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Petrophysical Evaluation of Bahariya Sandstone Reservoir in Al-Fadl and Al-Qadr Fields, North East Abu Gharadig Basin (NEAG), Western Desert

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Abstract

The objective of this study is to evaluate the Bahariya sandstone reservoir in the Al-Fadl and Al-Qadr fields, located in the northeast Abu Gharadig Basin, Western Desert. This evaluation is based on qualitative and quantitative well-log data from four wells: Alfadl-1, Alfadl-2, Alqadr-1, and Alqadr-6. The initial identification of potential reservoir zones was conducted by visually inspecting well log curves. Zones with favorable log responses—such as low gamma ray readings, positive resistivity separation, and neutron-density separation indicative of sandstone—were selected for further analysis. Key petrophysical parameters, including shale content, effective porosity, and water saturation, were computed using established equations. The results indicate that the Alfadl-1 well contains four promising intervals (A, B, C, and D), characterized by high effective porosity (averaging 20%) and low water saturation (below 50%). In contrast, the Alfadl-2 well did not reveal any significant reservoirs due to its high shale content. The Alqadr-1 well identified two promising zones (A and B), with effective porosities ranging from 13% to 19% and moderate water saturation ranging from 40% to 75%. Similarly, the Alqadr-6 well showed three zones (A, B, and C) with effective porosities ranging from 13% to 18% and an average water saturation of 50%. Overall, the Bahariya Formation exhibits potential hydrocarbon-bearing zones with varying degrees of reservoir quality, influenced by shale content and porosity levels. This evaluation provides a foundation for further exploration and development in the Northeast Abu Gharadig Basin.

Keywords: Bahariya sandstones; Well logs; Al-Fadl and Al-Qadr Fields, Abu Gharadig Basin.

Introduction

The northern Western Desert encompasses seven basins: Matruh, Shushan, Dahab, Natrun, Ghazalat, Gindi, and Abu Gharadig basins. These basins have attracted numerous oil companies for hydrocarbon exploration. Badr El-Din Petroleum Company (BAPETCO) is among the companies operating in this region, drilling successful wells in the Al-Fadl and Al-Qadr Fields within the Abu Gharadig Basin (Figs. 1& 2). Generally, the hydrocarbon exploration in these sedimentary basins is controlled by a complex geological history and a variety of depositional environments (El Gazzar et al., 2016; Sarhan et al., 2017a; Sarhan & Basal, 2020; Assal et al., 2021; Sarhan, 2019 & 2020; Shehata et al., 2018, 2019, 2023a; Shehata & Sarhan, 2022; Farouk et al., 2022, 2024a,b; Hassan et al., 2023; Selim & Sarhan, 2023; Sarhan & Abdel-Fattah, 2024a,b). Extensive studies have identified a rich subsurface sedimentary succession ranging from the Jurassic to the Tertiary periods in these basins, containing significant petroleum resources, primarily sourced from Jurassic-Cretaceous rock units. Notably, the Cenomanian Bahariya Formation and the Turonian-Coniacian Abu Roash Formation together account for over 90% of the petroleum reserves in the Western Desert (El Diasty & Moldowan, 2012; Sarhan & Collier, 2018; Hewaidy et al., 2018; El-Bagoury, 2020; Elmahdy et al., 2020; Shalaby & Sarhan, 2021; Sabry et al., 2023; Reda et al., 2024).

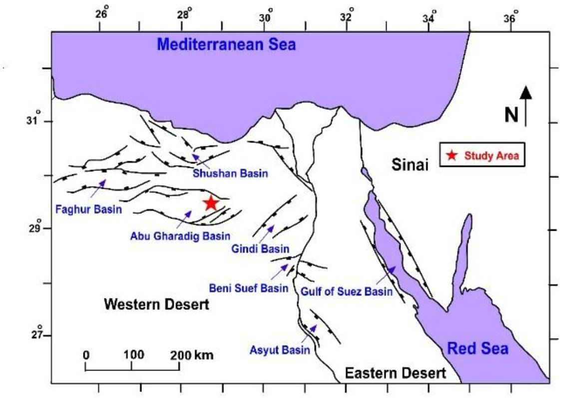

Figure 1: Map shows the location of the study area in Abu Gharadig Basin, Western desert, Egypt. (modified after Sarhan & Collier, 2018; Bosworth et al, 2008).

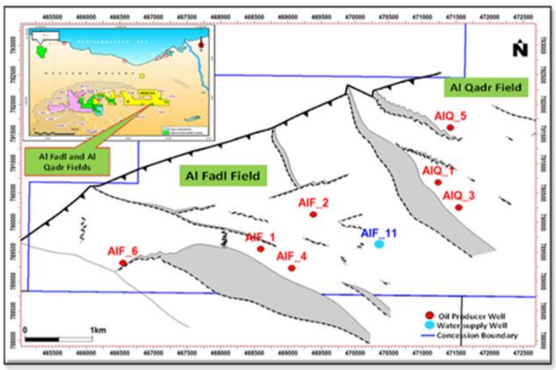

Figure 2: Map shows the location of Al-Fadl and Al-Qadr fields, North East of Abu Gharadig basin (NEAG), Western Desert, Egypt.

