Quest Journals
Journal of Research in Environmental and Earth Sciences
Volume 8 ~ Issue 6 (2022) pp: 06-10
ISSN(Online) :2348-2532
www.questjournals.org

Research Paper

Estimated presence of Hydrocarbons with Seismic Methods on the "X" Field, Central Sumatra Indonesia

Naufal Daffa Pramudya[1], Dimas Syafiyanto[2], M Irham Nurwidyanto[3], Aziza Muis[4]

[1,2,3](*Physics Department, Faculty of Sciences and Mathemacics Diponegoro University Indonesia)*
[4](*Prakarsa Betung Meruo Senami Jambi, Pertamina Indonesia)*
Corresponding Author: M Irham Nurwidyanto

ABSTRACT: *Seismic data interpretation is the final stage in investigation activities based on the analysis of all available information or data with the aim of determining the subsurface structure of a drilling prospect. This interpretation is also carried out by ensuring the results of exploration that have taken a drilling data directly to get how the condition of the subsurface structure is, in this study it is done by interpreting several lines that exist in the area being analyzed. Before interpreting, first prepare the data that will be prepared for the interpretation and analysis of a wells or line being analyzed such as well tops, well markers, density logs, P-wave data and other supporting data, well seismic tie is also carried out so that data wells with seismic data are well correlated.The results of the interpretation of this research in the form of seismic pits and cross-sections will later be able to provide an overview of what is contained in a layer and whether the wells contain potential hydrocarbons. Based on the log analysis of the well, it shows that there will be potential for hydrocarbons at a depth of 290-320 m.*

KEYWORDS: *seismic data, hidrocarbons, wells seismic, seismic interpretation, Central Sumatra*

R*eceived 22 May, 2022;* ***R****evised 02 June, 2022;* ***A****ccepted 04 June, 2022 © The author(s) 2022.*
P*ublished with open access at* ***www.questjournals.org***

I. INTRODUCTION

The interpretation of a seismic is an important thing in exploration process, by understanding the subsurface characteristics of a surface being analyzed it will know which areas have the potential for hydrocarbons, this interpretation and analysis itself aims to determine the subsurface structure of a drilling prospect. So that with the results of interpretation and analysis of hydrocarbons with this seismic method, it can make it easier for an exploration activity to be more confident in the presence of a hydrocarbon contained in the area.

The seismic method is one of the geophysical methods that is included in the active geophysical method which is used to interpret subsurface conditions based on the nature of the propagation of waves traversed in a subsurface medium. The seismic method is a very popular geophysical method in exploring exploration. The accuracy and high in modeling the subsurface lithological structure make this method superior compared to other methods. With the support of sophisticated technology and rapid research in this method are the key factors for the success of this method [1].

The Reflection Seismic method measures the time it takes for a sound impulse to travel from the reflected sound source from the geological formation and then back to the ground surface, in this reflection seismic method utilizing artificial waves that are given, after the wave propagates through the soil/rock medium below the surface, where The wave propagation will fulfill the laws of elasticity in all directions and experience reflection. In its application the reflection seismic method has several advantages by knowing and describing the condition of the subsurface structure laterally and vertically, it can also be used in stratigraphy to make it possible to directly detect the presence of hydrocarbons[2].

This data processing process is essentially a process to process seismic recording data into data in the form of a seismic cross-section that has followed the shape of the actual geological cross section. With this seismic cross section, it will be possible to interpret it to get the shape of a map of a surface[3]. Seismic interpretation activities not only require seismic data, but also well data and regional geological studies[4]. Seismic cross-

sectional interpretation aims to display a description of geological information from the results of seismic data processing with the support of seismic attributes[5].

II. Material And Methods

This data collection stage is in the form of preparing data to be processed further such as wells data, seismic data, check shots, wells tops, well markers, and also some other data needed to support data processing activities, as well as software that will be used such as petrel software. and also Humpson Russel software for data processing.

well seismic tie is the initial process in processing seismic data and well data, this process is also the process of binding well data with a depth domain into seismic data with a domain so that a data relationship between time and depth is generated from seismic data and well data (Time to Depth Relationships). The estimation of the well-to-seismic tie phase is a close and related step for geological interpretation. Usually these processes are completed separately or alternately, and errors in phase estimation can affect the quality of the well tie procedure[6].

Well correlation is to correlate data between seismic data and data well, Well-logs can be implemented in well-to-well correlation processes to identify lithological boundaries in oil and gas reservoirs. Well correlation is the process in which the depth of lithological boundaries in drilled wells across a reservoir is identified[7].

