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Research article

Evaluating of formation quality by interating core data and well log data in E sequence, X oilfield, Cuu Long Basin

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ABSTRACT

The X oilfield has a total of 4 wells, namely 1X, 2X, 3X and 4X. Sediment E sequence of X oilfield is the object of research in this study and has been determined to consist of 3 main distribution (E3, E4 and E5) and the distribution E clay above. Well logging measurements were performed throughout the E sequence for all 4 wells, core samples were taken at distribution E4 (at well 2X and 3X) and E5 (at well 4X). From the research results, it is shown that the formation of E sequence set has poor to moderate quality, but there are locations with good porosity and permeability. The low clay content in the reservoir (the average value of core samples for wells 2X, 3X and 4X is 6.96%, 8.94% and 5.7%, respectively, is a favorable factor for flow in the reservoir. The porosity-permeability relationship has a high correlation coefficient, so it is possible to trust this relationship to calculate the permeability for locations where the permeability measurement from the core sample is not performed. In order to evaluate the formation quality E of X oilfield accurately and comprehensively in all aspects, it is necessary not only to rely on core analysis and well-logging data, but also needs to be combined with conducting DST (Drill Stem Test), as well as other geological and stratigraphic methods.The results of the determination of porosity and permeability are not the same in 4 wells, showing the complicated change of facies of E sequence in the structure of X oilfield, so when simulation a wells, it is necessary to be careful and consider carefully based on building a map of the distribution of facies, in order to contribute to improving the efficiency of the oil and gas search and exploration process, reduce geological and economic risk factors, and provide more information to evaluate accurately and efficiently price oil and gas reserves.

Key words: Reservoir quality, Core analysis, Well-logging, Cuu Long basin

INTRODUCTION

X oilfield is located at the southeast corner of Block 15-1 in the Cuu Long Basin[1]. Distributing in the geological structure of X oilfield are pre-Cenozoic basement rock and Cenozoic sediments[2]. X oilfield has a total of 4 wells, namely 1X, 2X, 3X and 4X. Sedimentation E sequence of X oilfield is the object of study in this study and has been determined to consist of 3 main distribution (E3, E4 and E5) and the distribution E clay above[3]. X oilfield is located in Block 15-1, under the management of Cuu Long JOC company. At present, there are many Block in Cuu Long basin that have not been research deeply, so the study of formation quality by integrating well-logging data and core analysis is very important for production engineer to develop the oilfield and saving the money for company.[4]

Regarding the assessment of reserves, and the quality of formation, many researchers in Vietnam and abroad have been interested in researching, among which can mention a number of closely related research works, representatives in the country as well as in the world, including: J. Yan et al. (12/2006), Reservoir Description from Well-log and Reservoir Engineering: "An Example from Triassic Reservoirs in Northwest China", this method has been applied in the description of the Triassic aquifer of an area with hydrocarbon potential in the basin. NW China's Tarim area for further exploration[1]; Kesai Li and et al, (2018), "Improved horizontal well logging porosity calculation for a gas reservoir in the Northern Ordos Basin, China", Study on improving the calculation of porosity of vertical production wells using well-logging data[2]; Maisyita Azizah Oetomo, (2019) "Reservoir characterization by petrophysical analysis and core data validation, a case study of the X oilfield prospect sequence", Journal of Physics: Conference Series,), study of reservoir characteristics by physical analysis and core analysis[3]; A.M. Bagheri and et al (2005) "Integrated analysis of core and log data to determine reservoir rock types and extrapolation to uncored wells in a heterogeneous clastic and carbonate reservoir", Research on Integrated Log Data Analysis and Core Analysis to identify reservoir rock and

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extrapolate uncored wells in a heterogeneous clastic and carbonate reservoir[4]; Nguyen Xuan Kha (2016) "Distribution of porosity and permeability in fractured basement reservoir of White Tiger oilfield by core and logging data", evaluating the porosity distribution of central Block and northern Block of Bach Ho field. The research results show the heterogeneity in porosity of the basement rock of the mine.[5]; Do Quang Tung (2014) "Study on the correlation between permeability, porosity according to average particle size based on core sample data and analysis of graininess in upper Oligocene and lower Miocene X oilfield Block 09/1 Cuu basin Long", analyzed the average particle size of the oilfield, thereby assessing the ability of the average particle size to affect the porosity and permeability parameters of the oilfield[6]; Doan Tuong Hoan (2007) "Explaining the geophysical data of the well to determine and evaluate the permeability of the product reservoir in the rb 3x borehole, Ruby mine, Cuu Long basin" The research has studied well-logging interpretation and its application.

From the results of the overview study of the above researches, it is possible for my research team to inherit important and valuable data, form a mindset, establish a reasonable calculation and research process in order to improve and assess the quality of the formation quality in the reserve assessment and get a more general view of the quality of the formation in the study area.

X oilfield is a large gas field and condensate field located in the southeast corner of Block 15-1 of the Cuu Long basin, located nearly 135km to the east of Vung Tau city, 62km from the mainland and 56m under water. The oilfield is located in the North adjacent to Su Tu Vang oilfield (Cuu Long JOC), in the Northeast by Ruby oilfield (Petronas), in the South by Rang Dong Oilfield (JVPC) (Figure 1).

The stratigraphic column of the structure X oilfield Block 15-1 is built on the basis of the results of interpretation of seismic data, interpretation of petrophysic, biostratigraphy, core samples and debris of drilled wells. The geological profile opened by the wells includes pre-Cenozoic basement rocks and Cenozoic sediments. The mineralogy characteristics, sedimentary environment, fossils, etc. of each percentile unit are shown on the stratigraphic column (Figure 2).The results of analysis, interpretation and construction of geochemical models of oil and gas companies operating in the Cuu Long basin identified the following main source rock sources: Tra Cu source rock – E sequence Mainly Kerogen type II and III, TOC content varies from 0.5-7%, S1+S2 is about 2->30mg/g, HI is more than 500mg/g. Late Oligocene source rock - D and C sequence. The D set has values of geochemical parameters that reflect this is a good to very good rock. Kerogen belongs to types I, II and a little is type III, TOC varies in from 1-9%, S1+S2 about 2->30mg/g, HI: 80->500mg/g. The reservoir rock of Block 15–1 is the weathered basement rock , fractured rock and Oligocene sandstone located in the C, D, E, F sequence, in addition, there are reservoirs in the Miocene. The cap rock in the Su Tu Den and Su Tu Vang structure, The fracture basement and altered basement layer is sealed horizontally by the Bach Ho clay set with a thickness of 340-600 m. Mainly dark brown clay rich in organic matter interspersed with sandstone, siltstone and limestone and rarely with a thin layer of coal.[7] In X oilfield, there is a reservoir in the area of Bach Ho clay containing Rotalia and the local seal layer in the E layer, which is mainly composed of claystone. In the area of 15-1/05, the traps contain the basement raise form which is covered by the adjacent Oligocene sediments and the White Tiger clay layer. The sandstone traps in the Oligocene were mainly lenticular traps, stratigraphic beveled or tectonic seal. Traps contained in the Miocene are diverse but mainly structural traps. Traps in the basement of the X oilfield, formed before the Oligocene, were covered by Oligocene and Miocene sediments under the covered, creating favorable conditions for hydrocarbons to migrate from the source rock to fill the traps. The path through which oil and gas migrates is interspersed sand layers in exposed source rock.[8]

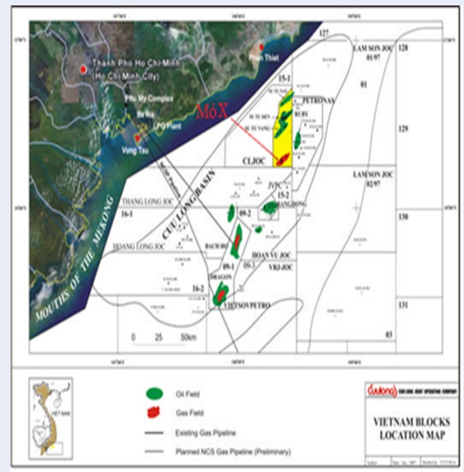

Figure 1: The geographical location of the X oilfield[5]