The structural evolution of the Abu Gharadig basin, influenced by events such as the Syrian Arc tectonic activity and Late Cretaceous dextral wrenching, has led to the development of NW-SE and WNW-ESE extensional faulting, along with NE-SW compressional structures, including the Abu Gharadig anticline (Sarhan, 2017b). These structural complexities play a crucial role in the distribution and accumulation of hydrocarbons within the AGB (Guiraud & Bosworth, 1997; Moustafa, 2008; Soliman et al., 2022; Shehata et al., 2023b). According to Sarhan (2021a, b), the most promising hydrocarbon reservoirs in the AGB are found in the sandy intervals of the Abu Roash E and C members, as well as the Bahariya sandstones.

The Upper Cretaceous rock units of the Al-Fadl field (Fig. 3) include, from base to top, the Bahariya, Abu Roash, and Khoman formations, with only the Kharita Formation penetrated from the Lower Cretaceous in the Al-Fadl field. This study focuses on the Bahariya Formation of the Upper Cretaceous age, providing a brief description of the lithostratigraphy of the studied field.

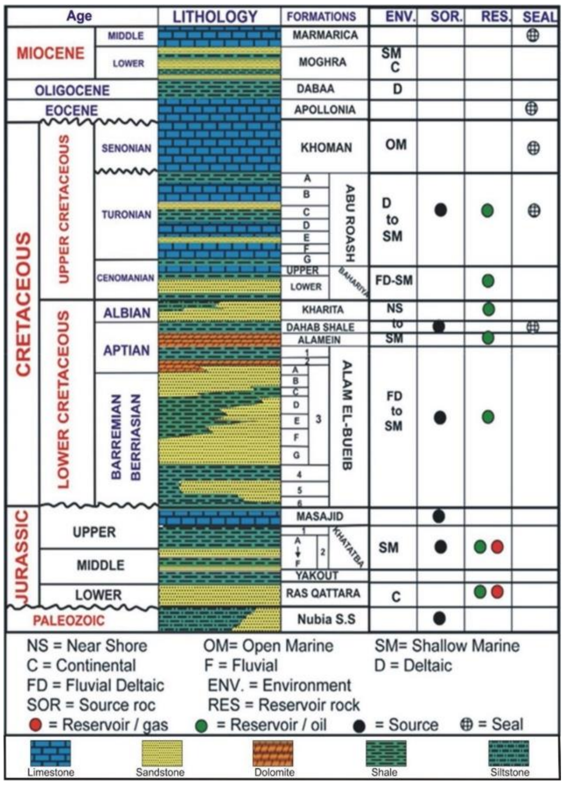

Figure 3: Regional stratigraphic column of the northern Western Desert (modified by Shalaby et al., 2011 after Schlumberger, 1984 & 1995).

The Al-Fadl and Al-Qadr fields in the Western Desert are part of the North East Abu Gharadig development license, which is overseen by Badr

El-Din Petroleum Company (Internal report, 2009). The Al-Fadl-1 and Al-Qadr-1 exploration wells were successfully tested in 2007, and to support the NEAG stakeholders (Shell Egypt, Apache, and EGPC), the NEAG1 License was granted in January 2008. These fields are part of the Upper Cretaceous potential, which is situated in the NEAG Extension concession's eastern region (Fig. 2).

Al-Fadl-1 was drilled to a total depth (TD) of 1476 meters below the derrick floor (mbdf), with the Bahariya Formation identified as oil-bearing, while the Kharita Formation tested wet(FDP BAPETCO 2009). This well initially produced 600 barrels per day (BPD) with nitrogen lift, increasing to 1200 BPD after fracturing, and 1700 BPD naturally, reaching 2600 BPD with nitrogen lift. Similar conclusions were drawn for the Bahariya and Kharita Formations in Al-Qadr-1(Internal report, 2007).

Al-Fadl and Al-Qadr Fields target the Upper Cretaceous Bahariya Formation, which has been highly successful within the central Abu Gharadig Basin, with major fields (BED-1, BED-2, BED-3) producing from the Abu Roash, Bahariya, and Kharita reservoirs. The Upper Cretaceous extends to the south of the NEAG Extension Concession and the East Bahariya Concession. However, within the NEAG Extension Concession, the Upper Cretaceous has had limited success, with minor discoveries in the Sheiba Fields. Moreover, the top seal at Al-Fadl and Al-Qadr fields is provided by the thick Abu Roash "G" shales and carbonates. The vertical offset on the main normal fault in the Al-Fadl field is larger than in the Al-Qadr structure, indicating that the Upper Cretaceous spill point is controlled by structural closure rather than Bahariya-Bahariya juxtaposition. The large fault offset places thin sands within the lower Abu Roash "E" section on the hanging wall against Bahariya sands on the footwall, with cross fault seal being the main prospect risk (Internal report, 2007).

