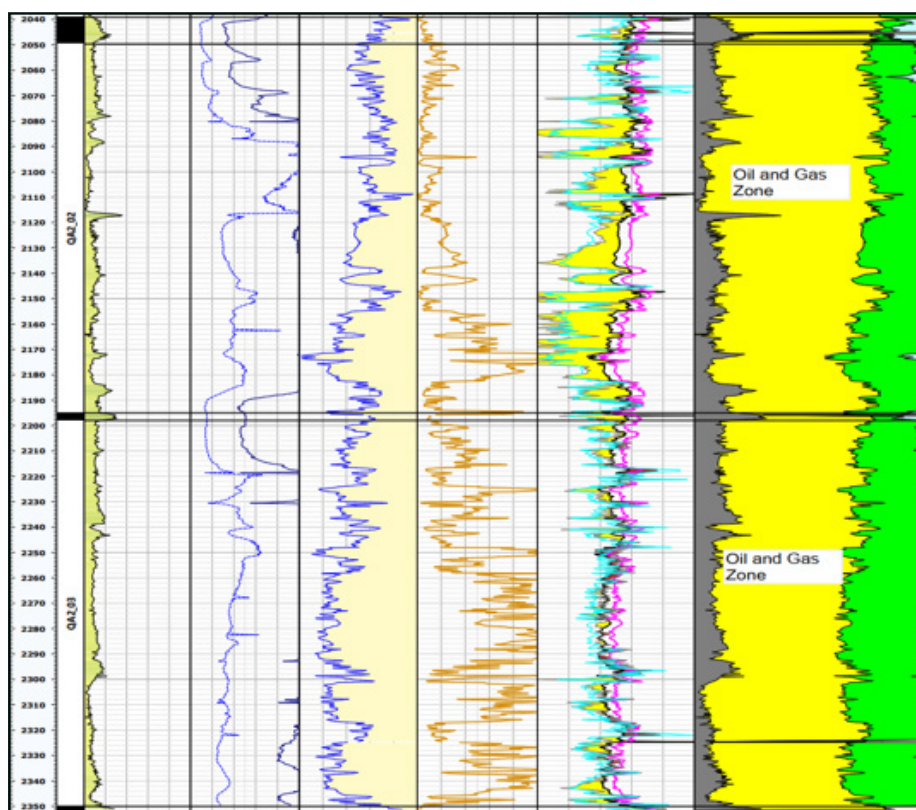
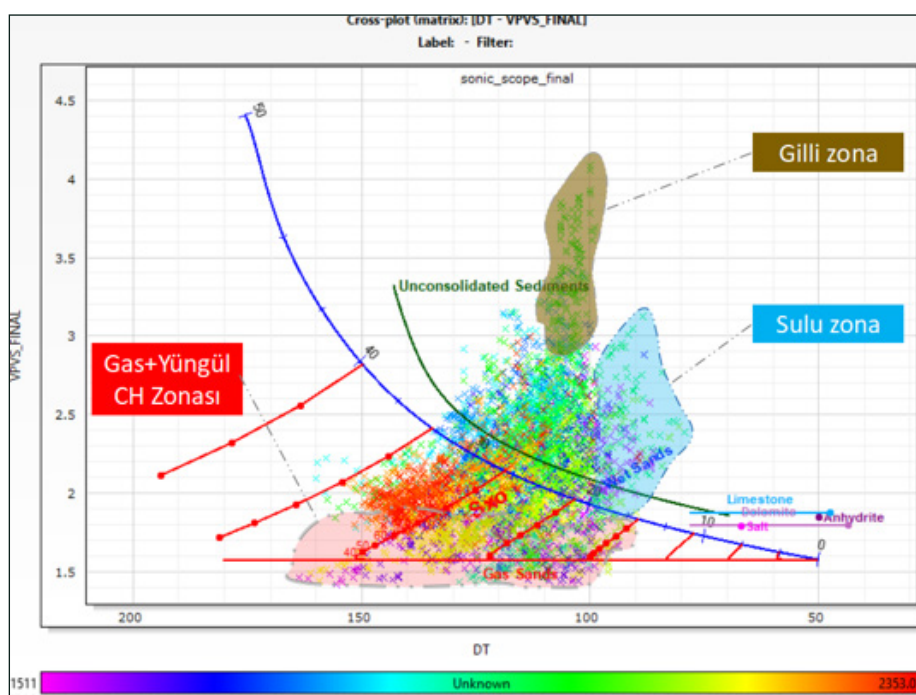