DATABASE

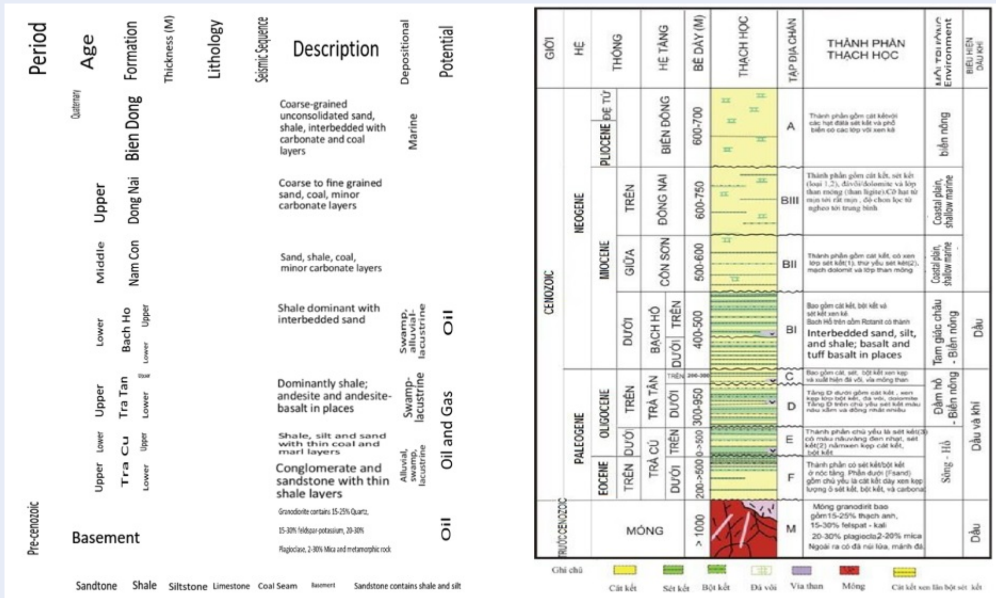

Figure 2: Stratigraphy column of X oilfield [6]

The results of Core Analysis and Well-Logging data

Well-logging measurements were performed throughout the E sequence for all 4 wells, core samples were taken at distribution E4 (at well 2X and 3X) and E5 (at well 4X) [9]. Core samples were taken from three wells, is X-2X; X-3X and X-4X. The results of core analysis of three wells are shown in Tables 1, 2 and 3 [10]. The results of well logging interpretation of four wells X-1X, X-2X, X-3X and X-4X are shown in and Figures 3, 4, 5 and 6.

METHODOLOGY

Integrating Core Analysis and Well-logging Data

From the results of interpreting the well log data and analyzing the core sample, the sequence containing parameters such as porosity, permeability, water saturation, clay content... of the sequence have been determined, from which which evaluates the quality of the reservoir (Figure 7) [12]

Currently, in the world and in the country to evaluate the quality of source rock geophysics engineers often use methods such as: DST, well log method,and based on core sample… [13]. In this study, the authors evaluate the quality of the source rock the X oilfield, Block 15-1, by integrating the well log data and core analysis data. [14] Core analysis has many shortcomings, so the integrated method is the most suitable choice to assess the quality of source rock in Block 15-1. [15]

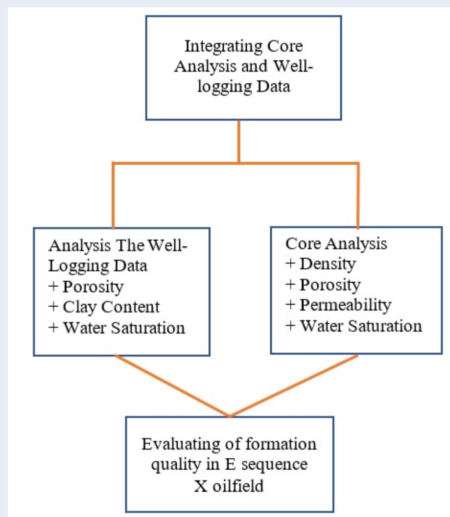

Figure 7: Research Process

After performing the analysis in the laboratory, the results of core analysis are compared with the results of well logging data [16]. The results show a high coincidence, showing the reliability of the results of well log calculations as well as reflecting the good quality of core sample data (Figures 8, 9 and 10). [17]

RESULTS AND DISCUSSION

Table 1: The results of core analysis E sequence at X-2X

2X					
Sample ID	Porosity %	Klinkenberg Permeability mD	Bulk Density g/cm3	Residual Water Saturation %	Clay content %
1	11.7	464.8	1.86		1.12
2	11.3	356.3	1.88	7.57	
3	11.0	161.7	1.86		3.43
4	10.9	206.5	1.88	10.94	
5	11.2	300.3	1.86		1.12
6	11.1	127.4	1.86		3.92
7	11.1	114.1	1.86	8.79	
8	7.6	7.63	1.86		3.43
9	4.0	0.0021	1.87		
10	4.7	0.0042	1.89	24.04	
11	8.2	5.425	1.85		8.54
12	8.8	9.52	1.86		6.23
13	8.5	6.909	1.85	14.34	
14	8.8	13.58	1.86		5.25
15	9.0	9.73	1.86		5.04
16	7.9	0.854	1.85	16.77	
17	8.7	4.515	1.85		6.93
18	7.4	16.38	1.85		5.53
19	5.9	1.008	1.85	16.01	
20	4.8	0.0161	1.86		18.90
21	4.8	0.0203	1.86		18.55
22	6.1	0.1442	1.86	23.42	
23	8.2	0.861	1.86		12.60
24	6.2	0.2534	1.85	23.12	
25	10.1	195.3	1.84		6.72
26	7.9	3.493	1.85		6.72
27	8.3	4.263	1.86	18.63	
28	6.9	0.6986	1.84		9.31
29	9.0	43.12	1.85		4.90
30	8.7	16.59	1.84		4.62
31	9.3	53.62	1.85		7.42
32	9.0	24.5	1.84		5.04
33	8.0	1.393	1.84	15.18	
34	8.1	2.289	1.84		7.70
Average	8.3	63.3	1.85	16.26	6.96

Table 2: The results of core analysis E sequence at X-3X

3X					
Sample ID	Porosity %	Klinkenberg Permeability mD	Bulk Density g/cm3	Residual Water Saturation %	Clay content %
1	7.6	1.813	1.84		7.91
2	6.8	0.252	1.8		13.72
3	7.6	0.707	1.83		5.39
4	3.5	0	1.86	42.47	
5	5.9	0.042	1.82	22.96	
6	3.8	0.014	1.86		
7	3.9	0.014	1.85		19.39
8	3.4	0.007	1.85		18.20
9	3.7	0.014	1.86	52.63	
10	4.5	0.021	1.85	24.72	
11	5.2	0.378	1.81		
12	7.6	5.642	1.81		6.51
13	7.4	5.663	1.82		7.42
14	6.2	1.575	1.83		
15	5.4	3.976	1.84		8.68
16	7.3	8.47	1.83	25.33	
17	7.2	3.612	1.82		6.79
18	4.0	0.007	1.86	44.74	
19	7.5	6.671	1.85		8.19
20	4.3	0	1.88	50.66	
21	5.2	0.112	1.9		
22	6.8	0.035	1.86	28.39	
23	6.0	0.126	1.85		
24	6.7	0.266	1.85		7.21
25	6.3	0.35	1.84		8.40
26	7.4	3.318	1.82		11.20
27	8.1	13.559	1.84		2.80
28	7.5	5.397	1.84	26.36	
29	7.7	3.717	1.83		4.90
30	6.5	1.316	1.85		3.01
31	6.3	0.462	1.82		12.32
32	6.1	0.105	1.83	41.01	
33	5.6	0.091	1.83	45.19	
34	5.3	0.126	1.83		
Average	6.0	2.0	1.84	36.77	8.94

Table 3: The results of core analysis E sequence at X-4X

4X					
Sample ID	Porosity %	Klinkenberg Permeability mD	Bulk Density g/cm3	Residual Water Saturation %	Clay content %
1	1.2	0.00106	1.9	22.44	
2	2.5	0.00103	1.87		29.89
3	1.8	0.00107	1.88	18.73	
4	3.2	0.0014	1.86	16.46	
5	3.4	0.00308	1.86		
6	7.8	0.00385	1.86	36.32	
7	7.9	0.0126	1.86		4.20
8	7.8	0.0133	1.86		4.90
9	8.6	0.714	1.84	27.87	
10	6.9	0.0126	1.86	31.61	
11	8.3	0.4298	1.84	27.8	
12	8.1	4.9	1.85		2.10
13	6.7	0.0371	1.85	26.68	
14	6.5	0.0287	1.85	32.55	
15	5.7	0.0189	1.84		0.21
16	6.2	0.0336	1.85	27.68	
17	6.4	0.1043	1.85		1.89
18	6.5	0.0273	1.86	21.85	
19	6.7	0.0336	1.86		3.08
20	6.6	0.0217	1.86		2.59
21	6.6	0.0175	1.86	22.14	
22	5.8	0.0308	1.86		3.71
23	6.0	0.0112	1.86	22.93	
24	7.1	0.3108	1.84		3.71
25	6.9	0.224	1.84		5.11
26	6.6	0.0826	1.84	25.73	
27	3.9	0.0112	1.84		8.89
28	7.3	0.2317	1.83	21.23	
29	6.6	0.112	1.84		6.51
30	7.0	0.0931	1.84	24.01	
31	7.4	0.6783	1.83		3.71
32	7.4	2.716	1.83	27.08	
33	7.8	5.418	1.85		4.90
34	7.4	4.767	1.84		5.11
Average	6.2	0.6	1.85	25.48	5.7

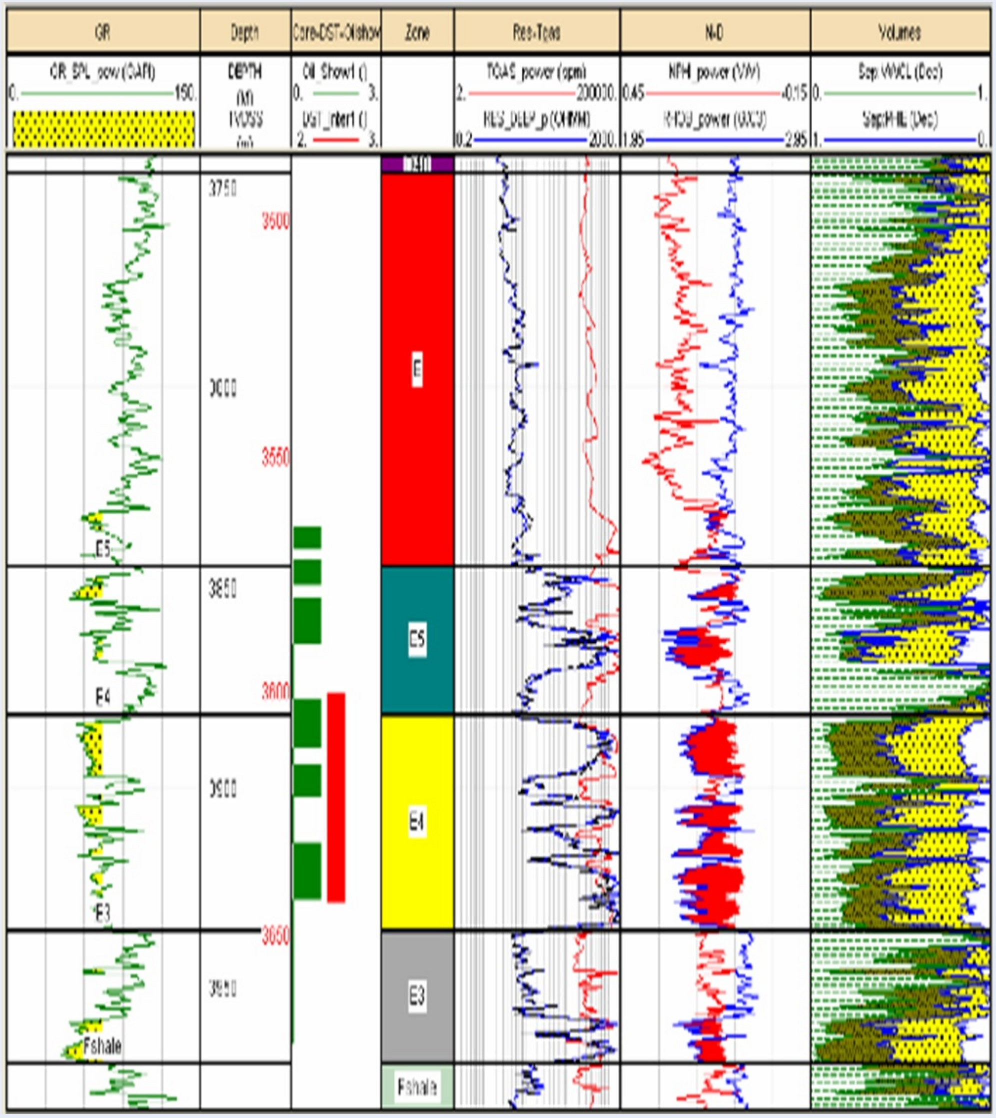

Figure 3: The results of well logging E sequence at well X-1X [11]

The Results After Integrating Well-logging Data and Core Analysis Data

After analyzing the core data , the results of density determination are shown in Tables 1, 2 and 3. The results of core sample analysis showed that the average density of wells X-2X was 1.85 g/cm3, well X-3X was 1.84 g/cm3 and well X-4X was 1.85 g/cm3. Based on the particle density distribution chart (Figure 11), it can be seen that the density of source rock E sequence set ranges from 1.8 g/cm3 to 1.9 g/cm3 , mainly in 1.84 g/cm3 to 1.86 g/cm3, the average value of the whole E sequence set is 1.85 g/cm3, which is quite high, indicating that the rock is compacted and has the appearance of secondary minerals (quartz, calcite, zeolite)

The porosity of E sequence based on well log data is calculated based on the measurement results of density lines, neutron lines and sound waves at wells X-1X, X-2X, X-3X and X- 4X and the results are shown in Figures 12, 13, 14 and 15. Table 4 presents porosity values of wells X-1X, X-2X, X-3X and X-4X.

The porosity of data taken from wells X-2X, X-3X and X-4X was determined by helium compression method based on Boyle's law. Measurement results are shown in Tables 1, 2 and 3. The porosity of E sequence according to the core sample material has an average value of 6.9%, ranging from 1.19% to 11.7%, mainly in range of 6% to 9%.

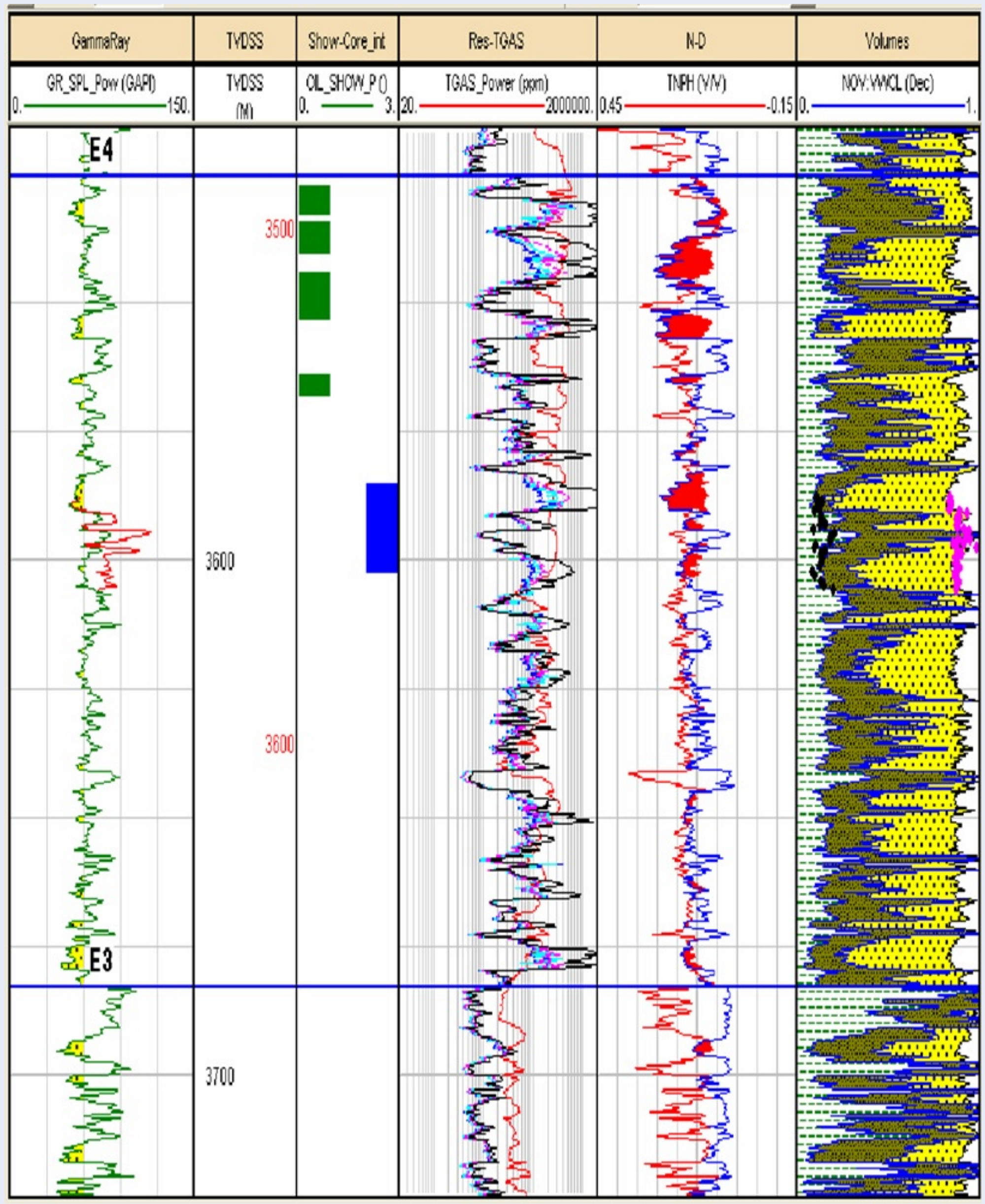

Figure 4: The results of well logging E sequence at well X-2X [11]

Table 4: The results of porosity values of wells X-1X, X-2X, X-3X and X-4X according to wells log data