Hydrocarbon source rock can produce different types of oil at various stages of maturation and basin development. The depth of burial, affecting formation temperature, is a controlling factor in oil genesis (Awad, 1983). The Khatatba source rock offers the best chance of charge for the eastern NEAG Extension area since the Abu Roash “F” source rock is immature over most of the area. Khatatba source rock analysis shows type II/III kerogen in nearby fields, capable of generating oil and gas (Internal report, 2007).

Al-Fadl and Al-Qadr Fields cover approximately 6 km x 3.7 km and consist of three-way dip fault closures at the top Bahariya level. The structures lie at the intersection of an inverted NE-SW trending reverse fault and NW-SE trending normal faults. The maximum fault throw is 500m, and the minimum is 25m. NW-trending normal faults in Al-Fadl and Al-Qadr fields are broken into a set of en-echelon faults, resulting in fault block compartmentalization. The central intra-field fault separates the area into Al-Fadl and Al-Qadr blocks, acting as a seal indicated by differences in the hydrocarbon column and oil-water contact.

This paper aims to evaluate the Bahariya sandstone reservoir in the Al-Fadl and Al-Qadr fields within the North East Abu Gharadig Basin, Western Desert, Egypt. This evaluation is conducted through the interpretation of qualitative and quantitative well log data from four wells (Alfadl -1, Alfadl-2, Alqadr-1, and Alqadr-6). The study aims to identify promising hydrocarbon zones and assess the reservoir characteristics to provide insights into the hydrocarbon potential of the Bahariya Formation in this region.

Data and Methodology

The data for this study were obtained from four wells: Al-Fadl-1, Al-Fadl-2, Al-Qadr-1, and Al-Qadr-6. The dataset includes well logs such as gamma ray, density, neutron porosity, resistivity, and caliper logs. These logs were used to evaluate the reservoir characteristics of the Bahariya Formation.

The initial identification of potential reservoir zones was based on a visual inspection of well log curves. Zones with favorable log responses—such as low gamma ray readings, positive resistivity separation, and neutron-density separation indicative of sandstone—were selected for further analysis. Subsequently, key petrophysical parameters were calculated for the most promising intervals. These parameters include shale volume, total porosity, and effective porosity, which were determined using the equations provided by Asquith and Gibson (1982). Water saturation was calculated using the Indonesian model (Poupon and Leveaux, 1971), while Bulk Volume Water was determined by applying Buckles' equation (1965).

Additionally, neutron and density log readings were cross-plotted (Schlumberger, 1972) to differentiate between lithologies and identify zones with high porosity. Points clustering between sandstone and limestone lines with porosity values ranging from 25% to 30% were considered potential reservoirs. Water saturation levels in the identified zones were then assessed using Pickett plots (Pickett, 1972). Zones with water saturation below 50% were considered hydrocarbon-bearing, whereas those with higher water saturation were interpreted as water zones.

Results

Al-Fadl-1 Well

The well log suite available for the Bahariya Formation in this well is displayed as tracks 3 through 7 (from the left) (Figs. 4, 5, and 6). The hole conditions for the entire section are excellent, as the Caliper log (Calip) nearly overlays the Bit Size (BS) (Track 3), indicating trusted log readings. Four optimistic zones (A, B, C, and D) were identified based on visual inspection of the log curve shapes and their correlations. These zones are characterized by positive resistivity separation (RLLD > RMSFL) in Track 7, indicating permeability, lower gamma ray readings (Track 4), and Neutron-Density separation indicative of sandstone (Track 5). Porosities for these zones are high (> 21%), confirmed by PEF readings typical for quartz (Track 6). These criteria suggest these zones are potential good reservoirs and warrant detailed log interpretation techniques.

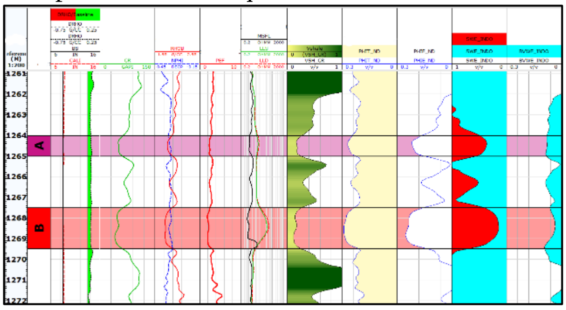

Figure 4: Well log suite of Bahariya Formation in Al Fadal-1 well (interval 1259-1270 m) displays pay Zones A and B (note the low gamma ray in Track 4 in addition to positive separations between resistivity logs in Track 7).

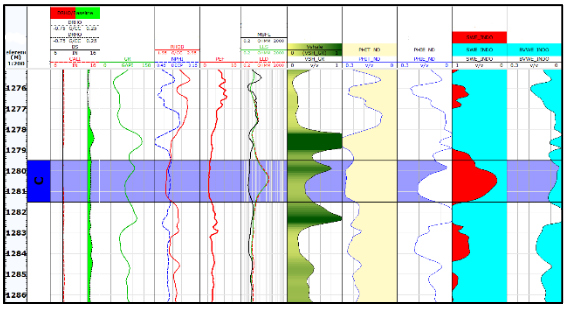

Figure 5: Well log suite for Baharyia Formation (interval 1279.5-1281.5 m) in Al Fadl-1 showing Zone C as a possible shaly reservoir (note the moderately high GR (Track 4) with positive resistivity separation in Track 7).

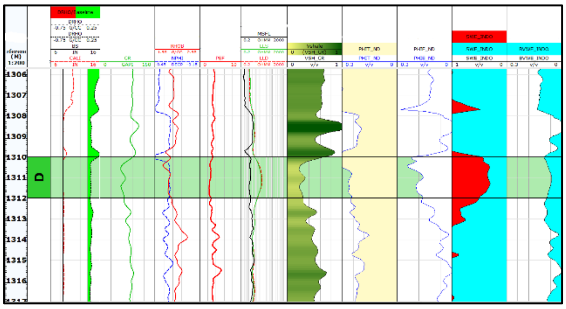

Figure 6: Well log suite represents Zone D in Al Fadl-1 well.

The Neutron and Density log readings for zones A-D, when plotted against each other (Fig. 7), cluster between sandstone and limestone lines, with points scattered between 25% and 30% porosity scale. Some points (blue balls) representing shaly sandstone have higher gamma ray readings, reflecting shale content.

The constructed Pickett plot (Fig. 8) for Zone A-D indicates water saturations:

- Zone B is the most prolific, with points below the 25% SW line.
- Zones A and D cluster between the 25% and 50% SW lines.
- Zone C shows a sharp oil-water contact, with points clustered below 25% and above 75% SW lines.

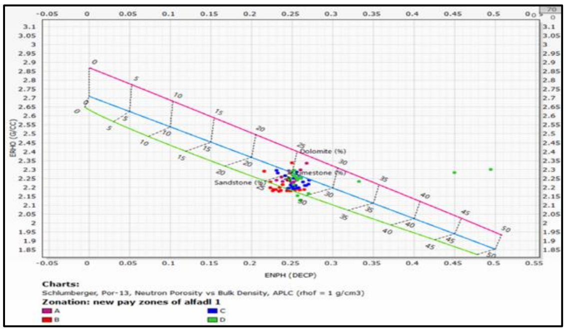

Figure 7: Neutron-Density cross plot for Zones A – D in Al Fadl-1 well, Abu Gharadig Basin, Western desert, Egypt.

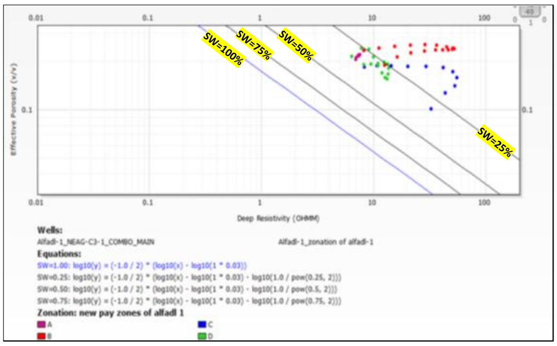

Figure 8: Pickett plot for Zones A - D in Al Fadl-1 well, Abu Gharadig Basin, Western desert, Egypt.

Al-Fadl-2 Well

In Al-Fadl-2, no zones of interest or good reservoirs were identified due to high shale content. There is A zone at the bottom of the Bahariya Formation that has low gamma ray readings (35 API) and Neutron-Density separation indicating sandstone. However, the zone has low shale volume (15-30%) and low deep resistivity (0.6-0.7 Ohms), indicating water presence. The bulk volume of water (0.19-0.22) is high, confirming the water zone interpretation (Fig.9).

The lithology of the water zone is clean sandstone according to the cross plot in Fig. (10), all the blue points cluster around the sandstone.

The picket plot assesses the high amount of water in this zone most of the points of the zone cluster around the sw=100% line as shown in Fig. (11).

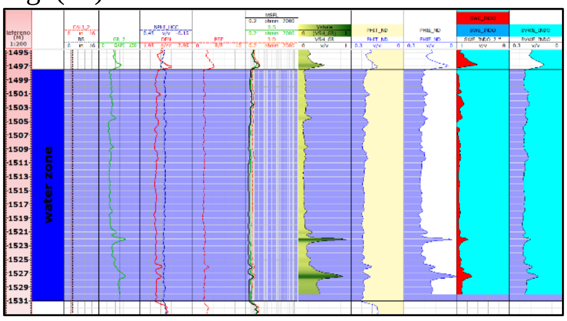

Figure 9: Well logs of the water zone in Alfadl-2 well.