Figure 11: Petrophysical Interpretation



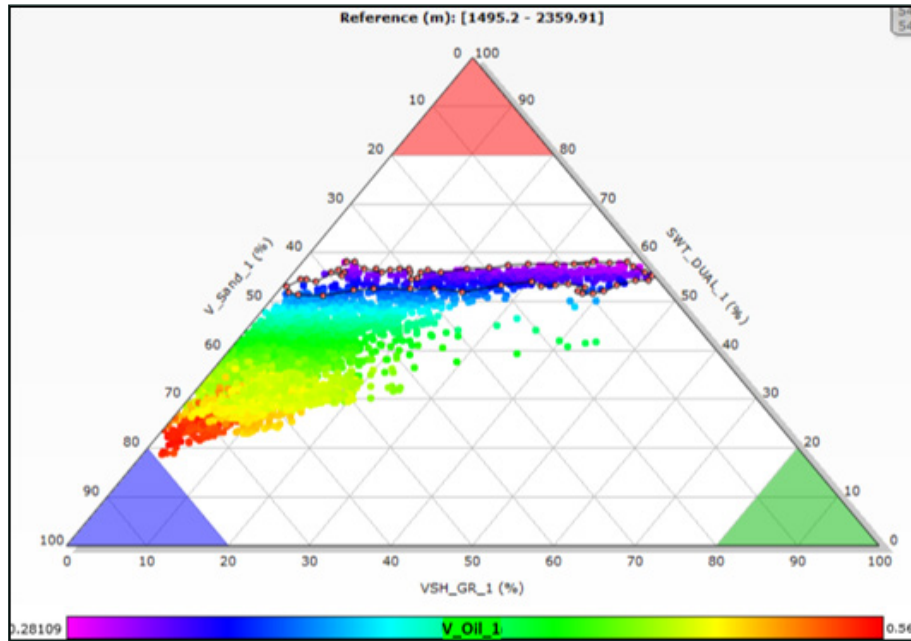


Figure 12: DT-VP/VS Crossplot and Ternary Lithology Diagram

Optimal Screen Completion and Screen Selection

Screen size for well completion was selected by considering the Particle Size Distribution (PSD) of the formation sand, reservoir permeability, sand-production risk, and long-term productivity. PSD analyses of samples from the Grgan well showed that the formation consists predominantly of medium- to coarse-grained sands. The median grain size (D50) was approximately 170–220 μm in most intervals, while D10 ranged from 270 to 450 μm . The fine fraction (<45 μm) constituted only 0–0.3% in most productive intervals, indicating a well-sorted formation with low clay content. On this basis, a 200 μm screen was proposed and selected. The selection was based on the considerations described below.

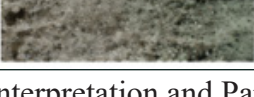
Dane ls (µm)	Tasvir	Grgan Deniz yeni quyudan	KNT TOPLANMA MHİTLRİ (DEPOZİSİYA MHİTLRİ)
300 µm İri qum	x iri qum danalari, ıpla gzle da grne bilen ldadır.		ay yataı (fluvial) – iri kanal ve ınılı barlar Yksak enerjili mhit. Gl axın iri qum və ınılan daşıyıp ay kanallarında və barlarda toplayır.
200 µm Orta–İri qum	Orta-iri qum danalari, asanlıqla seıla bilir.		Sahil (beach) – yksak enerjili sahil zonası Dala və axın tasiri ilə iri qumlar sahil boyunca daşıdır və yılır.
150 µm Orta qum	Orta ll qum danalari, ıpla gzle seilir.		Sahil arxası (shoreface) – delta n zonası Orta enerjili mhit. Dala bazasının altında, sahil arxasında qum kntlari toplanır.
100 µm İna qum	İna qum danalari, ıpla gzle atın seilir.		Sakit su (laguna, gl, estuari) – aşıı enerjili mhit Dalasız, sakit sularında ina qum kr. Laguna, krfaz və estuarlarda yayındır.
70 µm x ina qum	x ina qum danalari, sadəcə bydc ilə grnr.		Aşıı enerjili dəniz (shelf) – xarici shelf zonası Sakit dəniz mhitində ina qum və silt qarışıı kr.
30 µm Silt yaxın x ina hissacik	Siltə yaxın x ina hissaciklar, gzle grnmr.		Darin dəniz (prodelta) – prodelta və darin shelf ayların dənizə daşıdıı silt və x ina hissacikler prodelta zonasında kr.
10 µm x ina hissacik (silt lsnda)	x ina hissaciklar, adotan silt lsnda olur.		Darin dəniz – sakit knt mhiti Dalasız, x aşıı enerjili darin dəniz mhitində silt fraksiyalari toplanır.
7 µm Silt/gil lsna x yaxın	Silt və gil lsna x yaxın, mikroskopik hissaciklar.		Darin dəniz – gil knt mhiti (byk darinliklar) x sakit və darin mhitlərində gil mineraları və mikroskopik hissacikler uzun mddətdə toplanır.

