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Preface

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IOP Conf. Series: Earth and Environmental Science **1486** (2025) 011001 doi:10.1088/1755-1315/1486/1/011001

Preface

The 7th International Conference on Earth Resources, Mining, and Engineering (ICEMINE 2024) was successfully held in Yogyakarta, Indonesia, on October 24th, 2024. This prestigious gathering brought together researchers, academicians, practitioners, and stakeholders from around the globe to address critical challenges and opportunities in earth resources management, mining operations, and engineering innovations.

Under the theme "Mainstreaming Sustainable Development Goals in the Context of Earth Resources, Energy, and Their Environmental Implications," ICEMINE 2024 provided a dynamic platform for knowledge exchange and collaborative discussions. The conference highlighted the crucial intersection between resource utilization and sustainable development, emphasizing the need for balanced approaches that consider both economic growth and environmental stewardship.

This annual conference was organized by the Faculty of Mineral Technology and Energy, UPN "Veteran" Yogyakarta, in collaboration with Trisakti University as co-host. The successful execution of this event demonstrates the strong partnership between these institutions and their commitment to advancing knowledge in earth resources and engineering.

The proceedings encompass nine vital sub-themes that reflect the comprehensive nature of contemporary earth resource management:

1. Geological Science and Engineering, exploring fundamental earth processes and their practical applications
2. Geophysics, Geomatics and Geochemistry, advancing our understanding of Earth's physical and chemical properties
3. Earth Resources Project Evaluation and Valuation, addressing economic and feasibility aspects of resource development
4. Petroleum and Geothermal Engineering, focusing on sustainable energy extraction and utilization
5. Mining and Metallurgical Engineering, examining innovative extraction and processing methodologies
6. Taxation and Policy, discussing regulatory frameworks and economic instruments
7. Conservation, Geoheritage and Geopark, promoting preservation of geological heritage
8. Disaster Management, enhancing preparedness and response strategies
9. Reclamation and Environmental Issue, addressing ecological restoration and environmental protection

The papers presented in these proceedings represent significant contributions to their respective fields, offering new insights, methodologies, and solutions to contemporary challenges. They reflect the commitment of the global scientific community to advancing sustainable practices in earth resource management while maintaining environmental integrity.

We extend our deepest appreciation to our distinguished sponsors and supporting organizations whose generous support made this conference possible. Their commitment to advancing scientific knowledge and sustainable development has been instrumental in the success of ICEMINE 2024. We particularly acknowledge the support of industrial partners, professional associations, and government institutions that have contributed to the conference's success.

Our sincere gratitude goes to all participants, reviewers, and organizing committee members who contributed to the success of ICEMINE 2024. Their dedication and expertise have made these proceedings a valuable resource for the scientific community and industry practitioners alike.

Special appreciation goes to our host city, Yogyakarta, whose rich cultural heritage and geological significance provided an ideal backdrop for this important gathering. We are confident that the knowledge shared and connections formed during this conference will contribute significantly to the advancement of sustainable earth resource management practices worldwide.

Cordially Yours,

Yohana Noradika Maharani, S.T., M. Eng., Ph.D.

Chair of the 7th ICEMINE 2024

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Peer Review Statement

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Evaluation and Inventory of Idle Wells: A Case Study of Pertamina Hulu Rokan Working Area

Evaluation and Inventory of Idle Wells: A Case Study of Pertamina Hulu Rokan Working Area

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Abstract. The reactivation of idle wells will support the government's efforts towards achieving the target of 1 million barrels of oil per day (BOPD) production by 2030. Utilizing idle wells presents a promising opportunity for production enhancement at relatively low costs, thus necessitating inventory and evaluation. Idle wells with potential and favorable economics from both surface and subsurface aspects can be reactivated and separated based on the scale of work priority. The purpose of this study is to review well by well based on surface and subsurface data, followed by establishing a database related to recommendations for idle well operations. Evaluation of idle wells start from looking at the availability of surface data including the existence of well heads, production facilities, location access, and social issues. On the other hand, subsurface analysis of geological aspects consisted of stratigraphic marker, compartment, results of petrophysical calculations as well as reservoir and production. The work priority scale is depicted in the 1-4 quadrant (Q1-Q4), where Q1 is the main well recommended and Q4 is the most difficult. The analysis is carried out according to the work areas, namely asset 1 and asset 2. In the Asset 1 working area, 76 wells were included in Q1, 106 wells were included in Q2, 505 idle wells were included in Q3, 1106 idle wells were included in Q4, and 119 idle wells were included in the P&A category. In the Asset 2 working area, 57 wells were included in Q1, 145 wells were included in Q2, 702 idle wells were included in Q3, 1659 idle wells were included in Q4, and 37 idle wells were included in the P&A category.

1. Introduction

With the increasing demand for national energy, reactivating idle wells has become an essential focus in the energy sector. These wells which have been closed for economic, operational, or regulatory reasons, hold significant untapped potential that could offer a promising energy supply. Reactivating idle wells has been economically beneficial, increasing asset value and efficiency. Before the reactivation, it's crucial to assess the well's condition and integrity to ensure the safety standards are met. A significant challenge is the lack of data, especially for wells that have been idle for a long time. Therefore, developing a comprehensive database of idle wells is essential to identify those with the highest potential for successful reactivation and to maximize its benefits. The idle wells' database template and audit process are designed to handle many wells and support effective well stock management. The idle well database can be evaluated using quantitative assessment methods, where additive factors that estimate the good productivity potential and weighting factors assess the intervention risks. These factors are normalized to ensure a consistent audit process across different fields or reservoirs. The final ranking score is calculated by multiplying the weighting factor and the sum of the additive factors, which helps identify the wells with the highest potential for production improvement and those with the lowest potential, which should be considered for plug and abandon or P&A [1]. Data collection will be carried out on all production wells that are currently in an inactive state, and there is no plan to review [2]. The analysis is carried out according to the work areas, namely asset 1 and asset 2. Asset 1 is an area that is physiographically included in the North Sumatra Basin and Central Sumatra Basin. Whereas, Asset 2 is an area included in the South Sumatra Basin.

1.1 Geological Condition of Asset 1 Working Area

Asset 1 is an area that is physiographically included in the North Sumatra Basin and Central Sumatra Basin. For the last 100 years, the North Sumatra Basin has been known as a hydrocarbon basin. Its tectonic setting is in the back-arc basin [3]. This basin covers approximately 60,000 km2, consisting of onshore and offshore areas [4]. 25 TCF of gas reserves or 4.5 billion barrels equivalent and 1.5 BBOE of oil and condensate have been claimed as reserves in this Basin [5]. The stratigraphic and faulting trapping system are significantly important in this basin. Furthermore, intraformational seals compartmentalize the production area [6]. Central Sumatera Basin is one of the giant basins has a current total discovered resources of approximately 15 BBoen [5;7]. The type of play concept and petroleum system elements in the Central Sumatra Basin are source rocks consisting of shale rock of the Telisa and Pematang Formations, reservoir rocks composed of sedimentary rocks of the Sihapas and Pematang Groups, and the Telisa Formation is a regional cap rock in this basin [8]. The total number of idle wells recorded in this Asset 1 working area reaches 1912 wells, including 785 in the Rantau Field, 411 in the Pangkalan Susu Field, 561 in the Jambi Field, and 155 in the Lirik Field.

1.2 Geological Condition of Asset 1 Working Area

Asset 2 is working area that is physiographically included in the South Sumatra Basin. Oil and gas exploration in the South Sumatra basin began in the early 1900s. Since then, more than 300 oil and gas fields have been discovered in the basin [9]. The South Sumatera Basin is the hydrocarbon province with the 60th highest known reserves (exclusive of the United States) with estimated reserve at 4.3 BBoe [10]. The South Sumatra province covers an area of approximately 117,000 km2, which is mainly on the mainland of Sumatra. This basin is divided into several sub-basins: South Palembang, Central Palembang, North Palembang, and Jambi [11;12]. The total number of idle wells recorded in this Asset 2 working area reaches 2573 wells, including 268 wells in the Adera Field, 480 wells in the Pendopo Field, 385 wells in the Ramba Field, 402 wells in the Prabumulih Field, and 1065 wells in the Limau Field.

2. Methodology

The methods used in the idle well include both subsurface and surface analysis. To determine the subsurface potential of idle wells, a well by well review is conducted. Subsurface aspects involve stratigraphic correlation analysis, structural and stratigraphic compartmentalization, petrophysical log review, determination of current hydrocarbon-water contact, production performance, and well production history. Surface aspects include well integrity analysis,

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production facilities, site locations access to the idle wells, and issues surrounding the idle wells. Surface data screening begins with conducting data collection on field names, structure names, well names, and block names. Then, well locations, descriptions, and histories are recorded before conducting subsurface evaluation. Subsurface analysis begins with evaluating well diagrams, structural well positions, well correlations, reservoir conditions, perforations, and production history. Database inventory is managed using Microsoft Excel, following the SKK Migas guidelines, and includes general well information, potential data, issue data, and recommendations for work and work plans. The evaluation and inventory workflow as shown in Figure 1.

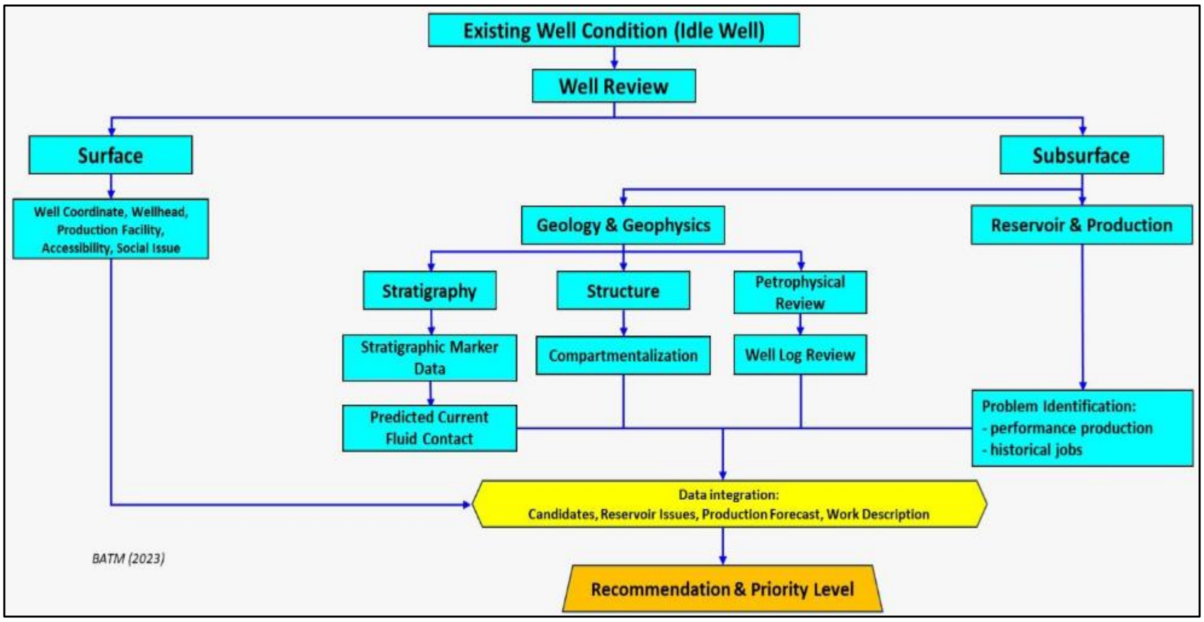

Figure 1. Evaluation and inventory workflow of idle well

An inventory of surface and subsurface analysis results are conducted in Table 1. In Table 1 columns 1-20 describe the general well information data group, which includes, in order: Zone name, field name, structure name, well name, formation name, existing layer name, well type, lifting method, well location, well status, initial and last well test, and cumulative production.

Table 1. General well information

1	2	3	4	5
Well Data Standard				
Zona	**Field**	**Structure**	**Well Name**	**Formation**
Zona	**Field**	**Structure**	**Well Name**	**Formation**

6	7	8
Well Data Standard		
Layer Existing	**Well Type**	**Lifting Method**
Layer Existing	***Well Type (Oil/Gas/Injector/Water)***	***Lifting Method (Natural/Gas Lift /Pump)***

9	10	11
Well Data Standard		
Location	**Wellhead Location**	
Location (Onshore/Offshore/Swamp)	**Wellhead Loc---Lat *(-5.123456)***	**Wellhead Loc---Long *(101.123456)***

12	13	14	15
Well Data Standard			
Well TD Location		**Initial Well Start Date**	**Last Well S/I Date**
Well TD Loc-Lat *(-5.123456)*	**Well TD Loc-Long *(101.123456)***	**Initial Well Start Date**	**Last Well S/I Date**

16	17	18	19	20
Well Data Standard				
Last Well Test			**Well Cum Prod**	
Last Well Test (BOPD)	**Last Well Test (MMSCFD)**	**Last Well Test (WC) %**	**Well Cum Prod Np (MSTB)**	**Well Cum Prod Gp (BSCF)**

In Table 2, columns 21-23 represent data based on the potential status according to the following explanations: Potential status: The status of the idle wells potential, using the scoring criteria. HC remaining potential (Oil, MSTB): Recording of the remaining potential volume for oil, in MBO. HC remaining potential (Gas, BSCF): Recording of the remaining potential volume for gas, in MMSCF.

Table 2. Potential data group

21	22	23
Potential Status		
Potential Status	**HC Remaining Potential**	
Potential Status (0/1/2)	**HC Remaining Potential (Oil, MSTB)**	**HC Remaining Potential (Gas, BSCF)**

In Tables 3 - 5, it is explained that columns 24-41 contain subsurface data (petrophysics and pressure), and surface data (wellhead, facility production, location, access, and casing). The scoring is filled out based on the information in Table 6.