Al-Qadr-1 Well

Zone A

Zone A in the Al-Qadr-1 well has a 3-meter thickness, with all log curves indicating a good reservoir. This zone has moderate gamma ray readings (65 API), excellent hole conditions (RHOB 2.28 gm/cc), and moderate resistivity (6.5 ohms). The sandstone nature is confirmed by RHOB and NPHI curves, with effective porosity between 13-15% (Fig. 12).

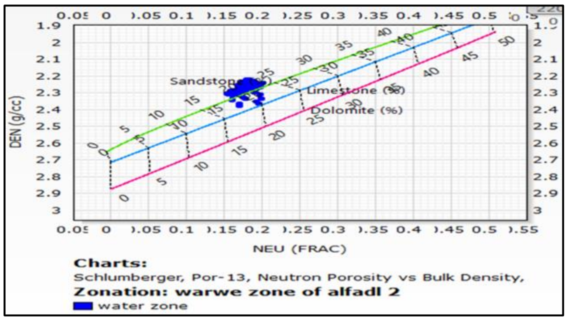

Figure 10: Neutron-Density cross plot for the water zone in Al Fadl-1 well Abu Gharadig Basin, Western desert, Egypt.

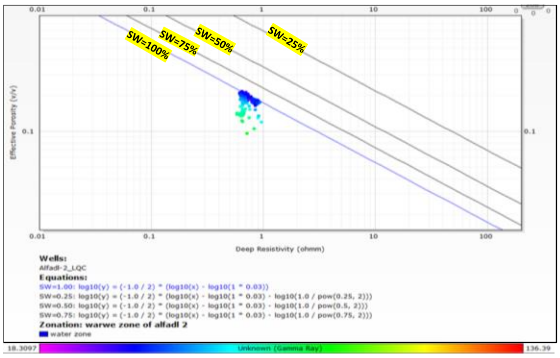

Figure 11: Picket plot of water zone in Al Fadl-2 well.

Zone B

Zone B in the Bahariya Formation within the Al Qadr-1 well has a thickness of 4.5 meters. All log curves corresponding to this interval indicate a good reservoir except for two peaks of high volume of shale. This zone exhibits a moderate gamma-ray reading of about 70 API due to the presence of shale. A moderate resistivity value is observed in track 4, reaching approximately 10.5 Ωm²/m (Fig. 12). The Bahariya reservoirs in both the Alfadl and Al Qadr fields exhibit lower-than-expected resistivities due to the ubiquitous presence of shale.

The sandstone nature of this reservoir is evident on both the RHOB and NPHI curves (Track 3). Additionally, the neutron-density separation of about 3 porosity units is indicative of a sandstone matrix, with the neutron reading positioned to the right of the density reading. The effective porosity of this zone is very good, ranging from 15% to 19%.

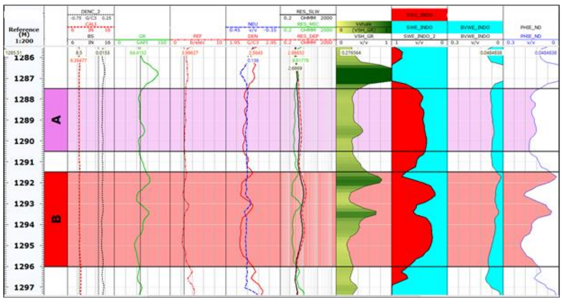

Figure 12: Well log suite for the prospective Zones (A and B) within the Bahariya Formation in Al Qadr-1 well.

Zone C

Zone C in the Bahariya Formation within the Al Qadr-1 well has a thickness of 3 meters (Fig.13). All log curves corresponding to this interval indicate a good reservoir. This zone exhibits a moderate gamma-ray reading of about 70 API due to the presence of shale. A moderate resistivity value is observed in track 4, reaching approximately 10.5 $\Omega m^2/m$. The Bahariya reservoirs in both the Alfadl and Al Qadr fields exhibit lower-than-expected resistivities due to the ubiquitous presence of shale.

The sandstone characteristics of this reservoir are reflected on the RHOB and NPHI curves (Track 3). The neutron-density separation of approximately 3 porosity units further confirms a sandstone matrix, with the neutron reading appearing to the right of the density reading. The effective porosity in this zone is excellent, varying between 15% and 19% (Figs. 13, 14, 15).

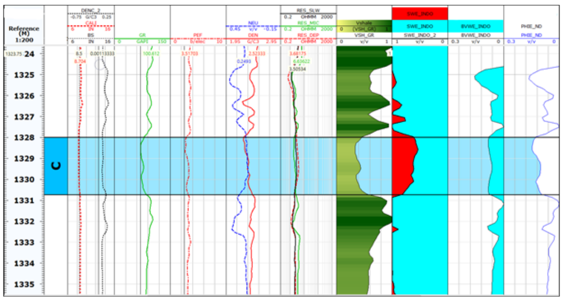

Figure 13: Well log suite for the prospective pay Zone C in Alqadr-1 well.