Number	Well	Porosity, %
1	X-1X	10.4
2	X-2X	9.1
3	X-3X	7.42
4	X-4X	7.35

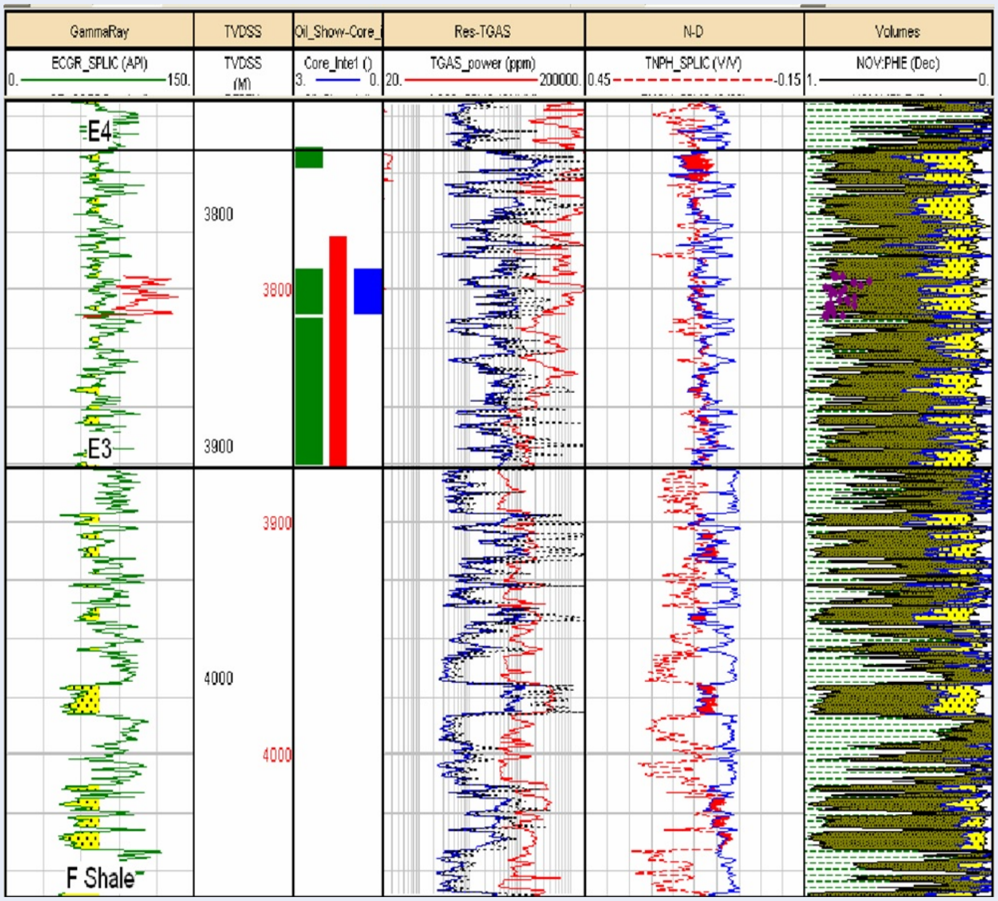

Figure 5: The results of well logging E sequence at well X-3X [11]

The permeability of E sequence has an average value of 22 mD. The average permeability values according to wells X-2X, X-3X and X-4X are 63.3 mD, 2 mD and 0.6 mD, respectively. After the porosity and permeability were determined by the core analysis, the porosity-permeability relationship was established (Figure 12)

ASSESSMENT THE FORMATION QUALITY

Critical Value

From the obtained results, determined with the critical permeability value of 0.0627mD, there are 73.91 % of the satisfied samples with the permeability greater than the critical value (Figure 14).

After determining the critical permeability value of 0.0627mD, based on the previously built porosity-permeability function the critical porosity value is 5.5 %. From the porosity results obtained from the core sample, we know that 78.43% of the samples satisfy the critical value (Figure 15).

To determine the critical clay content value, we proceed to build the relationship function between porosity and clay content of the samples (Figure 16). From the relationship chart, it can be inferred that with the critical porosity value of 5.5%, the corresponding critical clay content will be 16%. And 90.9% of samples analyzed for clay content had clay content less than this value (Figure 17).

Evaluation of the quality of source rock E sequence X Oilfield

The quality of the formation is evaluated through basic physical parameters, including porosity, permeability, clay content, and water saturation. These parameters are mainly calculated based on the results of interpretation of well log data and corrected by core analysis data of wells X (1X, 2X, 3X and 4X).

At the effective permeability to gas value Kg=0 corresponding to the Klinkenberg permeability value of 0.0627 mD, which is considered the critical value of the permeability and there are 73.91% of samples

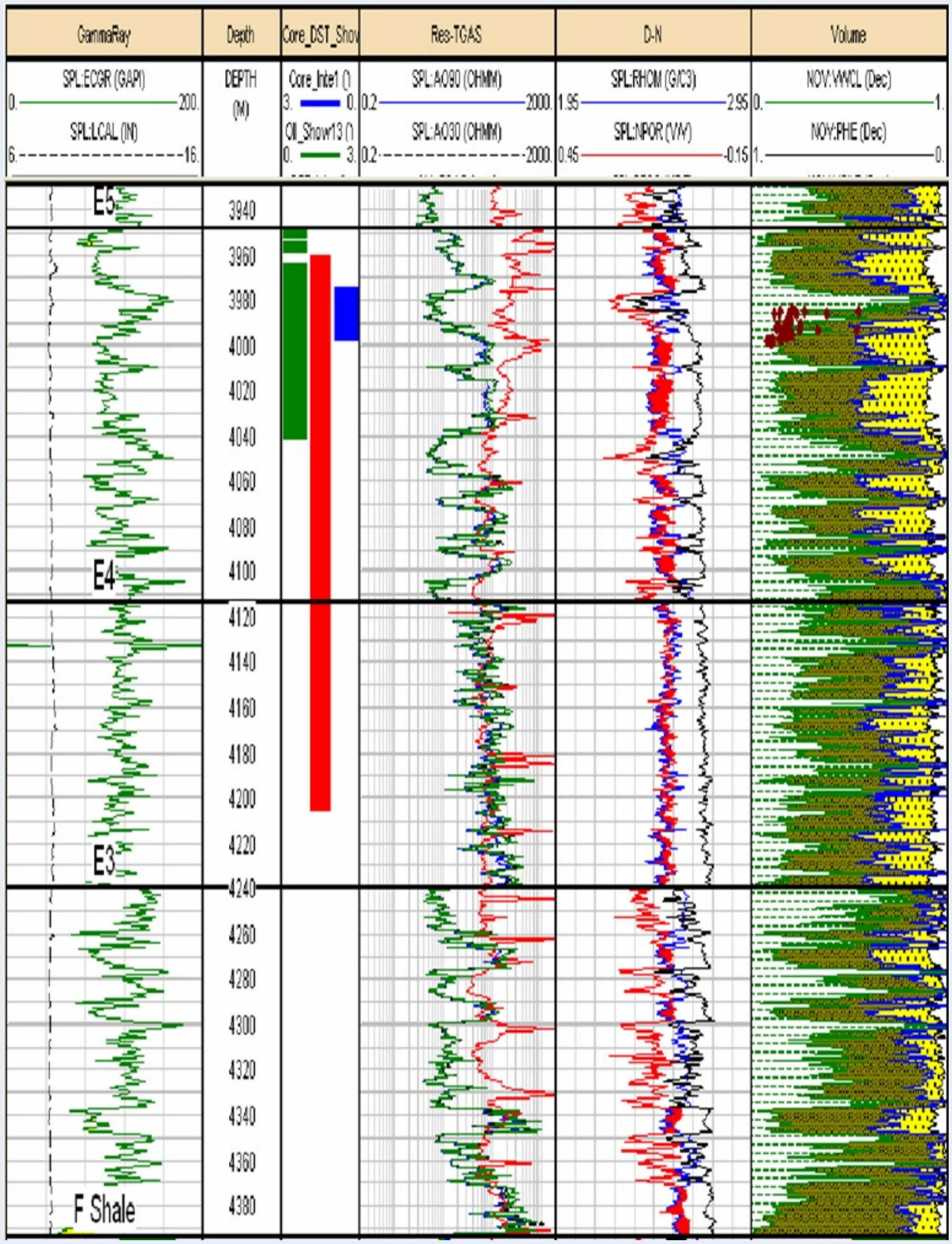

Figure 6: The results of well logging E sequence at well X-4X [11]

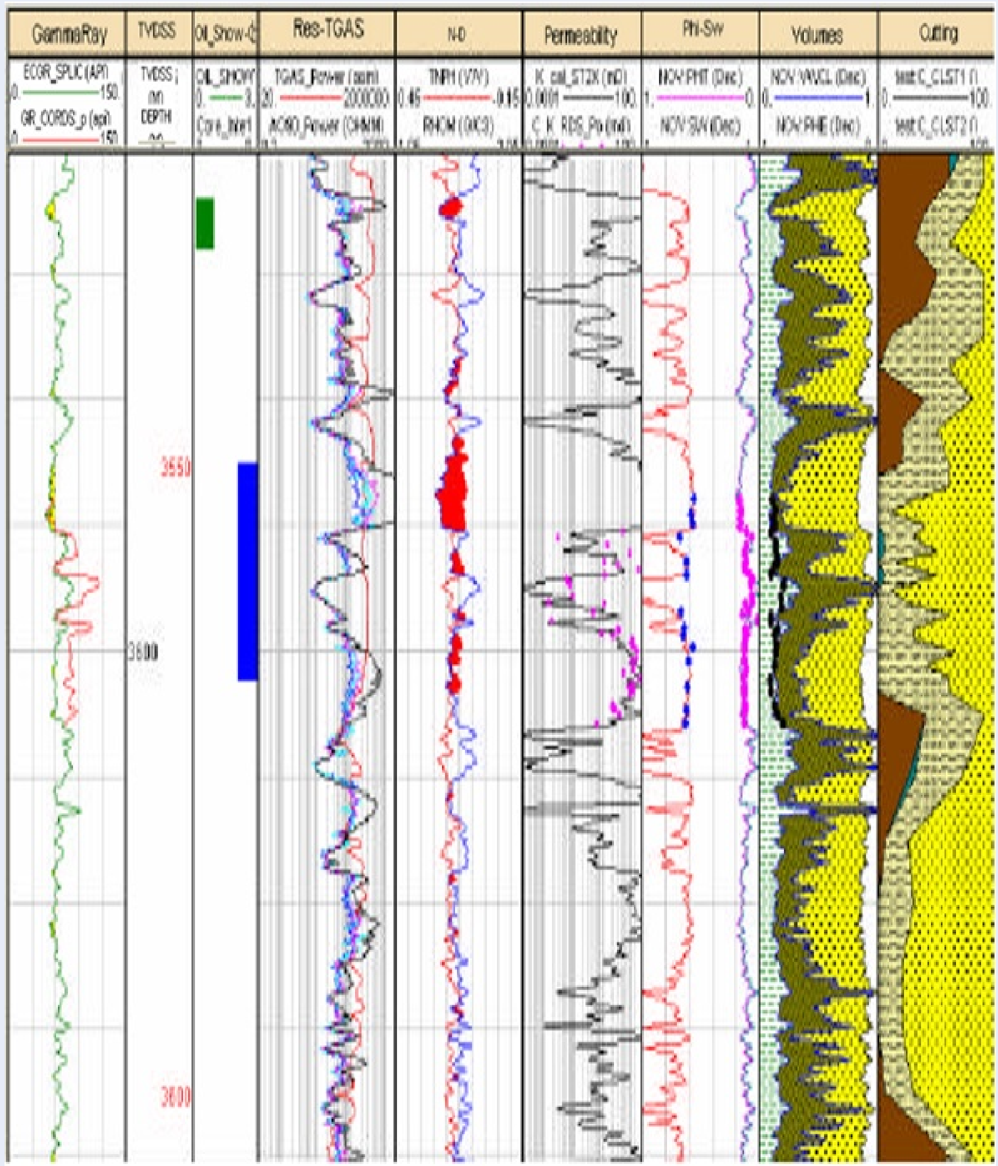

Figure 8: The results of comparison of core analysis data with wells log data of E sequence wells X-2X

with the value satisfying this critical value. The average permeability according to the core analysis results is 22mD, widely distributed from 0.001mD to over 464.8mD and mainly concentrated in the range of 0.035-28mD. Permeability values distributed over such a long range could be a signal of the existence of good permeability intervals in this deposit.

The porosity according to the core sample has an average value of 6.9%, ranging from 1.19% to 11.7%, concentrating in the range of 6% to 9%. The porosity of the core was compared with the porosity according to the well log and gave good results, showing that the quality of the core sample material is high and the well log data has high reliability.

The clay content calculated from the laboratory lithographic thin slice analysis results in general results in a relatively small clay content, mainly in the range of 0.21-9.1%, with an average value for both E sequence according to the core sample data is 7.2%. From the established porosity-clay content relationship, with the critical porosity value of 5.5%, we have the corresponding critical clay content value of 16%, and up to 90.9% of the samples are analyzed. has a satisfactory value less than this critical value. The E sequence

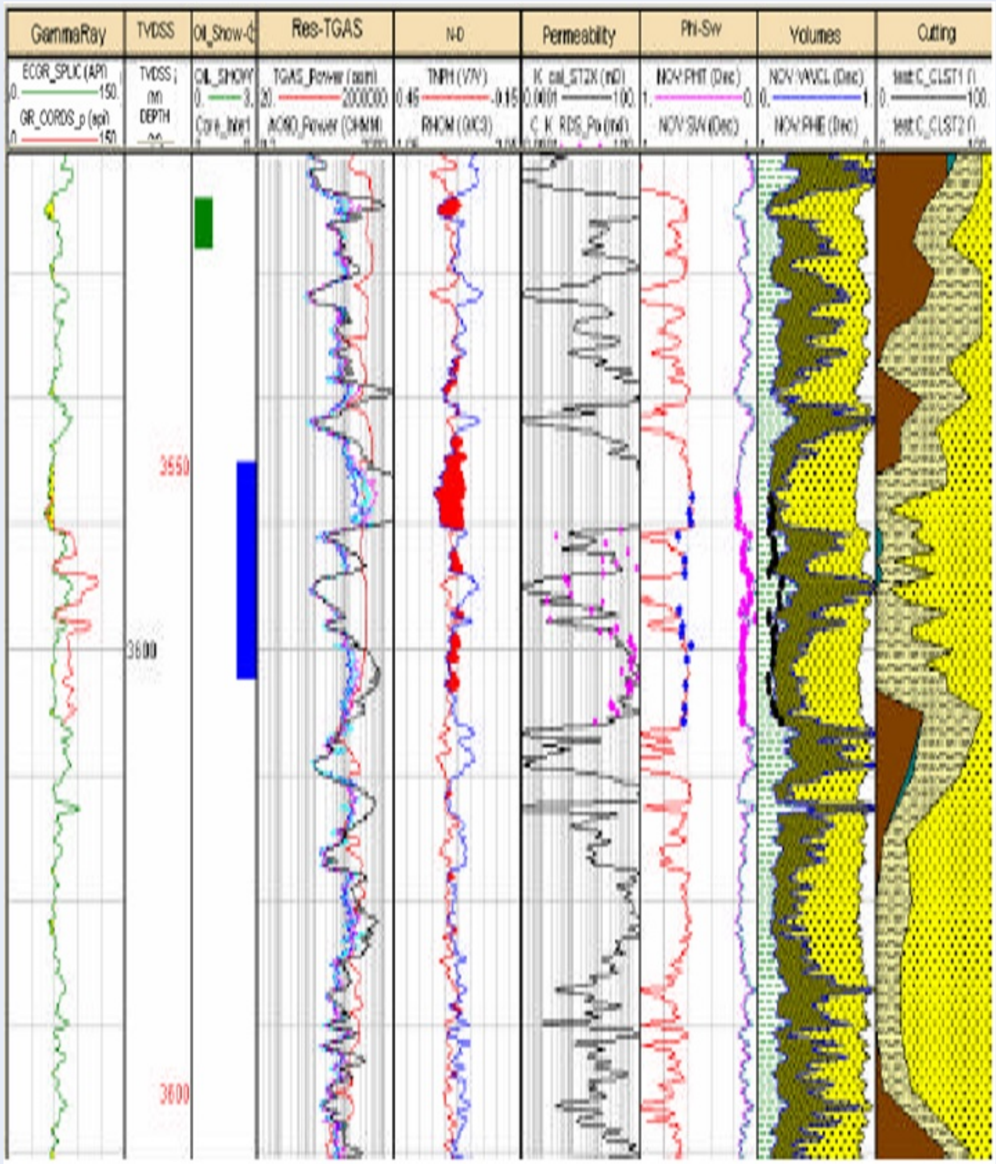

Figure 9: The results of comparison of core analysis data with wells log data of E sequence wells X-3X

has a small clay content, so the hollow channel is ventilated, which facilitates the smooth movement of the fluid.

The water saturation of the reservoir is calculated by the core sample and the well log interpretation, whereby the average water saturation of the whole E sequence according to the core sample is 26.1%. According to the well log data, the highest water saturation value is in well X-2X with 41% and the lowest is in well X-1X with 6.3-7.8%. The formation of E sequence X oilfield is evaluated as follows (Table 5):

In general, the quality assessment of sources E sequence at wells according to core sample data is of poor to moderate quality, with the best quality at well X-2X and the worst at well X-4X, existing some sites have good quality, which shows the oil and gas potential of the sequence.

The clay content is scattered and quite small, so it has little effect on the flow of the fluid, the water saturation is not high, combined with the effective thickness of the set is quite large, so this is a potential object and can be invested in. from further research to conduct economic exploitation.