Table 3. Petrophysical data group

24	25	26	27	28
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan				
Petrophysics (value)				
Vsh, v/v	**Por, v/v**	**k, mD**	**Res (Ohmm)**	**Sw, v/v**

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Table 4. Surface scoring

32	33	34	35	36
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan				
Surface (fill scoring 0-4)				
Surface Wellhead Scoring	**Surface Fasprod Scoring**	**Surface Location Scoring**	**Surface Access Scoring**	**Surface Casing Scoring**

Table 5. Subsurface scoring

37	38	39	40	41
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan				
Subsurface (fill scoring 0-4)				
Subsurface Reservoir Pressure Scoring	**Subsurface Reservoir Properties Scoring**	**Subsurface Fluid Properties Scoring**	**Subsurface Qoi Scoring**	**Subsurface EUR Scoring**

Table 6. Scoring base fill out

Issues		
related to the shut-in well		
Rank	Status	Description
0	None	No issue
1	Easy	Insignificant issue, available tech, no well intervention
2	Medium	Normal moderate issues, available tech, normal well intervention
3	Hard	Significant issues, heavy intervention
4	Barrier	Unrepairable, not doable, need new technology

Table 7 shows the group of well problem data, with columns 42–49 providing details on surface and subsurface issues. Scoring is completed based on the information in Table 8. In column 50, the 'doability' is described with the following details:

• Doability: Based on the well issue conditions, provide a conclusion on the likelihood of the well becoming a reactivation candidate.
• Recommendation: WO/WS/ST/P&A (Workover/Work standby/Shut-in/Plug & Abandon)
• Work Description: A detailed description of the planned job.
• Estimated Cost: If available, provide an estimate of the cost according to the type of job.

Table 7. Well problem group

42	43	44	45	46
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan				
Issues				
Reservoir Issues *(average AM & AN)*	**Reservoir Issues Explanation**	**Well Issues *(0/1/2/3/4)***	**Well Issues Explanation**	**Facility Issues *(0/1/2/3/4)***

47	48	49	50
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan			
			Doability
Facility Issues Explanation	**Market Issues *(0/1/2/3/4)***	**Market Issues Explanation**	***Doability (L/M/H)***

Table 8. Scoring base doability fill out

Doability		
Doability rank based on issues		
Rank	Status	Description
L	Low	Low doability, requires a lot more works
M	Medium	Medium doability, issues require well intervention
H	High	High doability, no significant issue

3. Result and discussion

3.1 Subsurface evaluation

Subsurface evaluation is used to evaluate the candidates of idle wells potential. The subsurface analysis starts with evaluating a well diagram, well position structurally, well correlation, reservoir condition, perforation, and production history. Figure 2 and Figure 3 are examples of subsurface analysis on one of the wells.

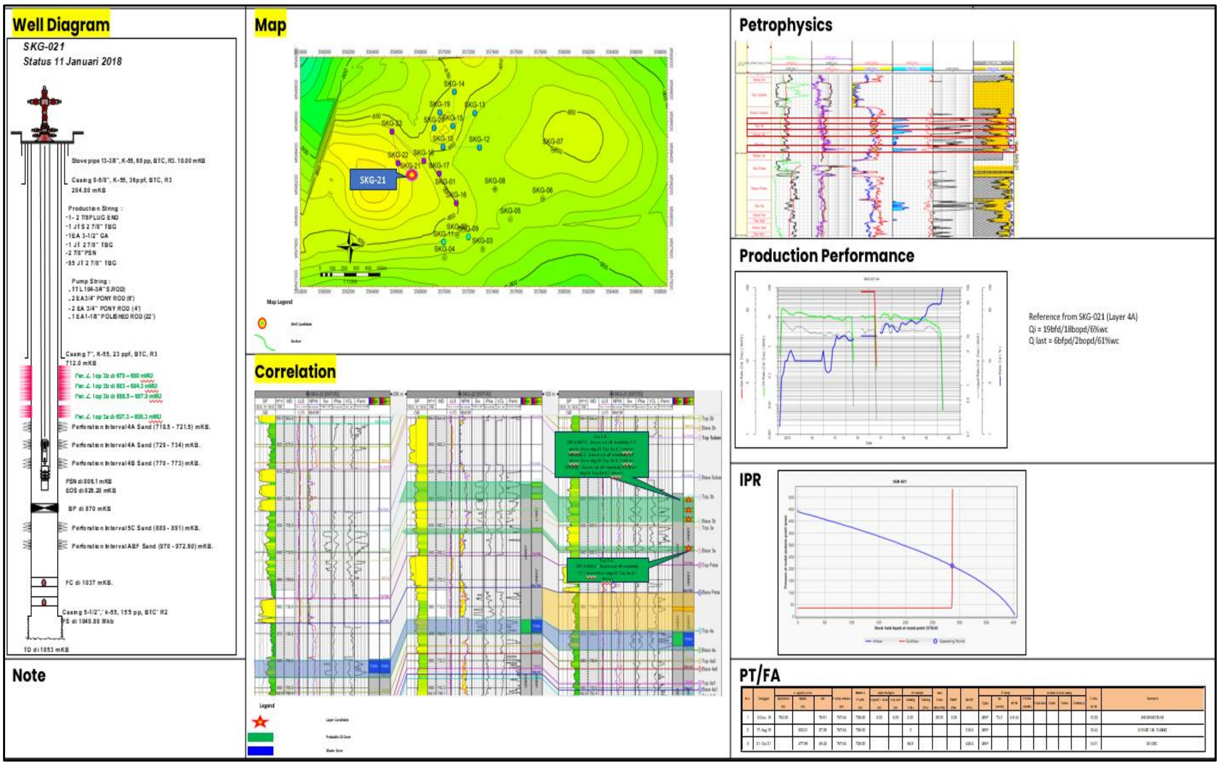

Figure 2. An example of subsurface evaluation in asset 1

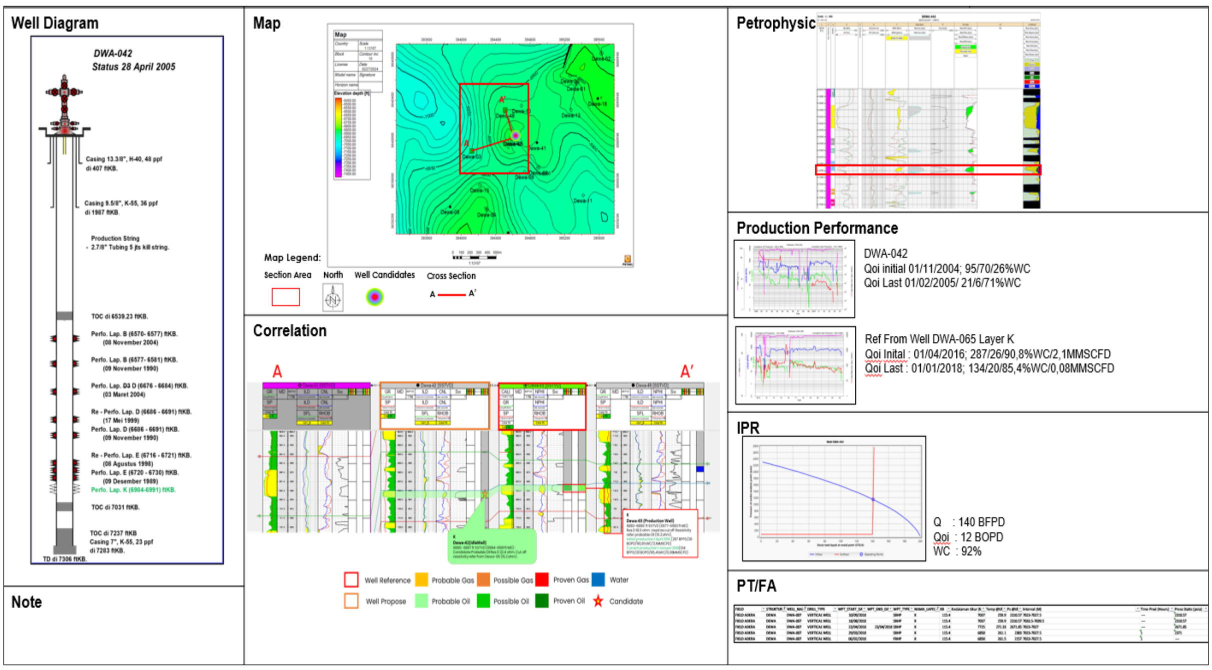

Figure 3. An example of subsurface evaluation in asset 2

3.2 Work priority scale

A quadrant system is used to simplify the mapping of idle well work priorities. The priority quadrant system is described by quadrants 1-4 (Q1-Q4). Idle wells that are put into the Quadrant 1 (Q1) category are the top priority to be worked on by looking at the ease of work (low surface risk) and high hydrocarbon potential (low subsurface risk). Quadrant 2 (Q2) is the next work priority where the well has high hydrocarbon potential (low subsurface risk) but less favorable surface conditions (high surface risk). Quadrant 3 (Q3) is the third job priority, where the well has low hydrocarbon potential (high subsurface risk) but good surface conditions (low surface risk). Quadrant 4 (Q4) is the fourth job priority, as the well has high subsurface and surface risks. The quadrant value is determined by the total surface score and total subsurface score according to the following criteria:

- If both the total surface score and total subsurface score are <2, the well is in quadrant 1 (Q1).
- If the total surface score is >=2 and <4, and the total subsurface score is <2, the well is quadrant 2 (Q2).
- If the total surface score is <2 and the total subsurface score is >=2 and <4, the well is quadrant 3 (Q3).
- If the total surface score is >=2 and <4, and the total subsurface score is >=2 and <4, the well is in quadrant 4 (Q4).

The asset 1 working area consists of 76 wells that were included in Q1, 106 wells were included in Q2, 505 idle wells were included in Q3, 1106 idle wells were included in Q4, and 119 idle wells were included in the P&A category. Job recommendations for as many as 1189 idle wells are for well service job (WS), 205 idle wells for workover (WO), 153 idle wells no data (hold), 236 idle wells no coordinate (hold), ten idle wells not found, and 129 idle wells for Plug & Abandon (Figure 4).

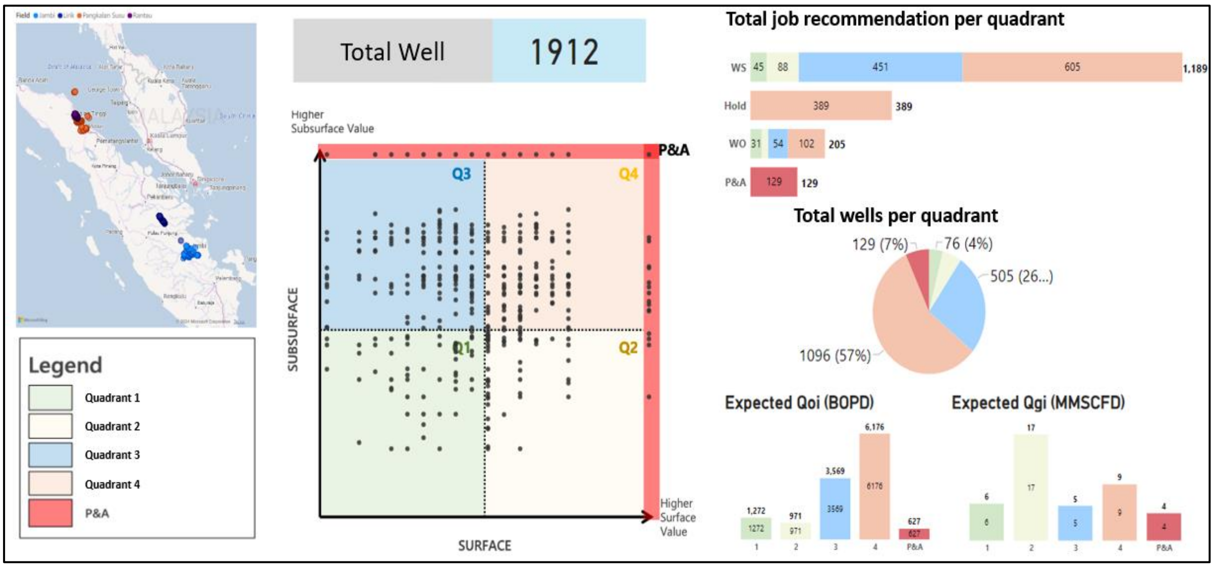

Figure 4. Idle well evaluation and dashboard of asset 1

The asset 2 working area consists of 57 wells that were included in Q1, 145 wells were included in Q2, 702 idle wells were included in Q3, 1659 idle wells were included in Q4, and 37 idle wells were included in the P&A category. Job recommendations for as many as 1781 idle wells are for well service job (WS), 33 idle wells for workover (WO), 423 idle wells no data (hold), 326 idle wells no coordinate (hold), 10 idle wells not found, and 37 idle wells for Plug & Abandon (Figure 5).

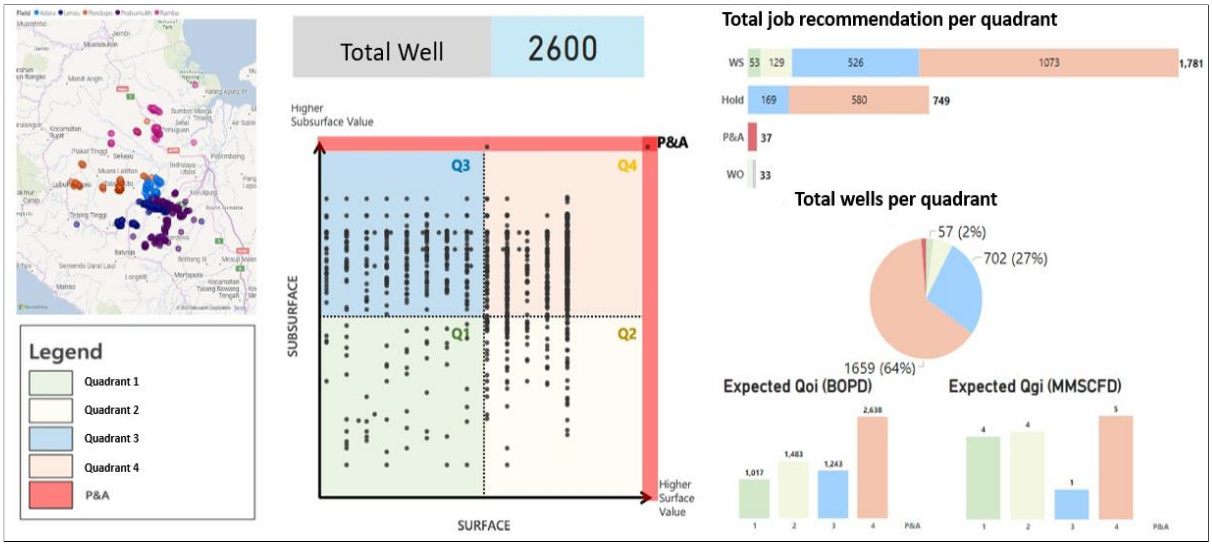

Figure 5. Idle well evaluation and dashboard of asset 2

4. Conclusion

Based on surface and subsurface data from Pertamina Hulu Rokan's asset 1 and asset 2 working areas, 4512 idle wells have been evaluated. With both asset 1 and asset 2 working areas consisting of 133 wells included in Q1, 251 wells included in Q2, 1207 idle wells included in Q3, 2765 idle wells included in Q4, and 37 idle wells included in the P&A category. Job recommendations for as many as 1781 idle wells for well service job (WS), 33 idle wells for workover (WO), 423 idle wells with no data (hold), 326 idle wells with no coordinate (hold), ten idle wells not found, and 166 idle wells for Plug & Abandon. Job recommendations in both assets for as many as 2970 idle wells for well service job (WS), 238 idle wells for workover (WO), 576 idle wells no data (hold), 562 idle wells no coordinate (hold), 20 idle wells not found, and 166 idle wells for Plug & Abandon.

Acknowledgments

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Evaluation and Inventory of Idle Wells: A Case Study of Pertamina Hulu Rokan Working Area

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Abstract. The reactivation of idle wells will support the government's efforts towards achieving the target of 1 million barrels of oil per day (BOPD) production by 2030. Utilizing idle wells presents a promising opportunity for production enhancement at relatively low costs, thus necessitating inventory and evaluation. Idle wells with potential and favorable economics from both surface and subsurface aspects can be reactivated and separated based on the scale of work priority. The purpose of this study is to review well by well based on surface and subsurface data, followed by establishing a database related to recommendations for idle well operations. Evaluation of idle wells start from looking at the availability of surface data including the existence of well heads, production facilities, location access, and social issues. On the other hand, subsurface analysis of geological aspects consisted of stratigraphic marker, compartment, results of petrophysical calculations as well as reservoir and production. The work priority scale is depicted in the 1-4 quadrant (Q1-Q4), where Q1 is the main well recommended and Q4 is the most difficult. The analysis is carried out according to the work areas, namely asset 1 and asset 2. In the Asset 1 working area, 76 wells were included in Q1, 106 wells were included in Q2, 505 idle wells were included in Q3, 1106 idle wells were included in Q4, and 119 idle wells were included in the P&A category. In the Asset 2 working area, 57 wells were included in Q1, 145 wells were included in Q2, 702 idle wells were included in Q3, 1659 idle wells were included in Q4, and 37 idle wells were included in the P&A category.

1. Introduction

With the increasing demand for national energy, reactivating idle wells has become an essential focus in the energy sector. These wells which have been closed for economic, operational, or regulatory reasons, hold significant untapped potential that could offer a promising energy supply. Reactivating idle wells has been economically beneficial, increasing asset value and efficiency. Before the reactivation, it's crucial to assess the well's condition and integrity to ensure the safety standards are met. A significant challenge is the lack of data, especially for wells that have been idle for a long time. Therefore, developing a comprehensive database of idle wells is essential to identify those with the highest potential for successful reactivation and to maximize its benefits. The idle wells' database template and audit process are designed to handle many

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wells and support effective well stock management. The idle well database can be evaluated using quantitative assessment methods, where additive factors that estimate the good productivity potential and weighting factors assess the intervention risks. These factors are normalized to ensure a consistent audit process across different fields or reservoirs. The final ranking score is calculated by multiplying the weighting factor and the sum of the additive factors, which helps identify the wells with the highest potential for production improvement and those with the lowest potential, which should be considered for plug and abandon or P&A [1]. Data collection will be carried out on all production wells that are currently in an inactive state, and there is no plan to review [2]. The analysis is carried out according to the work areas, namely asset 1 and asset 2. Asset 1 is an area that is physiographically included in the North Sumatra Basin and Central Sumatra Basin. Whereas, Asset 2 is an area included in the South Sumatra Basin.

1.1 Geological Condition of Asset 1 Working Area

Asset 1 is an area that is physiographically included in the North Sumatra Basin and Central Sumatra Basin. For the last 100 years, the North Sumatra Basin has been known as a hydrocarbon basin. Its tectonic setting is in the back-arc basin [3]. This basin covers approximately 60,000 km2, consisting of onshore and offshore areas [4]. 25 TCF of gas reserves or 4.5 billion barrels equivalent and 1.5 BBOE of oil and condensate have been claimed as reserves in this Basin [5]. The stratigraphic and faulting trapping system are significantly important in this basin. Furthermore, intraformational seals compartmentalize the production area [6]. Central Sumatera Basin is one of the giant basins has a current total discovered resources of approximately 15 BBoen [5;7]. The type of play concept and petroleum system elements in the Central Sumatra Basin are source rocks consisting of shale rock of the Telisa and Pematang Formations, reservoir rocks composed of sedimentary rocks of the Sihapas and Pematang Groups, and the Telisa Formation is a regional cap rock in this basin [8]. The total number of idle wells recorded in this Asset 1 working area reaches 1912 wells, including 785 in the Rantau Field, 411 in the Pangkalan Susu Field, 561 in the Jambi Field, and 155 in the Lirik Field.

1.2 Geological Condition of Asset 1 Working Area

Asset 2 is working area that is physiographically included in the South Sumatra Basin. Oil and gas exploration in the South Sumatra basin began in the early 1900s. Since then, more than 300 oil and gas fields have been discovered in the basin [9]. The South Sumatera Basin is the hydrocarbon province with the 60^{th} highest known reserves (exclusive of the United States) with estimated reserve at 4.3 BBoe [10]. The South Sumatra province covers an area of approximately 117,000 km2, which is mainly on the mainland of Sumatra. This basin is divided into several sub-basins: South Palembang, Central Palembang, North Palembang, and Jambi [11;12]. The total number of idle wells recorded in this Asset 2 working area reaches 2573 wells, including 268 wells in the Adera Field, 480 wells in the Pendopo Field, 385 wells in the Ramba Field, 402 wells in the Prabumulih Field, and 1065 wells in the Limau Field.

2. Methodology

The methods used in the idle well include both subsurface and surface analysis. To determine the subsurface potential of idle wells, a well by well review is conducted. Subsurface aspects involve stratigraphic correlation analysis, structural and stratigraphic compartmentalization, petrophysical log review, determination of current hydrocarbon-water contact, production performance, and well production history. Surface aspects include well integrity analysis,

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production facilities, site locations access to the idle wells, and issues surrounding the idle wells. Surface data screening begins with conducting data collection on field names, structure names, well names, and block names. Then, well locations, descriptions, and histories are recorded before conducting subsurface evaluation. Subsurface analysis begins with evaluating well diagrams, structural well positions, well correlations, reservoir conditions, perforations, and production history. Database inventory is managed using Microsoft Excel, following the SKK Migas guidelines, and includes general well information, potential data, issue data, and recommendations for work and work plans. The evaluation and inventory workflow as shown in Figure 1.