Al-Qadr-6 Well

Zone A

Zone A in the Bahariya Formation within the Al Qadr-6 (Fig. 16) well has a thickness of two meters. All log curves corresponding to this interval indicate a good reservoir. This zone exhibits a moderate gamma-ray reading of about 65 API due to the presence of shale. A moderate resistivity value is observed in track 4, reaching approximately 4.8 ohms. The Bahariya reservoirs in both the Alfadl and Al Qadr fields exhibit lower-than-expected resistivities due to the ubiquitous presence of shale.

The sandstone nature of this reservoir is evident on both the RHOB and NPHI curves (Track 3). The neutron-density separation confirms a sandstone matrix, with the neutron reading positioned to the right of the density reading. The effective porosity of this zone is very good, ranging from 13% to 15%.

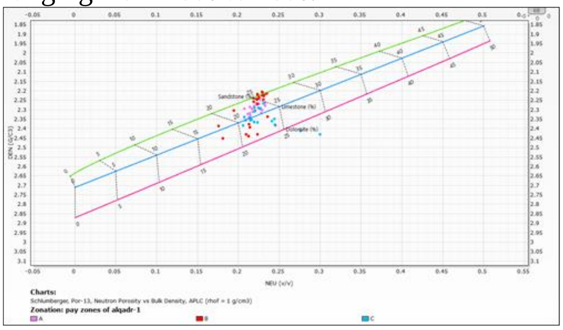

Figure 14: Neutron-Density cross plot for the different pay zones in Al Qadr-1 well.

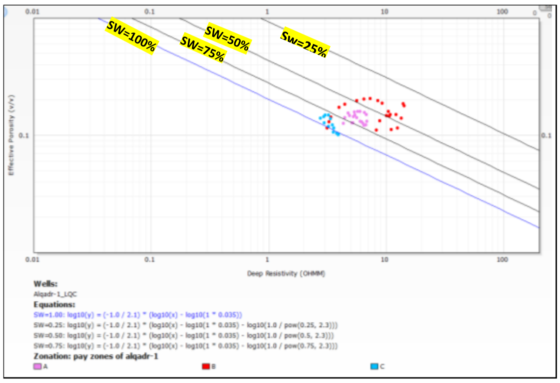

Figure 15: Picket plot represents the different reservoir zones in Al Qadr-1 well.

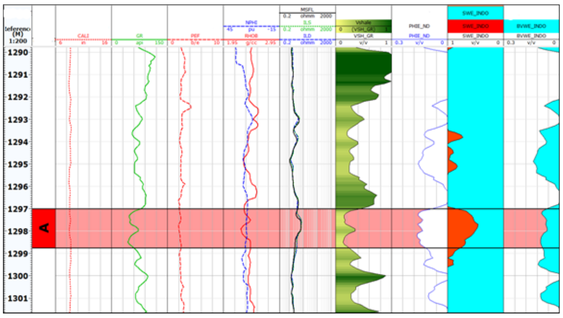

Figure 16: Well log suite for Zone A Alqadr-6 well.

Zone B

Zone B in the Bahariya Formation within the Al Qadr-6 well has a thickness of 2 meters(. All log curves corresponding to this interval indicate a good reservoir. This zone exhibits a moderate gamma-ray reading of about 65 API due to the presence of shale. A moderate resistivity value is observed in track 4, reaching approximately 6.6 ohms.

The Bahariya reservoirs in both the Alfadl and Al Qadr fields exhibit lower-than-expected resistivities due to the ubiquitous presence of shale. The sandstone nature of this reservoir is evident on both the RHOB and NPHI curves (Track 3). The neutron-density separation confirms a sandstone matrix, with the neutron reading positioned to the right of the density reading. The effective porosity of this zone is very good, ranging from 14% to 18% (Figs. 17, 18, 19).

Zone C

Zone C in the Bahariya Formation within the Al Qadr-6 well has a thickness of 2.5 meters. All log curves corresponding to this interval indicate a good reservoir. This zone exhibits a moderate gamma-ray reading of about 70 API due to the presence of shale. A low resistivity value is observed in track 4, reaching approximately 2.5 ohms, due to the presence of some shale (Figs. 17, 18, 19).

The Bahariya reservoirs in both the Alfadl and Al Qadr fields exhibit lower-than-expected resistivities due to the ubiquitous presence of shale. The sandstone nature of this reservoir is evident on both the RHOB and NPHI curves (Track 3). The neutron-density separation confirms a sandstone matrix, with the neutron reading positioned to the right of the density reading. The effective porosity of this zone is very good, ranging from 15% to 17%.