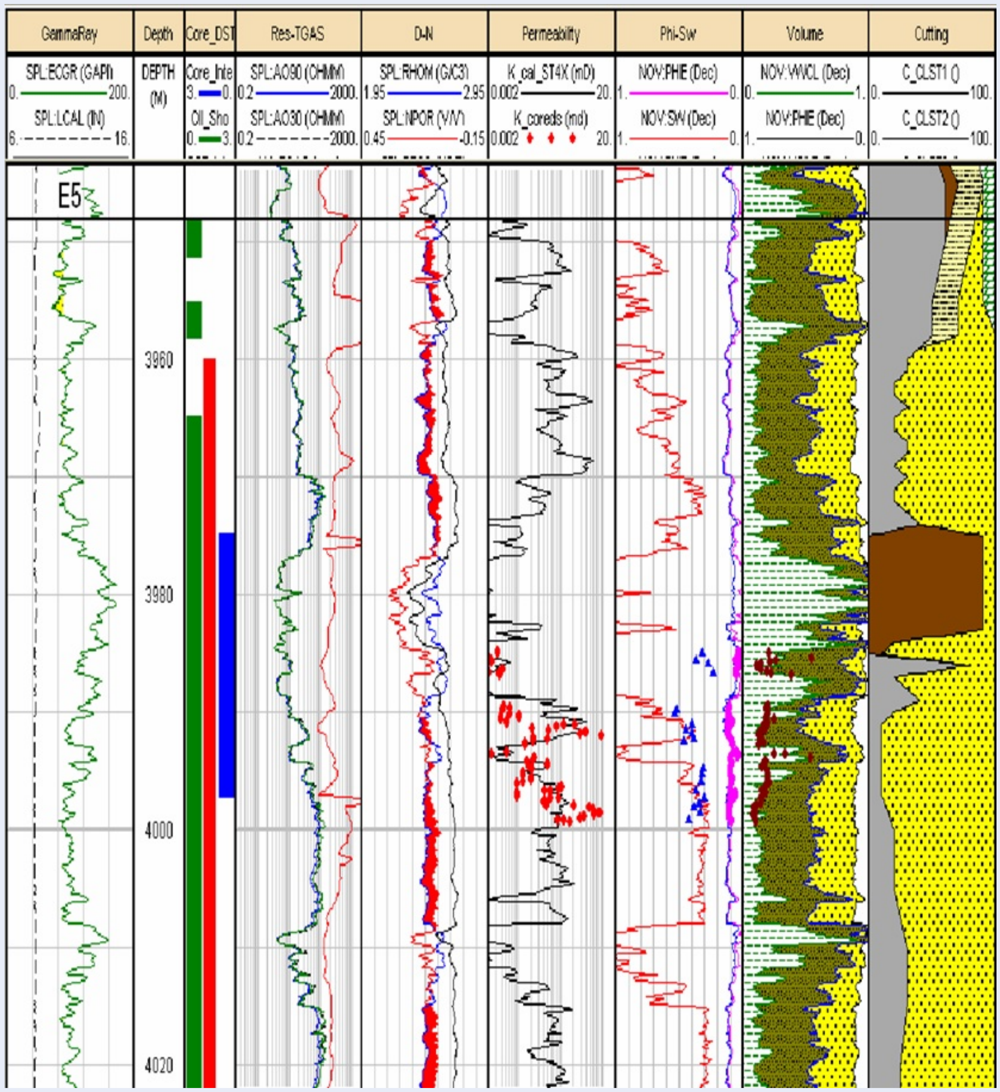

Figure 10: The results of comparison of core analysis data with wells log data of E sequence wells X-3X

Table 5: Evaluation of the quality of formation E sequence according to the core sample of the X oilfield in the Cuu Long basin [7]

Well	Average Porosity, %	Average Permeability, mD	Evaluate
X-2X	8.3	63.3	Poor-Good
X-3X	6.0	2.0	Poor- Moderate
X-4X	6.2	0.6	Poor-Poor
Average	6.9	22	Poor-Good

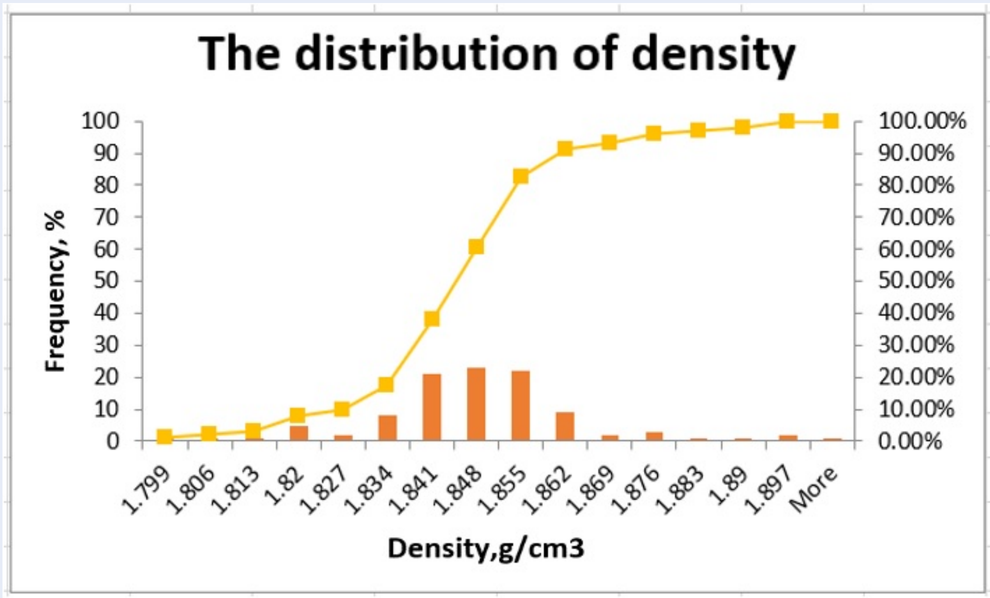

Figure 11: Particle bulk density distribution chart of source rock in well X-2X, X-3X và X-4X