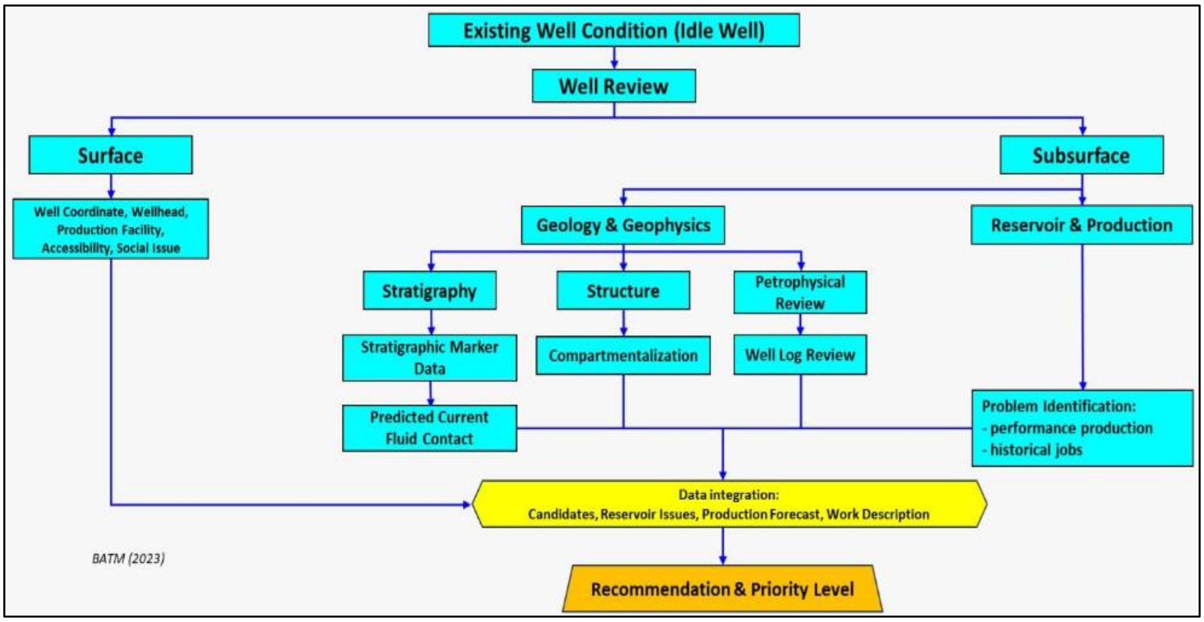

Figure 1. Evaluation and inventory workflow of idle well

An inventory of surface and subsurface analysis results are conducted in Table 1. In Table 1 columns 1-20 describe the general well information data group, which includes, in order: Zone name, field name, structure name, well name, formation name, existing layer name, well type, lifting method, well location, well status, initial and last well test, and cumulative production.

Table 1. General well information

1	2	3	4	5
Well Data Standard				
Zona	**Field**	**Structure**	**Well Name**	**Formation**
Zona	**Field**	**Structure**	**Well Name**	**Formation**

6	7	8
Well Data Standard		
Layer Existing	**Well Type**	**Lifting Method**
Layer Existing	***Well Type (Oil/Gas/Injector/Water)***	***Lifting Method (Natural/Gas Lift /Pump)***

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9	10	11
Well Data Standard		
Location	Wellhead Location	
Location (Onshore/Offshore/Swamp)	Wellhead Loc---Lat *(-5.123456)*	Wellhead Loc---Long *(101.123456)*

12	13	14	15
Well Data Standard			
Well TD Location		Initial Well Start Date	Last Well S/I Date
Well TD Loc-Lat *(-5.123456)*	Well TD Loc-Long *(101.123456)*	Initial Well Start Date	Last Well S/I Date

16	17	18	19	20
Well Data Standard				
Last Well Test			Well Cum Prod	
Last Well Test (BOPD)	Last Well Test (MMSCFD)	Last Well Test (WC) %	Well Cum Prod Np (MSTB)	Well Cum Prod Gp (BSCF)

In Table 2, columns 21-23 represent data based on the potential status according to the following explanations: Potential status: The status of the idle wells potential, using the scoring criteria. HC remaining potential (Oil, MSTB): Recording of the remaining potential volume for oil, in MBO. HC remaining potential (Gas, BSCF): Recording of the remaining potential volume for gas, in MMSCF.

Table 2. Potential data group

21	22	23
Potential Status		
Potential Status	HC Remaining Potential	
Potential Status (0/1/2)	HC Remaining Potential (Oil, MSTB)	HC Remaining Potential (Gas, BSCF)

In Tables 3 - 5, it is explained that columns 24-41 contain subsurface data (petrophysics and pressure), and surface data (wellhead, facility production, location, access, and casing). The scoring is filled out based on the information in Table 6.

Table 3. Petrophysical data group

24	25	26	27	28
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan				
Petrophysics (value)				
Vsh, v/v	Por, v/v	k, mD	Res (Ohmm)	Sw, v/v

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Table 4. Surface scoring

32	33	34	35	36
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan				
Surface (fill scoring 0-4)				
Surface Wellhead Scoring	**Surface Fasprod Scoring**	**Surface Location Scoring**	**Surface Access Scoring**	**Surface Casing Scoring**

Table 5. Subsurface scoring

37	38	39	40	41
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan				
Subsurface (fill scoring 0-4)				
Subsurface Reservoir Pressure Scoring	**Subsurface Reservoir Properties Scoring**	**Subsurface Fluid Properties Scoring**	**Subsurface Qoi Scoring**	**Subsurface EUR Scoring**

Table 6. Scoring base fill out

Issues		
related to the shut-in well		
Rank	Status	Description
0	None	No issue
1	Easy	Insignificant issue, available tech, no well intervention
2	Medium	Normal moderate issues, available tech, normal well intervention
3	Hard	Significant issues, heavy intervention
4	Barrier	Unrepairable, not doable, need new technology

Table 7 shows the group of well problem data, with columns 42–49 providing details on surface and subsurface issues. Scoring is completed based on the information in Table 8. In column 50, the 'doability' is described with the following details:

- Doability: Based on the well issue conditions, provide a conclusion on the likelihood of the well becoming a reactivation candidate.
- Recommendation: WO/WS/ST/P&A (Workover/Work standby/Shut-in/Plug & Abandon)
- Work Description: A detailed description of the planned job.
- Estimated Cost: If available, provide an estimate of the cost according to the type of job.