Shifting and Balancing aims to correlate and balance seismic and amplitude on the existing seismic cross-section on the track, this shifting and balancing activity is applied to all existing lines in the analyzed area. The overall aim of seismic interpretation is to aid in constructing the most accurate earth model or reservoir description possible[8].

Modeling from Schlumberger Petrel makes it easy to know the geological conditions with the presence of various colors that show various kinds and different conditions according to the interpreted area.

III. RESULT

From the processing of this data, it is obtained that the well seismic tie, this well seismic tie is a combination of two wells data and seismic data so that they are correlated into a Time to Depth Relationship, as shown in Figure 1. From the well seismic tie, the correlation data between seismic data and well data is obtained, namely the well correlation of 0.707. For a good correlation between seismic data and well data, it is actually close to 0. It is also possible to get a number close to 0 we use the stretching method to tie the existing data to the two data

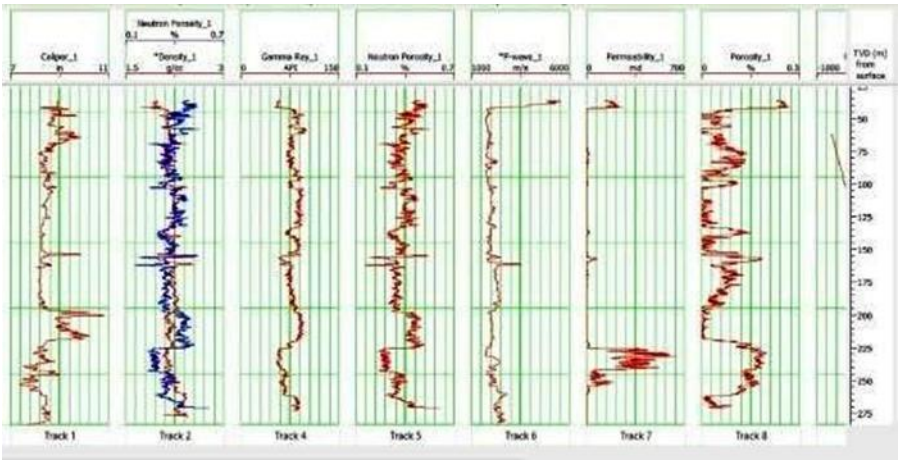

Figure 1. log analisis

From Figure 1, it can be seen that the Gamma Ray Log shows a low response which indicates the area or depth is permeable which is also indicated by the resistivity log showing a high response and a positive separation between the density log and the neutron log. potential of a hydrocarbon.

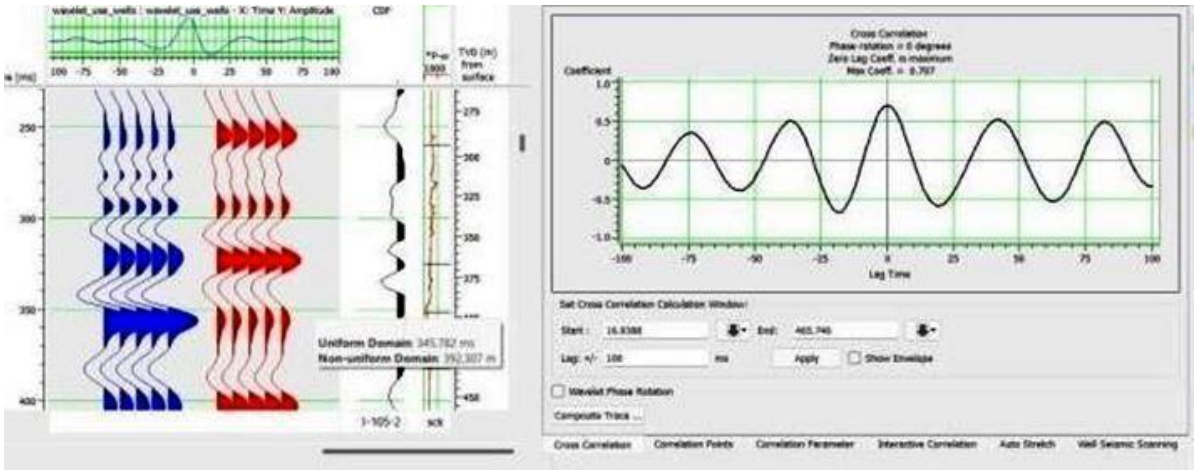

Figure 2. Well seismic Tie and Seismic correlation

The interpretation of each path is in the form of picking faults and picking horizons to obtain a model that is primarily geological, the Schlumberger Petrel interpretation is used with picking and picking horizons for each lane in the analyzed area.