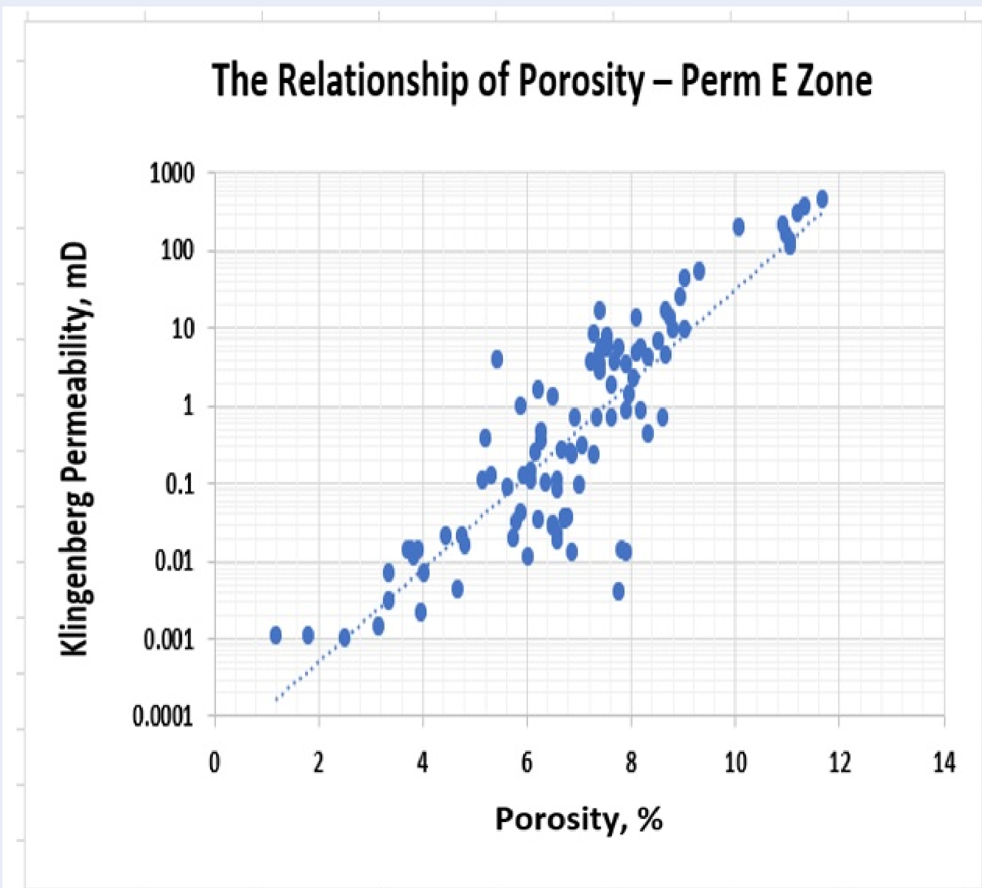

Figure 12: The relationship Porosity and Permeability E sequence X oilfield

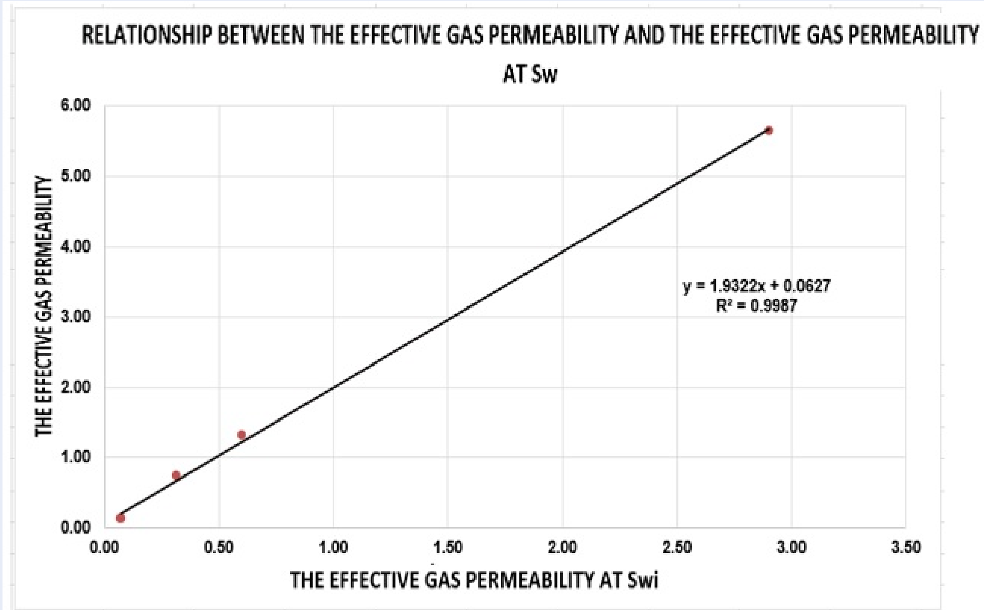

Figure 13: Determine the critical value of permeability

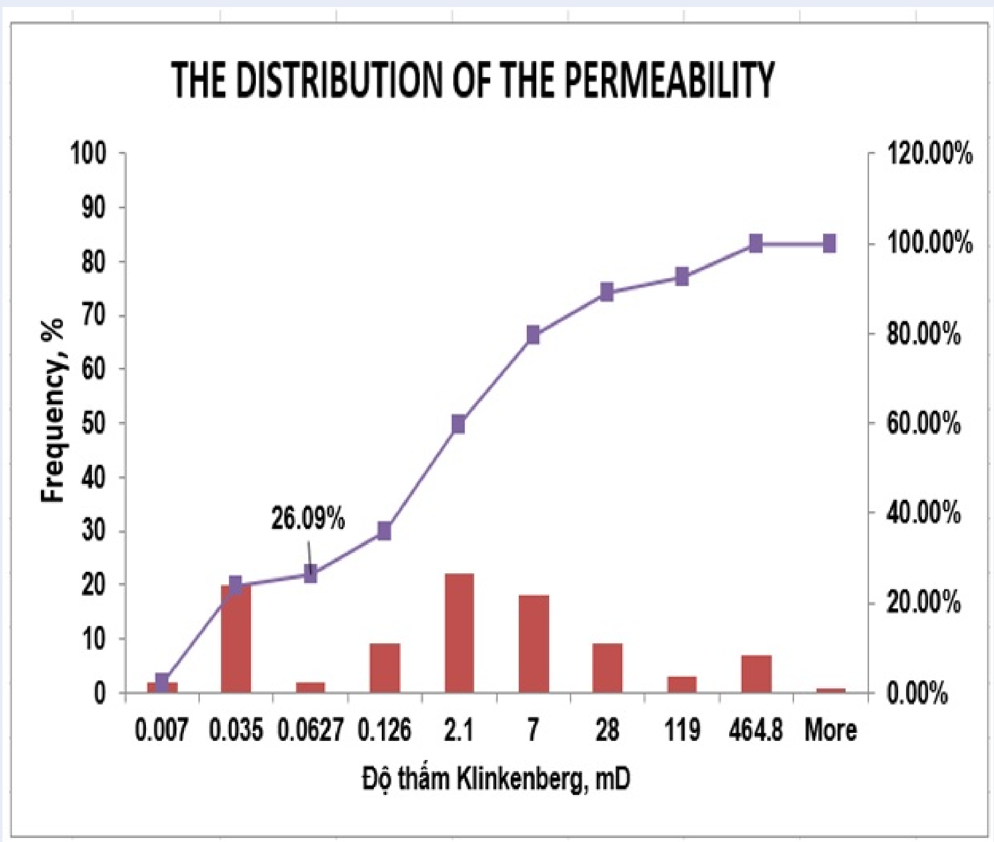

Figure 14: Permeability histogram of the E sequence of X oilfield

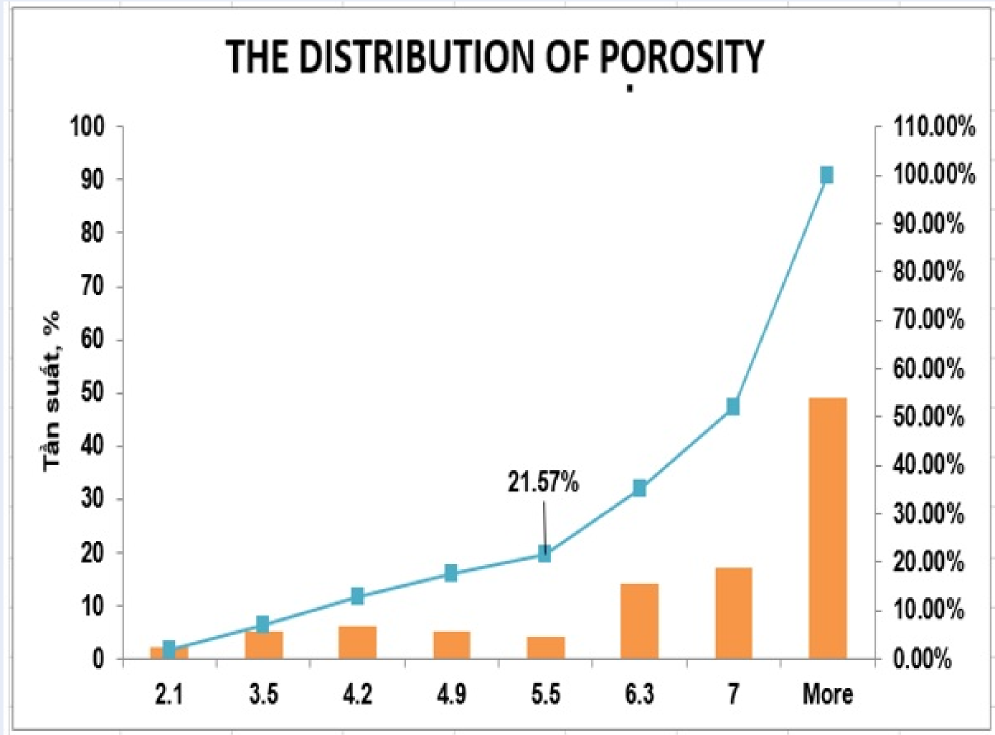

Figure 15: Frequency histogram of the porosity of E sequence of X oilfield [4]

