
Constraining 3D Geological Models by their Diagenetic Overprint - an Example from the Khuff Formation

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The Khuff Formation is one of the most important reservoir formations in the Middle East Gulf Region and one of the world's biggest gas reserves. In these reservoirs a complex diagenetic history has had a major impact on the final static and dynamic reservoir properties. Therefore in order to optimise production of existing Khuff reservoirs, and future field development plans, it is necessary to:

- understand the type, impact and timing of the main diagenetic phases at all scales from regional understanding to the fine-scale reservoir heterogeneities
- develop approaches to effectively incorporate the most significant ones into the static reservoir model.

Dolomitization is one of the most crucial diagenetic phases since it strongly constrains the permeability architecture of the field. Detailed diagenetic studies suggest that there are various types of genetic dolomite types (including evaporative, mixed evolved sea-water - freshwater and late thermobaric dolomites). These genetic dolomite types have different stratigraphic and geographic distributions, and geometries. Each dolomitization type can be associated with a specific process, and link to a paleogeographic setting, stratigraphic position and structural setting. The description of the diagenetic fabrics and analysis of their spatial distribution allows empirical rules regarding the 3D distribution of these products to be established.

The modelling approach is geologically-driven and based on the relationships between dolomite type, stratigraphic position, palaeogeographic position, depositional facies, and proximity to fault/fracture zones. The results are then quality controlled to ensure coherency with the conceptual models.