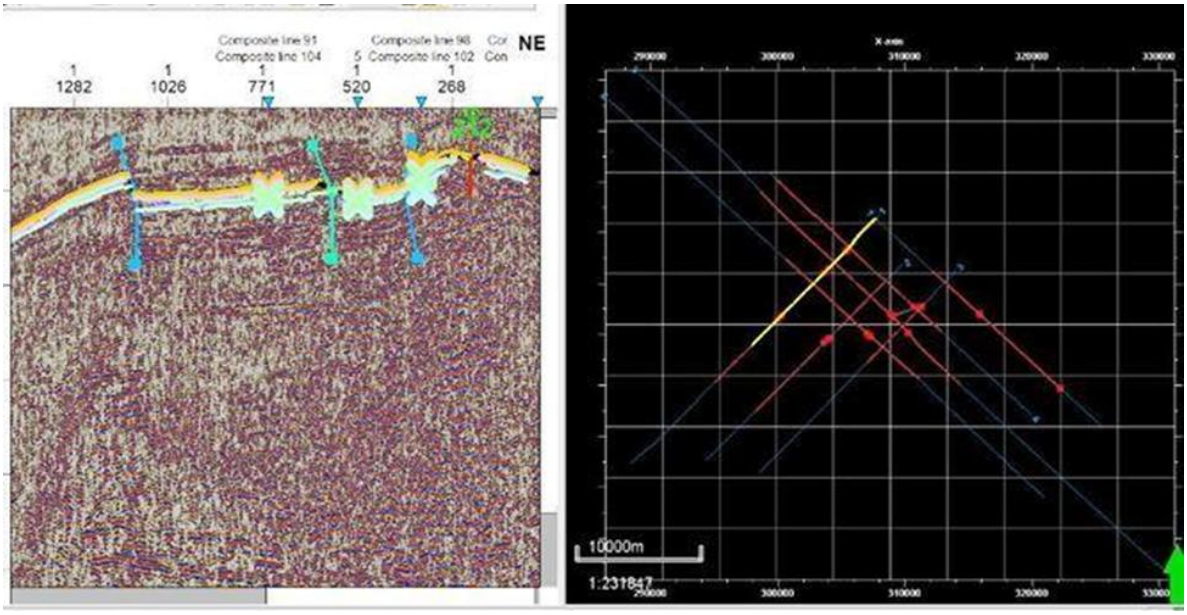

Figure 3. Picking horizon and picking fault on seismic line

After there is a picking horizon and a picking fault on all lines, it can determine the hydrocarbon path, this path shows where there will be hydrocarbons in the seismic section under review, After picking faults and picking horizons for the seven cross-sectional lines, we can see the path for the presence of a hydrocarbon, the black image in Figure 4 shows where the hydrocarbon path is located.

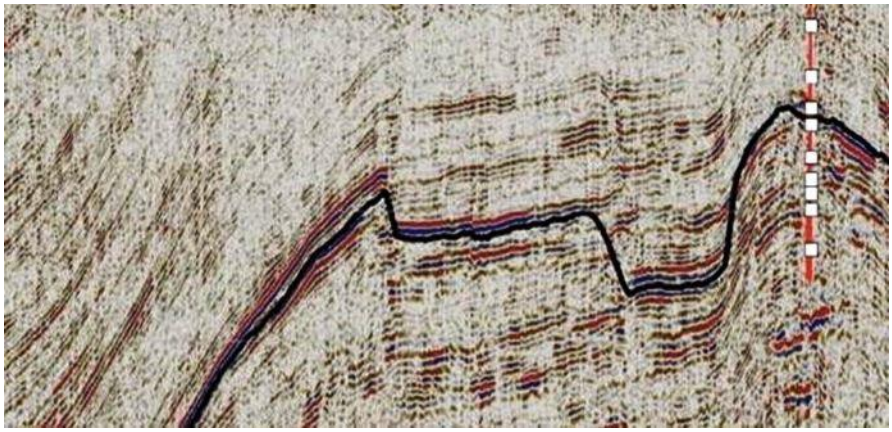

Figure 4. hydrocarbon pathway

IV. Discussion

Modeling in this section is used to facilitate the precise detection of where a hydrocarbon is located. in Figure 5 the red color shows the condition of the accumulation of hydrocarbons, the contour map in Figure 5 is also visible in accordance with the elevation time modeling which shows the potential of the area.