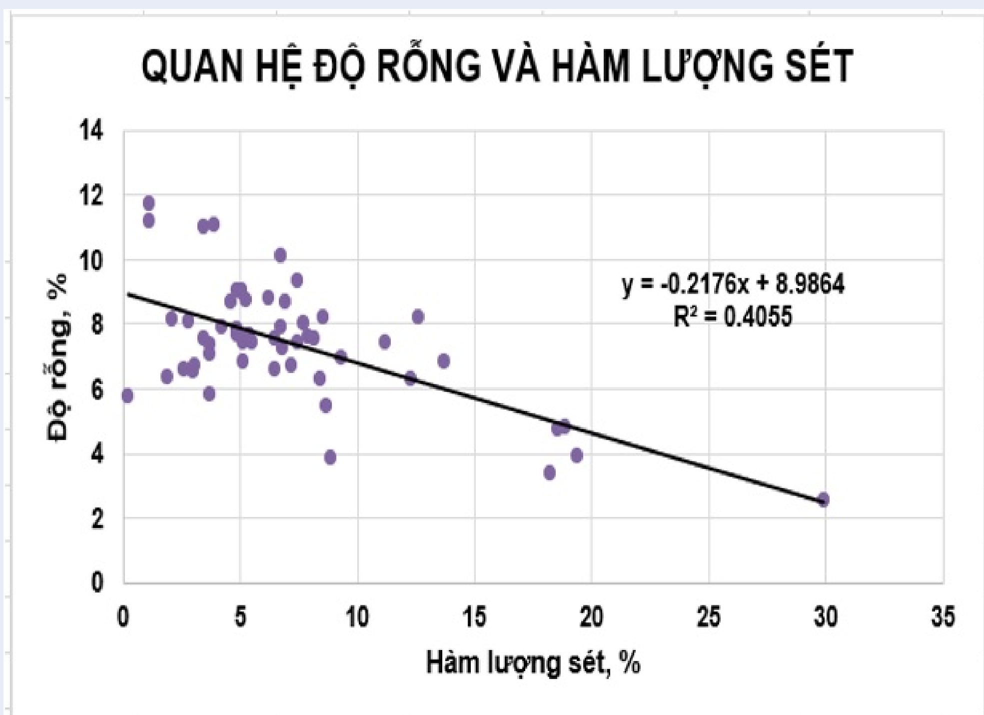

Figure 16: The relationship of porosity-clay content

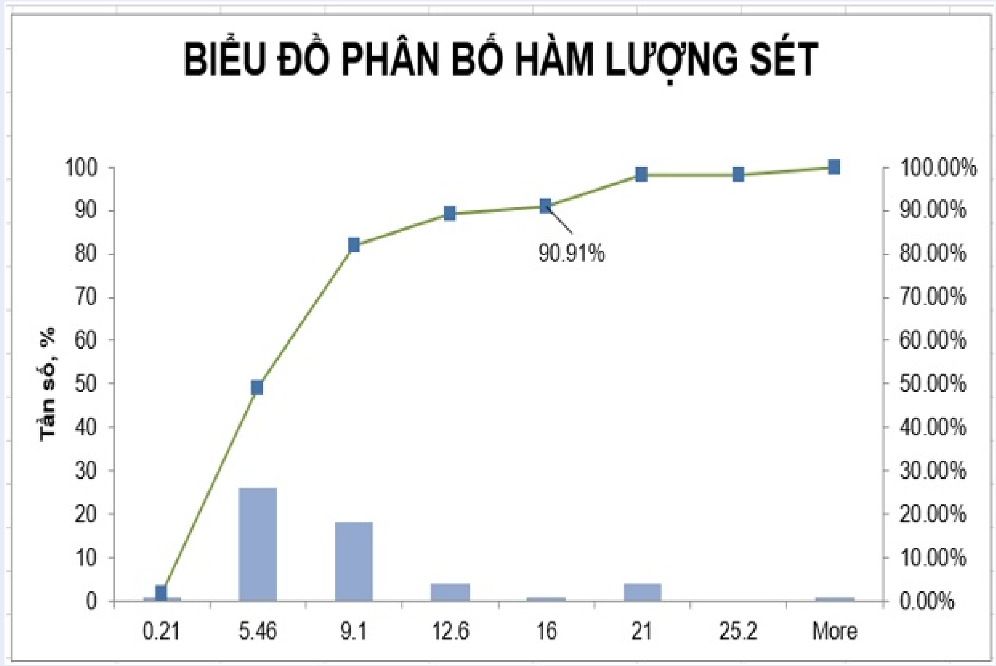

Figure 17: Frequency chart of clay content in E sequence of oilfield

CONCLUSION AND RECOMMENDATIONS

Conclusions

X oilfield is located at the southeast corner of Block 15-1 in the Cuu Long Basin. Participating in the geological structure of X oilfield are pre-Cenozoic old basement rock and Cenozoic mantle sediments. Field X has a total of 4 wells, namely 1X, 2X, 3X and 4X. Sediment E sequence of X oilfield is the object of research in this research and has been identified as consisting of 3 main distribution (E3, E4 and E5) and the E clay sub-set lying above. Well log measurements were performed throughout the E sequence for all 4 wells, core samples were taken at distribution E4 (at well 2X and 3X) and E5 (at well 4X).

From the results of interpreting the well log data and analyzing the core, the sequence's containing parameters such as porosity, permeability, water saturation, clay content... of the set have been determined, from which evaluates the quality of the reservoir. In general, the formation of the E sequence is of poor to moderate quality, however, there are locations with good porosity and permeability. The low clay content in the reservoir (the average value of core samples for wells 2X, 3X and 4X is 6.96%, 8.94% and 5.7%), respectively, is a favorable condition for flow in the reservoir. The porosity-permeability relationship has a high correlation coefficient, so it is possible to trust this relationship and calculate the permeability for locations where the permeability measurement from the core analysis is not performed.

In order to evaluate the formation E sequence X oilfield accurately and comprehensively in all aspects, it is necessary not only to rely on core analysis documents and well logging data but also needs to be combined with conducting DST, as well as other geological and stratigraphic methods. The evaluation of formation of E sequence using core analysis data and well log data also gave useful and reliable results.

Recommendations

In order to closely study the quality of the formation as well as the oil and gas potential, it is necessary to conduct additional research on specific core sample analysis criteria to more accurately assess the permeability properties, the ability to for the line to be able to serve the mining and development of the mine. As well as more effective permeability data to calculate critical values even more accurately. There are still many uncertain factors in the evaluation process that can affect the results such as the quality of collected documents, research methods, and experience of the evaluators. Therefore, in economic conditions, modern techniques need to supplement and invest in further research to serve as a premise for the mine development process in later stages.

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Conflict interest

I'm the main author of the manuscript publicing the research results: "Evaluating of formation quality by integrating core analysis and well-logging in E sequence, X oilfield, Cuu Long basin". I hereby undertake the following:

• I and my co-authors of this manuscript have permission from the Sponsor and the Project Manager to use and publish the research results.

• All authors named in the article have read the manuscript, agreed to the order of authorship, and agreed to submit the article to the journal STDJET.

• This work does not have any conflicts of interest between the authors in the article and with other authors.

Authors' contribution

• Tuan Nguyen: Lead author of the manuscript, who drafted the paper, designed the study, and performed the basic and statistical analysis.

• Xuan Tran Van: Participates in research design and implementation, interprets data, collects data, and performs fundamental and statistical analysis.

• Huy Nguyen Quang: Involved in the design and implementation Research, analyze, interpret data, collect facts, and perform fundamental and statistical analysis.

• Thanh Quoc Truong: Contributed to data interpretation and data collection, and checked the article.

• Huong Tran Thi Mai: Contributed to data interpretation and data collection, and checked the article.

• Huy Pham Gia: Contributed to data interpretation and data collection, and checked the article.

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Đánh giá chất lượng thành hệ bằng tích hợp tài liệu phân tích mẫu lõi và địa vật lý giếng khoan trong tập E, mỏ X, bồn trũng Cửu Long

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TÓM TẮT

Mỏ X đã có tổng cộng 4 giếng khoan là 1X, 2X, 3X và 4X. Trầm tích tập E của mỏ X là đối tượng nghiên cứu của bài nghiên cứu này và đã được xác định là gồm 3 thân cát chính (E3, E4 và E5) và phụ tập E sét nằm bên trên. Các phép đo địa vật lý giếng khoan đã được thực hiện xuyên suốt toàn tập E cho cả 4 giếng khoan, mẫu lõi đã được lấy tại các thân cát E4 (tại giếng 2X và 3X) và E5 (tại giếng 4X). Từ kết quả nghiên cứu cho thấy, chất lượng thành hệ tập E có chất lượng từ kém đến trung bình tuy nhiên lại xuất hiện những vị trí có độ rỗng và độ thấm thuộc loại tốt. Hàm lượng sét trong vỉa thuộc mức thấp (có giá trị trung bình theo mẫu lõi cho các giếng 2X, 3X và 4X lần lượt là 6.96%, 8.94% và 5.7%), là một yếu tố thuận lợi cho dòng chảy trong vỉa. Quan hệ độ rỗng – độ thấm có hệ số tương quan cao, vì vậy có thể tin tưởng quan hệ này và tính toán độ thấm cho các vị trí không được tiến hành đo độ thấm từ mẫu lõi. Để đánh giá được tầng chứa tập E mỏ X một cách chính xác và toàn diện về mọi mặt thì không chỉ dựa vào tài liệu phân tích mẫu lõi và tài liệu minh giải địa vật lý giếng khoan mà còn cần kết hợp với việc tiến hành các phân tích thử vỉa, cũng như là các phương pháp địa chất, địa tầng khác. Kết quả xác định độ rỗng, độ thấm là không giống nhau tại 4 giếng khoan cho thấy sự thay đổi phức tạp của tướng đá tập E trong cấu tạo của mỏ X, do đó khi thiết kế giếng khoan cần cẩn trọng và xem xét kỹ lưỡng dựa vào xây dựng bản đồ phân bố tướng đá, nhằm góp phần nâng cao hiệu quả của quá trình tìm kiếm thăm dò dầu khí, giảm thiểu yếu tố rủi ro về địa chất và kinh tế, cung cấp thêm nhiều thông tin để đánh giá trữ lượng dầu khí một cách chính xác và hiệu quả.

Từ khoá: chất lượng thành hệ, phân tích mẫu lõi, địa vật lý giếng khoan, bồn trũng Cửu Long

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