Figure 13: Petrophysical Interpretation and Particle-Size Distribution — Grgan Deniz

The 200 μm slotted screen provides the following technical advantages:

1. It effectively retains the larger formation particles and prevents sand production.
2. It allows smaller particles to be produced during the initial production period and subsequently promotes formation of a natural self-filtration bridge.
3. It avoids a significant reduction in formation permeability and supports a low skin factor.
4. It reduces the probability of screen plugging and supports stable, high long-term production.
5. During production with an Electric Submersible Pump (ESP), it minimizes abrasive pump wear while preserving the high-permeability characteristics of the formation and supporting maximum productivity.

PSD results show that most grains in the productive intervals fall within the 150–300 μm range and that the proportion of fines is very low. Selection of a 150 μm screen would therefore increase the risk of early plugging and higher hydraulic resistance, whereas a 250–300 μm screen would increase the probability of larger sand grains entering the well. Following analysis of these factors, a 200 μm slot size was considered the optimal compromise between sand control and productivity.

Accordingly, based on the PSD evaluation, the 200 μm screen was selected to match the formation grain-size distribution. This selection minimizes sand-production risk, preserves well productivity, extends ESP service life, and supports safe long-term operation. A 200 μm slotted standalone screen can therefore be considered a technically and economically optimal solution for the Grgan-N well and subsequent wells. Application of the same approach in future wells is expected to support successful completion performance.



Figure 14: Grain Sizes Based on Cuttings Analysis From the Well Drilled in the Grgan Field

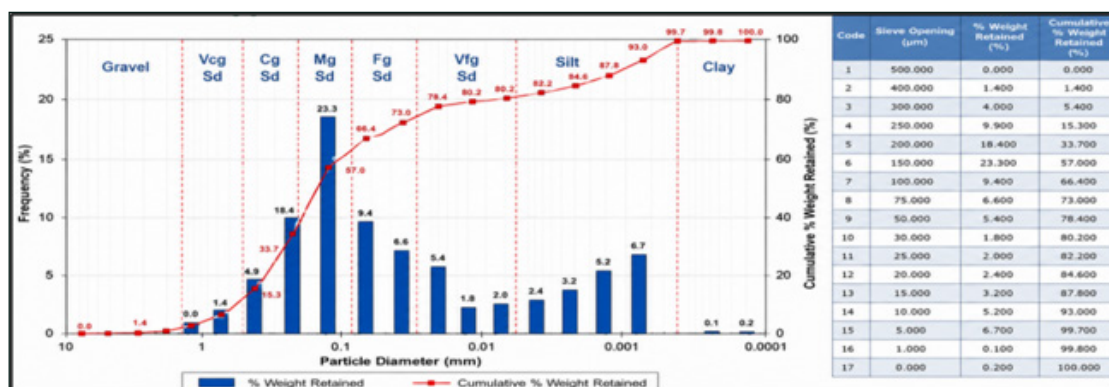


Figure 15: Combined Grain-Size Results Obtained from Cuttings Analyses of the Grgan Well

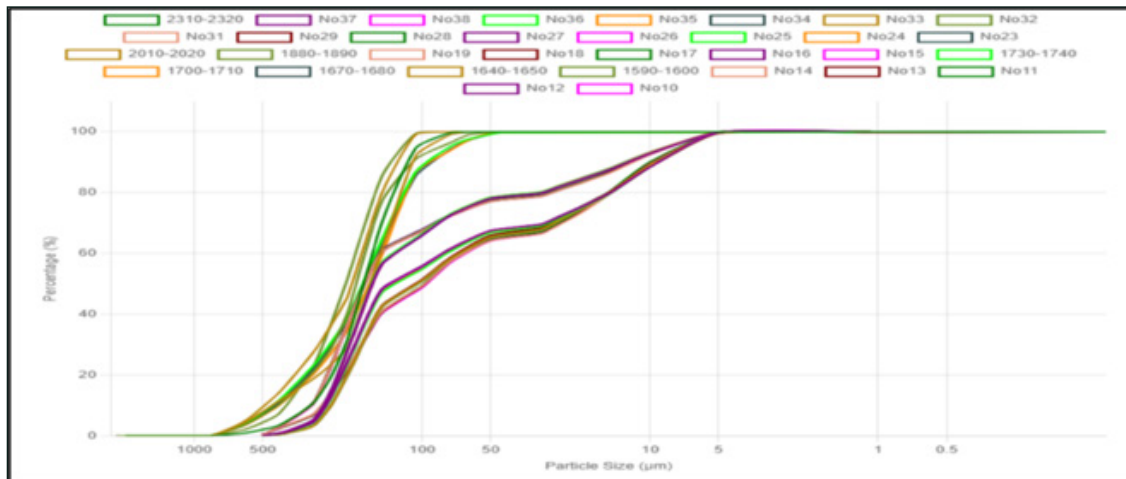


Figure 16: Overall Particle-Size Distribution of the Rock Samples

Detailed simulations of screen running were performed, and Vanguard Energy LLC successfully ran the screen to bottom without complications.

