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Extended Abstract

Study of the relationship between fracture intensity distribution and geomechanical parameters in Sarvak reservoir, in an oilfield located in Dezful Embayment

Khadijeh Hashemian[1], Vali Mehdipour[2*]

1- Geomechanics Department, Pars Petro Zagros (PPZ) Company, Tehran, Iran
2- Geosciences Department, Dana Energy Company, Tehran, Iran

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Keywords

Sarvak Formation, fracture intensity, seismic attribute, 3D model, porosity

Abstract

In this study, the distribution of the fracture intensity in the Sarvak carbonate Formation in an oilfield located in the Dezful Embayment and its relationship with geomechanical parameters were investigated. Therefore, fracture intensity data, reservoir data such as porosity, along with rock elastic properties were imported into software. In this software, after providing several seismic attributes, they were merged together using the neural network approach and converted to one driver (representative attribute) to be applied as a secondary variable for fracture intensity modeling. After constructing the 3D grid, the imported data such as fracture intensity, porosity, and geomechanical parameters were scaled up and prepared for modeling. Therefore, all related logs including porosity, Young's modulus, Poisson's ratio, and uniaxial compressive strength along with the fracture intensity logs were distributed in three dimensions using geostatistical algorithms, to investigate the relationship between geomechanical parameters and fracture network distribution. Based on this study, there is a notable relationship between geomechanical parameters and porosity while there is no logical relationship between geomechanical parameters and fracture intensity. Also, the parts with high fracture intensity in the upper and lower Sarvak do not show a clear relationship with the effective porosity distribution, indicating the effect of diagenesis processes in porosity variation during the geological time.

1. Introduction

Fractured reservoirs in Dezful embayment are the main parts of the hydrocarbon reservoirs in Iran. Studies of the natural fracture models in fractured reservoirs are very important because they play significant role in oil production and occurring some problems such as mud loss during drilling. The impact of the fracture on production can be positive or negative. Fractures are defined as discontinuous surfaces in the rock without displacement which can be opened or closed. The fracture intensity is used for fracture description which is defined as the number of fractures in area or volume. The natural fractures were created during the geological times but geomechanics indicates the current situation of the rocks. Recent studies show that geomechanical parameters have a high correlation with diagenetic parameters such as cementation [1,2]. The study of the relationship between fracture intensity and geomechanical parameters distribution is the main aim of this study. In this study, geomechanical parameters such as Young's module, Poisson's coefficient, and UCS, were calculated in Sarvak reservoir of the studied field, and then they were distributed using geostatistical methods to check their relationship with the fracture network. Therefore, appropriate geostatistical algorithms have been

* **Corresponding Author:** mehdipour.vali@gmail.com

applied for their distribution [3]. It should be noted that applying secondary data such as inversion data and appropriate algorithms can be useful in 3D modeling.

1.1 Geological setting

The studied oil field is located in the Dezful Embayment (as a subdivision of the Zagros). Sarvak Formation is the main reservoir of this field which is considered one of the main carbonate reservoirs in Iran. It has two shallow and deep facies in Zagros. The age of Sarvak Formation is from Albian- Turonian.

2. Methodology

In this study, Petrel software has been used for providing seismic attributes and also for parameter propagation across the field. Using this software, some seismic attributes were provided to be used for fracture modeling. Those attributes help us to better understating the reservoir. The study of seismic attributes provides valuable qualitative information about the underground geometrical and qualitative parameters, such as subsurface structure, the detection of gas-bearing zones, existing of the faults and channels, the determination of reservoir characteristics, etc. In this study, seismic attenuation, ant-tracking, variance, and curvature attributes were provided and used.

3. Results and Conclusions

In order to construct the 3D model of the porosity, fracture intensity, and geomechanical parameters, a 3D structural model has been constructed. The grid size was 100*100m. Then, all of them were scaled up to grid size and the variography setting was done for them to be prepared for geostatistical distribution. Appropriate geostatistical algorithms such as SIS and SGS have been used for 3D distribution. Seismic trends and inversion data were used for porosity distribution, and in turn, it was used as secondary data for geomechanical parameters propagation. The constructed seismic attributes have been merged into unique attribute by applying Petrel software to be used as asecondary data for fracture intensity distribution (Figure 1).

Based on this study, the area showing high fracture intensity in the upper and lower Sarvak do not show a clear relationship with the distribution of effective porosity, which indicates the effect of diagenesis processes in modifying the porosity and, rock parameters during the geological time. However, the geomechanical parameters such as Young's modulus and uniaxial compressive strength have significant inverse correlations with the porosity. Therefore, the porosity model can be used as secondary data in their distribution. Porosity has a 64% inverse correlation with Young's modulus. This inverse relationship for uniaxial compressive strength is 54% and for Poisson's ratio is 57%.

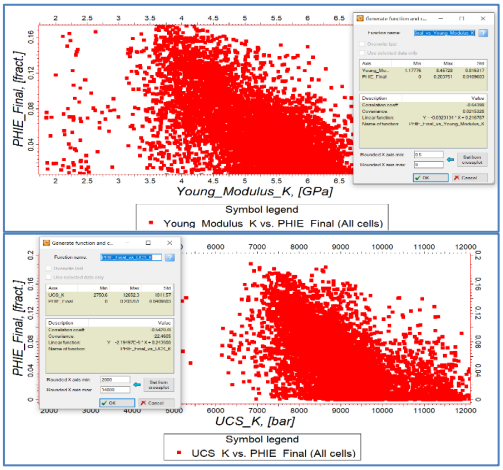

Fig. 1. Correlation coefficient between Young's modulus and UCS with porosity

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5. References

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