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Table 7. Well problem group

42	43	44	45	46
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan				
Issues				
Reservoir Issues *(average AM & AN)*	**Reservoir Issues Explanation**	**Well Issues *(0/1/2/3/4)***	**Well Issues Explanation**	**Facility Issues *(0/1/2/3/4)***

47	48	49	50
Data for idle wells issues ranking, explanation, priority, work recommendation, and work plan			
			Doability
Facility Issues Explanation	**Market Issues *(0/1/2/3/4)***	**Market Issues Explanation**	***Doability (L/M/H)***

Table 8. Scoring base doability fill out

Doability		
Doability rank based on issues		
Rank	Status	Description
L	Low	Low doability, requires a lot more works
M	Medium	Medium doability, issues require well intervention
H	High	High doability, no significant issue

3. Result and discussion

3.1 Subsurface evaluation

Subsurface evaluation is used to evaluate the candidates of idle wells potential. The subsurface analysis starts with evaluating a well diagram, well position structurally, well correlation, reservoir condition, perforation, and production history. Figure 2 and Figure 3 are examples of subsurface analysis on one of the wells.

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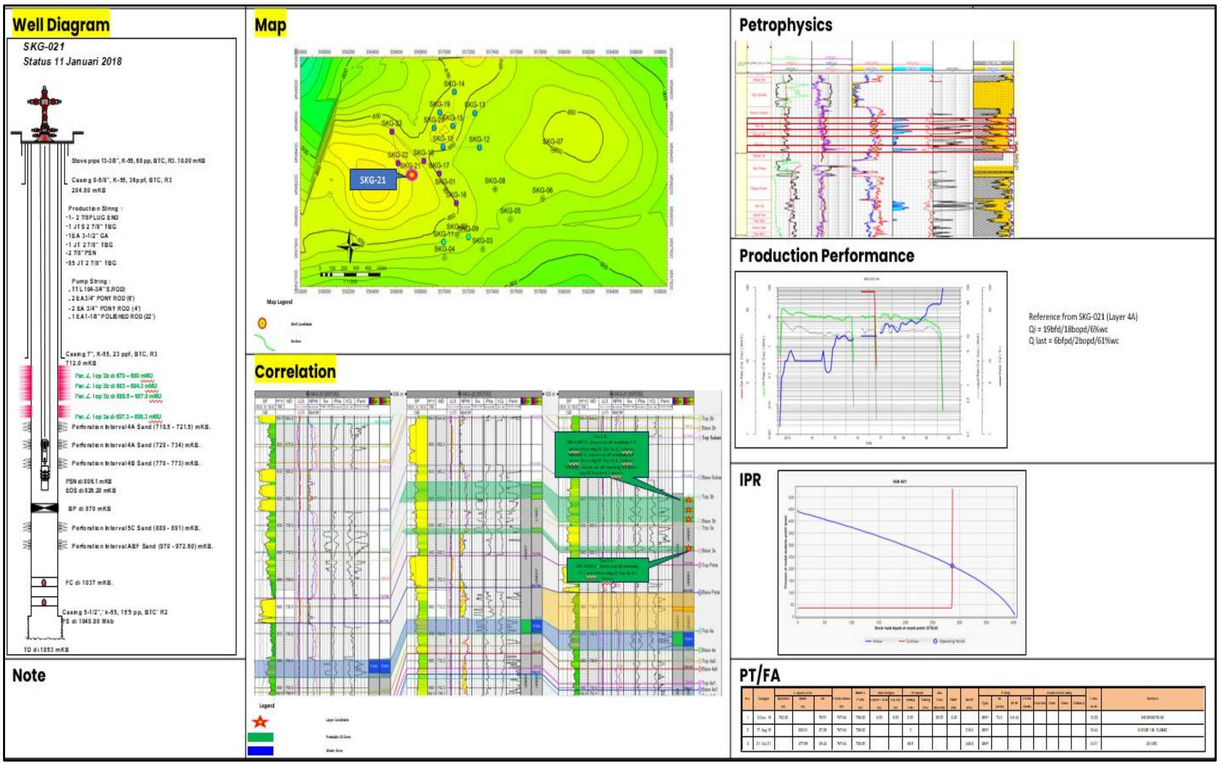

Figure 2. An example of subsurface evaluation in asset 1

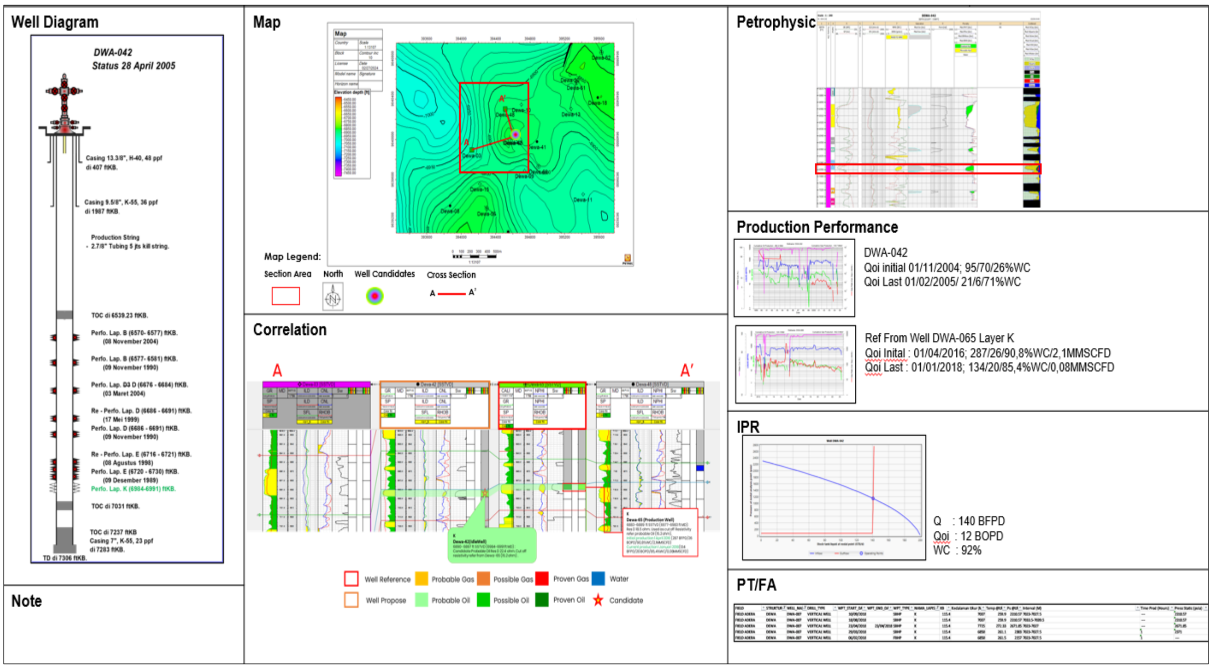

Figure 3. An example of subsurface evaluation in asset 2

3.2 Work priority scale

A quadrant system is used to simplify the mapping of idle well work priorities. The priority quadrant system is described by quadrants 1-4 (Q1-Q4). Idle wells that are put into the Quadrant 1 (Q1) category are the top priority to be worked on by looking at the ease of work (low surface

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risk) and high hydrocarbon potential (low subsurface risk). Quadrant 2 (Q2) is the next work priority where the well has high hydrocarbon potential (low subsurface risk) but less favorable surface conditions (high surface risk). Quadrant 3 (Q3) is the third job priority, where the well has low hydrocarbon potential (high subsurface risk) but good surface conditions (low surface risk). Quadrant 4 (Q4) is the fourth job priority, as the well has high subsurface and surface risks. The quadrant value is determined by the total surface score and total subsurface score according to the following criteria:

- If both the total surface score and total subsurface score are <2, the well is in quadrant 1 (Q1).
- If the total surface score is >=2 and <4, and the total subsurface score is <2, the well is quadrant 2 (Q2).
- If the total surface score is <2 and the total subsurface score is >=2 and <4, the well is quadrant 3 (Q3).
- If the total surface score is >=2 and <4, and the total subsurface score is >=2 and <4, the well is in quadrant 4 (Q4).