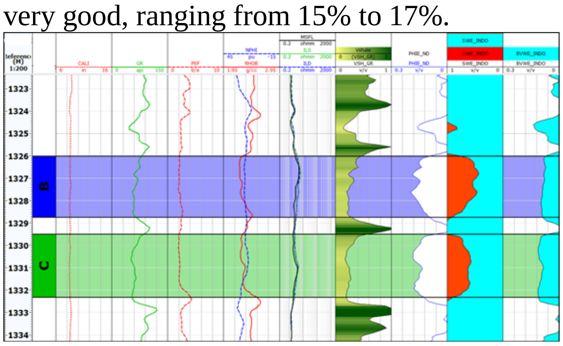

Figure 17: Well log suite for Zones B and C in Al Qadr-6 well.

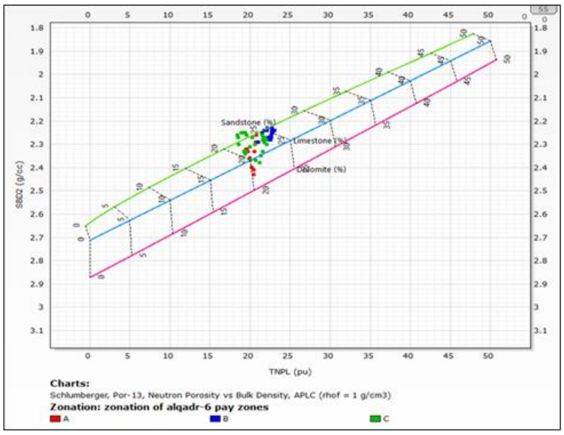

Figure 18: Neutron-Density cross plot for the three pay zones in Al Qadr-6 well.

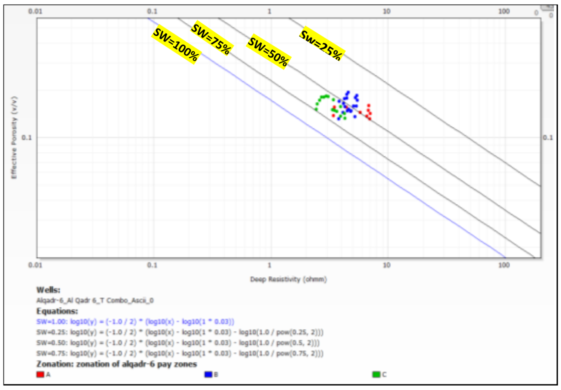

Figure 19: Picket plot represents the pay zones in Al Qadr-6 well.

Discussion

The petrophysical evaluation of the Bahariya sandstone reservoir in the Al-Fadl and Al-Qadr Fields of the North East Abu Gharadig Basin (NEAG), Western Desert, Egypt, provides a comprehensive understanding of the reservoir's characteristics and potential. The analysis, based on well log data from four wells—Al-Fadl-1, Al-Fadl-2, Al-Qadr-1, and Al-Qadr-6—offers insights into the spatial distribution, quality, and hydrocarbon potential of the Bahariya Formation. The results indicate that the Bahariya sandstone formations in the NEAG region exhibit varying reservoir qualities across different wells.

Al-Fadl-1 Well:

The well logs suggest four promising zones (A, B, C, and D) with favorable reservoir conditions. High porosities (>21%) and good hole conditions make these zones potential hydrocarbon reservoirs. The Pickett plot analysis reveals that Zone B is the most prolific, with low water saturation (<25%), making it a prime target for hydrocarbon production. Zones A and D also show potential, although with moderate water saturation, while Zone C indicates a clear oil-water contact with higher water saturation. The excellent hole conditions and moderate resistivity values, coupled with positive resistivity separation and low gamma ray readings, validate the interpretation of these zones as promising reservoirs. The overall reservoir quality is supported by the high porosities and favorable log responses.

Al-Fadl-2 Well:

There is no significant hydrocarbon-bearing zones were identified due to high shale content and poor resistivity values. The high shale volume and low resistivity confirm the presence of water, indicating that this well does not present viable prospects for hydrocarbon production in the Bahariya Formation. Therefore, the lack of promising zones in Al-Fadl-2 underscores the variable nature of reservoir quality within the Bahariya Formation and highlights the importance of detailed well-log analysis to identify productive intervals.

Al-Qadr-1 Well:

The three Zones A, Zone B, and zone C exhibit good reservoir qualities with effective porosities between 13-19% and moderate resistivity values. The low gamma ray readings and clear separation between neutron and density logs confirm the sandstone nature of these zones. Accordingly, the favorable reservoir conditions and moderate resistivity values indicate that these zones have potential for hydrocarbon production. The results align with the observations from Al-Fadl-1, reinforcing the viability of these zones for further exploration.

Al-Qadr-6 Well:

The well identifies three promising zones (A, B, and C) with effective porosities ranging from 13% to 18%. Despite moderate to low resistivity values due to shale content, these zones show good reservoir characteristics. The effective porosities and moderate resistivities in these zones, coupled with favorable log responses, suggest that they have potential for hydrocarbon production. The results are consistent with the findings from Al-Qadr-1 and further support the hydrocarbon potential of the Bahariya Formation in this region.