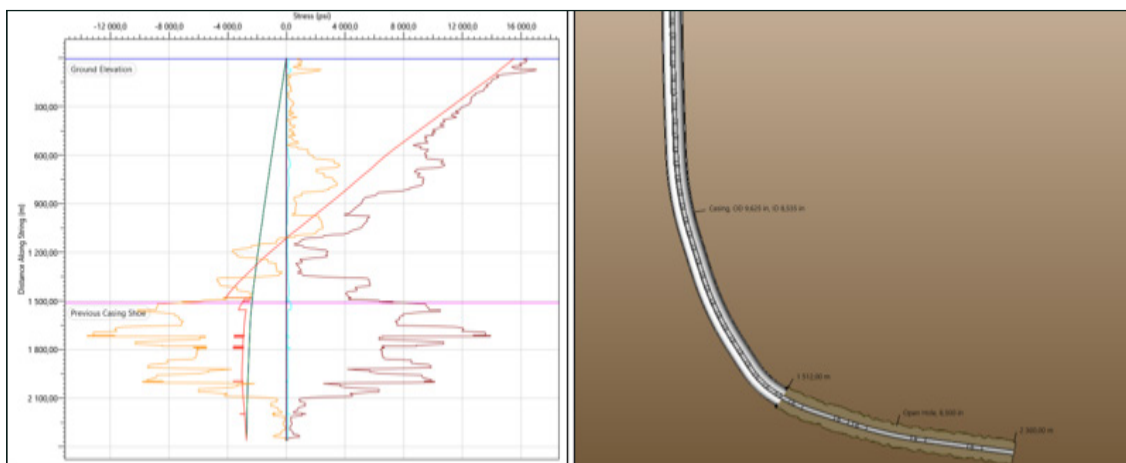


Figure 17: Screen-Running Simulation

Methods

The following methods were applied in the study:

- ✓**Empirical analysis** — analysis of production data.
- ✓**Statistical and comparative analysis** — comparison of the effectiveness of different methods.
- ✓**Simulation modeling** — construction of a 3D structural model using geological and geophysical well data.
- ✓**Analysis of industry practices** — evaluation of the effectiveness of methods applied in different countries, including geosteering practices.
- ✓**Drilling simulation models** — analyses using different BHAs.
- ✓**Drilling hydraulic calculations** — selection of the optimal operating regime.
- ✓**Completion simulation models** — selection of the completion design and evaluation of screen conveyance to the bottom of the well [1-7].

Conclusion

Through the coordinated efforts of the Glolynx Azerbaijan LLC geology and drilling teams and the completion team (Vanguard Energy LLC), all working toward a common objective, the following results were achieved:

1. The Grgan Deniz Field was brought back into production by Glolynx Azerbaijan LLC after many years

of inactivity. Despite the challenges associated with both the well trajectory and reservoir navigation, the project team assessed the risks and successfully drilled the well. The first redevelopment well became a reference for subsequent planned wells in the field, while the high oil production achieved encouraged the development of new projects.

2. Application of this approach to other suspended oil and gas fields has the potential to open new production areas and contribute to the country's energy security.
3. Through efficient application of drilling technologies, the well was delivered to the Client 30 days ahead of schedule, resulting in an additional 30 days of oil production.
4. The implemented optimization measures reduced overall drilling costs.
5. Accurate geological structural modeling enabled successful steering of the well over an 848 m interval within the reservoir, achieving record performance.
6. Reservoir horizons were successfully tracked using the 3D seismic cube.
7. By optimizing the planned target, the trajectory was adjusted 16 m upward and 4 m to the right to remain within the oil-saturated interval and avoid the water-bearing zone.
8. By reducing the drilling-fluid density specified in the original program and minimizing formation damage, high oil production was achieved.
9. Wireline logging operations were successfully conducted at an inclination angle of 82°.
10. Petrophysical interpretation enabled accurate identification of oil-saturated intervals for completion operations.
11. Analysis of drilling cuttings supported selection of the appropriate screen size.
12. Following drilling, the well was successfully completed with a 168.3 mm screen over an 848 m interval, representing the first operation of its kind in SOCAR's history.
13. High oil production rates were achieved.
14. The first well drilled in an area where no drilling operations had been conducted for many years was completed without complications, in full compliance with HSE requirements, and delivered to the Client with high oil-production performance.
15. As a result of these activities, the Gūrgan Deniz Field was successfully reactivated, providing additional production and creating new opportunities for future field development.

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