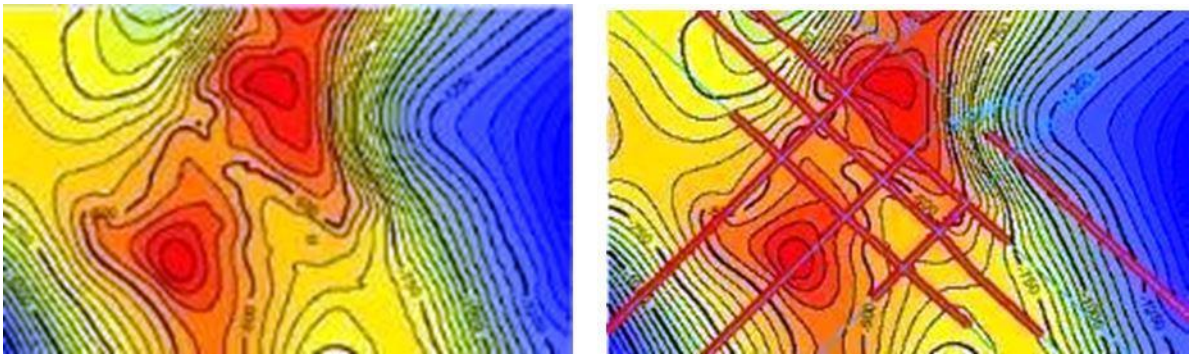

Figure 5. Area modeling analyzed based on elevation time.

The results of the analysis log readings in Figure 1 of the area analyzed using 7 seismic data lines and several wells indicate that there will be a potential hydrocarbon reservoir in the area. Coupled with the depth with various data such as log analysis with Gamma Ray logs showing a low response which indicates the area or depth is permeable, and also indicated by resistivity logs showing a high response and positive separation between density logs and neutron logs, adding that the area in the cross section line 1 shows the potential for hydrocarbons at a depth of 290-320 m. Coupled with the geological conditions that exist in the seismic line 1 section, it shows that there will be a trap, which means that the area will contain a hydrocarbon trap and is a feature of the petroleum system that is happening.

V. CONCLUSION

Based on the log analysis of the well, it shows that there will be potential for hydrocarbons at a depth of 290-320 m, it is also shown that the area is a permeable area, plus the modeling map in the 7-line area on the seismic cross section shows the area being analyzed does have the potential for a hydrocarbon. But apart from that it is also necessary to add some additional data regarding the geological conditions in the analyzed area which of course affects whether the geological conditions of the area are still the same or have changed.of motion is, the acceleration due to gravity.

REFERENCES

[1]. Budi, R.2010. Inversi Seismik Metodologi, Depok: FMIPA Universitas Indonesia.
[2]. Nurdiyanto, B.(2011). Penentuan Tingkat Kekerasan Batuan Menggunakan Metode Seismik Refraksi. Jurnal Meteorologi dan Geofisika, vol.1 no 2, pp. 69-73.
[3]. Fahmi Aulia R, Ayu syaeful, Juan Pandu.G.N.R.2016. Analisis Peta Struktur Domain
[4]. Roden, R., 2016. Seismic Interpretation in the Age of Big Data. Geophysicals Insight. SEG International Exposition and 86th Annual Meeting, h. 4911-4915.
[5]. Wahyuni S, Dr. Eng Idris M.2015. Studi Interpretasi Struktur Geologi Bawah Permukaan

[6]. Gabriel R Gelpi, Daniel O Perez, Danilo R Velis.2019. Simultaneus automatic well to seismic tie and Wavelet Phase Estimation. Paper presented at the SEG International Exposition and Annual Meeting, San Antonio, Texas, USA Paper Number: SEG-20193215613.
[7]. Nan Qin and Li Yun Fu.2018. Reliability measurement of joint seismic inversion based on seismic-to-well correlation.Exploration Geophysics. Vol44 no. Issue 2.
[8]. Fengjio Zhang. Pan Zhang. Zhou Xu. Xiangbo gong. Liguo Han.2021. Multisource Seismic Full Waveform Inversion of Metal Ore Bodies. College of Geoexploration Science and Technology, Jilin University, Changchun 130026, China.