On the other hand, a consistent theme across the wells is the influence of shale content on resistivity readings. The presence of shale generally lowers resistivity values, which affects the overall interpretation of reservoir quality. This is evident in both Al-Fadl and Al-Qadr Fields, where the observed resistivities are lower than expected due to the pervasive shale content.

The detailed petrophysical analysis highlights the variability in reservoir quality across different wells and zones. While Al-Fadl-1 shows promising hydrocarbon zones with significant potential, Al-Fadl-2 is less favorable due to its high shale content. Al-Qadr-1 and Al-Qadr-6 offer promising zones with good reservoir characteristics, reinforcing the potential for hydrocarbon production in these areas.

Conclusions

- The interpretation of wire-line log data for the Bahariya Formation sandstones in the Alfadl and Al Qadr fields suggests they are favorable for oil and gas reservoirs. A detailed petrophysical evaluation of the Alfadl-1 well-identified hydrocarbon-bearing zones A, B, C, and D, which correspond to a total net pay thickness of 7.5 meters. These intervals exhibit a moderate shale volume, a favorable effective porosity of approximately 23%, and a low bulk volume water (BVW) of around 0.03, indicating good reservoir quality.
- In the Alfadl-1 well, the promising sandstone zones A, B, C, and D, with a cumulative thickness of 8 meters, present a strong case for further exploration. Similarly, in the Al Qadr-1 well, zones A and B, totaling 7 meters in thickness, exhibit effective porosities ranging from 15% to 19% and low BVW values between 0.04 and 0.05. The Al Qadr-6 well also shows potential, with three promising zones—A, B, and C—having a combined thickness of 5.5 meters and a BVW of approximately 0.06.
- The evaluation of the Bahariya sandstone

reservoir in the NEAG region provides critical insights into the reservoir's potential. These findings highlight the importance of detailed log analysis in identifying promising hydrocarbon zones and directing exploration and development efforts in the region. Future work should aim to refine reservoir models and optimize exploration strategies to maximize hydrocarbon recovery from the Bahariya Formation.

- Additional wells should be drilled in the Al-Fadl and Al-Qadr fields, targeting the identified zones in Al-Fadl-1, Al-Qadr-1, and Al-Qadr-6 for detailed reservoir characterization and potential hydrocarbon extraction.

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الملخص العربي

عنوان البحث: التقييم البتروفيزيائي لخزان الحجر الرملي بمتكون البحرية في حقلي الفضل والقدر، شمال شرق حوض أبو الغراديق، الصحراء الغربية

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[١]قسم الجيولوجيا، كلية العلوم، جامعة دمياط، دمياط ، مصر.

الهدف من هذه الدراسة هو تقييم خزان الحجر الرملي البحري في حقلي الفضل والقدر ضمن حوض أبو الغراديق الشمالي الشرقي، الصحراء الغربية، مصر. يستخدم هذا التقييم بيانات سجلات الآبار النوعية والكمية من أربع آبار: الفضل-١، والفضل-٢، والقدر-١، والقدر-٦. استند التحديد الأولي لمناطق الخزان المحتملة إلى الفحص البصري لمنحنيات سجلات الآبار. تم اختيار المناطق ذات الاستجابات السجلية المواتية، مثل قراءات أشعة جاما المنخفضة، وفصل المقاومة الإيجابية، وفصل كثافة النيوترون الدالة على الحجر الرملي، لمزيد من التحليل. تم حساب المعلمات البتروفيزيائية الرئيسية بما في ذلك حجم الصخر الزيتي، والمسامية الكلية، والمسامية الفعالة، وتشبع الماء باستخدام المعادلات المعمول بها. تشير االنتائج إلى أن بئر الفضل-١ يحتوي على أربع مناطق واعدة (أ، ب، ج، د) تتميز بمسامية فعالة عالية (٢٠٪ في المتوسط) وتشبع منخفض بالماء (<٥٠٪). ومع ذلك، لم يكشف بئر الفضل-٢ عن أي خزانات مهمة بسبب محتوى الصخر الزيتي العالي. حدد بئر القدر-١ منطقتين واعدتين (أ و ب) بمسامات فعالة تتراوح من ١٣-١٩٪ وتشبع متوسط بالماء يتراوح من ٤٠-٧٥٪. وبالمثل، أظهر بئر القدر-٦ ثلاث مناطق (أ، ب، ج) بمسامات فعالة تتراوح من ١٣-١٨٪ ومتوسط تشبع بالماء ٥٠٪. بشكل عام، يُظهر تكوين البحرية مناطق محتملة حاملة للهيدروكربونات بدرجات متفاوتة من جودة الخزان، متأثرة بمحتوى الصخر الزيتي ومستويات المسامية. يوفر هذا التقييم أساسًا لمزيد من الاستكشاف والتطوير في حوض شمال شرق أبو الغراديق.