Iraqi Geological Journal

Journal homepage: https://www.igj-iraq.org

Geometry and Tectonic History of West Qurna-1 Structure, Southern Iraq, Mauddud Carbonate Reservoir as Case Study

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Received:
23 January 2024

Accepted:
9 March 2024

Published:
31 May 2024

Abstract

West Qurna 1 is a portion of the supergiant anticline that extends more than 120 km. This elongated anticline contains, from north to south, West Qurna 2, West Qurna 1, North Rumaila, and South Rumaila. The Mauddud reservoir in the West Qurna 1 oilfield has only been subjected to very few studies, as the vast majority of the studies were concentrated on the main reservoir, which is the Mishrif reservoir, in addition to the Zubair and Yammama reservoirs. The current study attempts to incorporate all available data to better understand the subsurface structure of the Mauddud reservoir in West Qurna I. First, the well tops for each unit within the Mauddud reservoir have been picked from 25 wells that were well dispersed over the entire study area. All data, including well tops and 3D seismic interpretation reports, were used to build structural maps for each unit including: Upper Mauddud A, Upper Mauddud B, Lower Mauddud A, Lower Mauddud B, Lower Mauddud C, and Top of Nahr Umer Formation. Finally, the study concludes that the Mauddud structure in West Qurna 1 was classified as a gentle, approximately asymmetrical, anti-form, horizontal, non-cylindrical, brachy anticline. The structures within the Zubair subzone were formed due to multiple geological factors, including the Alpine orogeny resulting from the collision between the Arabian and Eurasian plates, salt tectonics associated with the Infra-Cambrian Hormuz Formation, and movements of basement rocks. The development of subsurface structures is collectively influenced by the interplay of various factors, including the Alpine orogeny, basement faults affecting anticlines, and salt tectonics shaping salt structures.

Keywords: Fold classification; West Qurna 1 Oilfield; Geometric analysis; Structural analysis, Iraq

1. Introduction

The West Qurna 1 (WQ1) oilfield is considered one of the supergiant oilfields in Mesopotamia hydrocarbon province, Southern Iraq (Abdullah et al., 2018). According to World Oil and Journal of Petroleum Technology, the West Qurna Oil Field (southern Iraq) has a potential of 21 billion barrels of oil reserves within the Cretaceous units (Mahdi et al., 2022). The potentiometric map in the West Qurna oilfield indicated high potential sites that are of great importance for migration and accumulation (Awadh et al., 2019). West Qurna 1 oilfield is geographically located approximately 50 km Northwest of Basra city (Fig.1). The study area covered approximately 442 km^2. Clay and alluvial sediment covered most of the study area (Abdullah et al., 2022). The field presents the dome that extend with Rumaila oilfield direction, although the third dome is currently delineated as West Qurna oilfield, from a structural perspective, it is inherently connected to the northern Rumaila anticline (Al-Kaabi et al.,

DOI: