



Extended Abstract

Analysis of the present-day stress state in one of the oil fields of the Abadan Plain: Geomechanical modeling and recommendations for optimizing drilling and reservoir management

Mohsen Ezati^{1*}, Mohammad Reza Ebadi², Mehdi Hazineh¹, Hesamoddin Kazemeini¹, Fahimeh Shokraneh¹, Forough Farokhnia¹, Hamed Amiri¹

1- Pasargad Exploration and Production Company

2- Petroleum Engineering and Development Company (PEDEC)

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Abstract

This study analyzes the present-day stress state in one of the oil fields of the Abadan Plain in southwest Iran, with the aim of improving wellbore design and supporting reservoir management decision-making. Owing to the limited availability of reliable stress data in this area—particularly the scarcity of World Stress Map (WSM) information on horizontal stress orientations and the absence of dependable constraints on stress magnitudes and stress regime—a comprehensive geomechanical model was developed through the integration of petrophysical data, image logs, dipole sonic logs, drilling reports, geological data, and leak-off test (LOT) results. Stress indicators interpreted from image logs reveal that the maximum horizontal stress orientation (SHmax) is predominantly aligned in a northeast–southwest direction. Estimation of stress magnitudes further indicates that, within the studied formations, the maximum horizontal stress exceeds the vertical stress, while the minimum horizontal stress is lower than the vertical stress ($SH_{max} > SV > Sh_{min}$), implying the dominance of a strike-slip stress regime in the field. The findings are consistent with regional structural trends and available WSM data, and they provide a practical framework for wellbore stability assessment, safe mud weight window determination, drilling trajectory optimization, and the improvement of reservoir management strategies in the oil fields of the Abadan Plain.

1. Introduction

Understanding the contemporary stress state within hydrocarbon reservoirs is essential for optimizing drilling operations and ensuring safe reservoir management. In the Abadan Plain of southwestern Iran, where oil exploration and production are of significant economic importance, detailed knowledge of the regional stress regime remains limited, with existing data primarily focusing on horizontal stress orientations provided by the World Stress Map (WSM).

To address this gap, this study integrates a wide range of geomechanical data—including petrophysical measurements, image logs, dipole

sonic logs, drilling reports, geological information, and leak-off tests—to develop comprehensive models of the present-day stress conditions.

2. Methodology

The methodology employed in this study primarily revolves around a comprehensive geomechanical modeling approach, with a particular emphasis on the stress polygon method to delineate the in-situ stress regime. Data integration played a crucial role, incorporating petrophysical measurements, image logs, dipole sonic logs, drilling reports, geological data, and leak-off test (LOT) results to ensure robust model

* Corresponding Author: mohsenezati7@gmail.com

calibration [1, 2].

The stress polygon technique was applied by analyzing the orientations and magnitudes of the horizontal stresses derived from image logs and other datasets [3], allowing for the identification of potential stress regimes within the region (Fig.1).

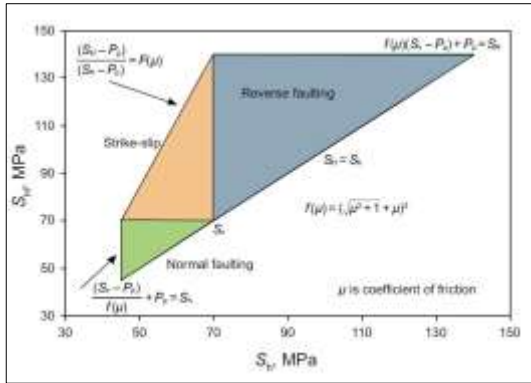


Fig. 1. The stress polygon plot.

3. Results and Conclusions

The results of this study reveal that the Abadan Plain is characterized by a strike-slip stress regime, with the maximum horizontal stress (SHmax) generally oriented northeast-southwest and exceeding the vertical stress (SV), while the minimum horizontal stress (Shmin) remains below SV.

The analysis shows that SHmax is consistently greater than SV across all formations, whereas Shmin is less than SV, indicating a predominantly strike-slip tectonic setting (Fig.2).

These findings highlight the importance of considering horizontal stress magnitudes and orientations in drilling and reservoir management to mitigate risks such as wellbore instability and to optimize hydraulic fracturing operations.

The integration of diverse geomechanical data provides a robust framework for understanding the regional stress distribution, facilitating safer and more effective drilling strategies in the Abadan Plain.

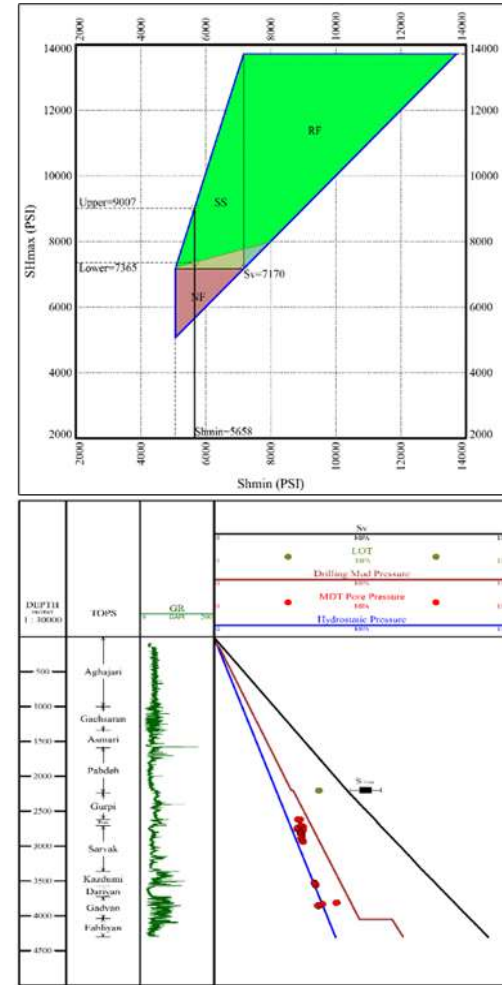


Fig. 2. The stress stress analysis.

4. References

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