The asset 1 working area consists of 76 wells that were included in Q1, 106 wells were included in Q2, 505 idle wells were included in Q3, 1106 idle wells were included in Q4, and 119 idle wells were included in the P&A category. Job recommendations for as many as 1189 idle wells are for well service job (WS), 205 idle wells for workover (WO), 153 idle wells no data (hold), 236 idle wells no coordinate (hold), ten idle wells not found, and 129 idle wells for Plug & Abandon (Figure 4).

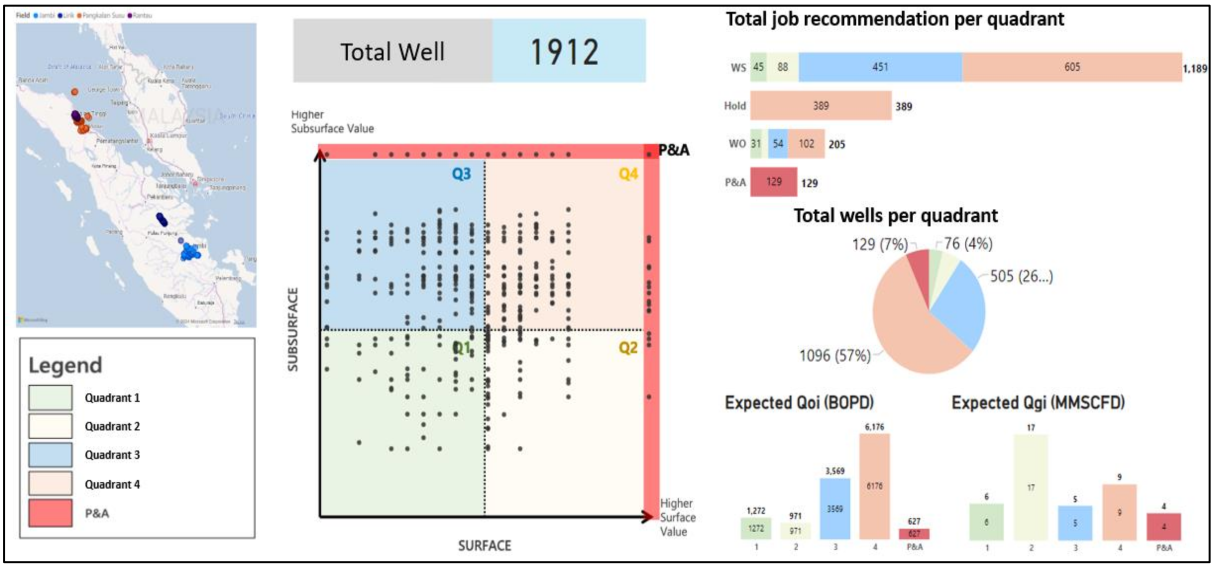

Figure 4. Idle well evaluation and dashboard of asset 1

The asset 2 working area consists of 57 wells that were included in Q1, 145 wells were included in Q2, 702 idle wells were included in Q3, 1659 idle wells were included in Q4, and 37 idle wells were included in the P&A category. Job recommendations for as many as 1781 idle wells are for well service job (WS), 33 idle wells for workover (WO), 423 idle wells no data (hold), 326 idle wells no coordinate (hold), 10 idle wells not found, and 37 idle wells for Plug & Abandon (Figure 5).

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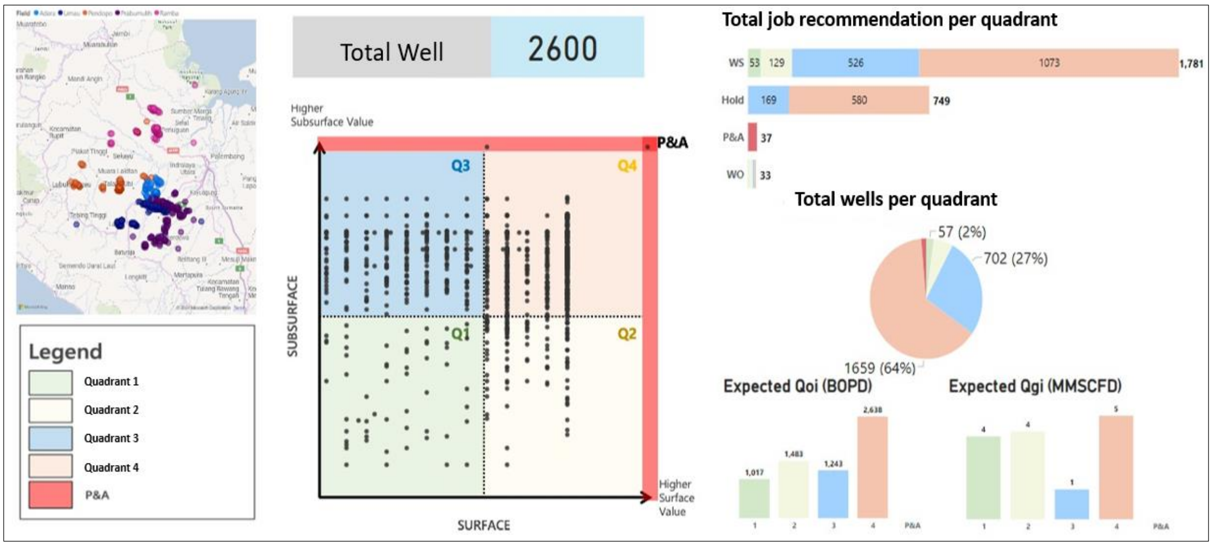

Figure 5. Idle well evaluation and dashboard of asset 2

4. Conclusion

Based on surface and subsurface data from Pertamina Hulu Rokan's asset 1 and asset 2 working areas, 4512 idle wells have been evaluated. With both asset 1 and asset 2 working areas consisting of 133 wells included in Q1, 251 wells included in Q2, 1207 idle wells included in Q3, 2765 idle wells included in Q4, and 37 idle wells included in the P&A category. Job recommendations for as many as 1781 idle wells for well service job (WS), 33 idle wells for workover (WO), 423 idle wells with no data (hold), 326 idle wells with no coordinate (hold), ten idle wells not found, and 166 idle wells for Plug & Abandon. Job recommendations in both assets for as many as 2970 idle wells for well service job (WS), 238 idle wells for workover (WO), 576 idle wells no data (hold), 562 idle wells no coordinate (hold), 20 idle wells not found, and 166 idle wells for Plug & Abandon.

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