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**Regional Study of Sarvak and Ilam Formations in the Sirri District of the Persian Gulf**

Sirri district forms part of vast sedimentary area located between:

- The Qatar uplift in the west

- The mio-geosyncline of the Zagross in the north

- The Omanides geosyncline in the south east

- To the south, this sedimentary extends to the Rub Alkali desert.

The study of the Middle Cretaceous contains, Mishrif member from the the Sarvak formation and Late Cretaceous formations contains Laffan, Ilam and Gurpi, among them, the Mishrif and the Ilam Formations are reservoir rock, while the Laffan and the Gurpi are seals of these reservoir rock, Respectively.

Sedimentological study shows the Mishrif Formation principally consisted of three separate facies:

Fore reef or microfragmental facies , shallow marine platform. It is a transition Khatiyah to Mishrif facies. (variable energy zone). The fore reefal facies is relatively porous and permeable, and give moderately low productivities. Main Reef, with rudist debris, peloid and alveolinid it corresponds to high zone in an external barrier. The reefs give the best porosities and permeabilities with very good productivities. Back reefal facies, belongs to low energy zone and generally considered as a very bad reservoir conditions although it might have a very extensive range of petrophysical values.

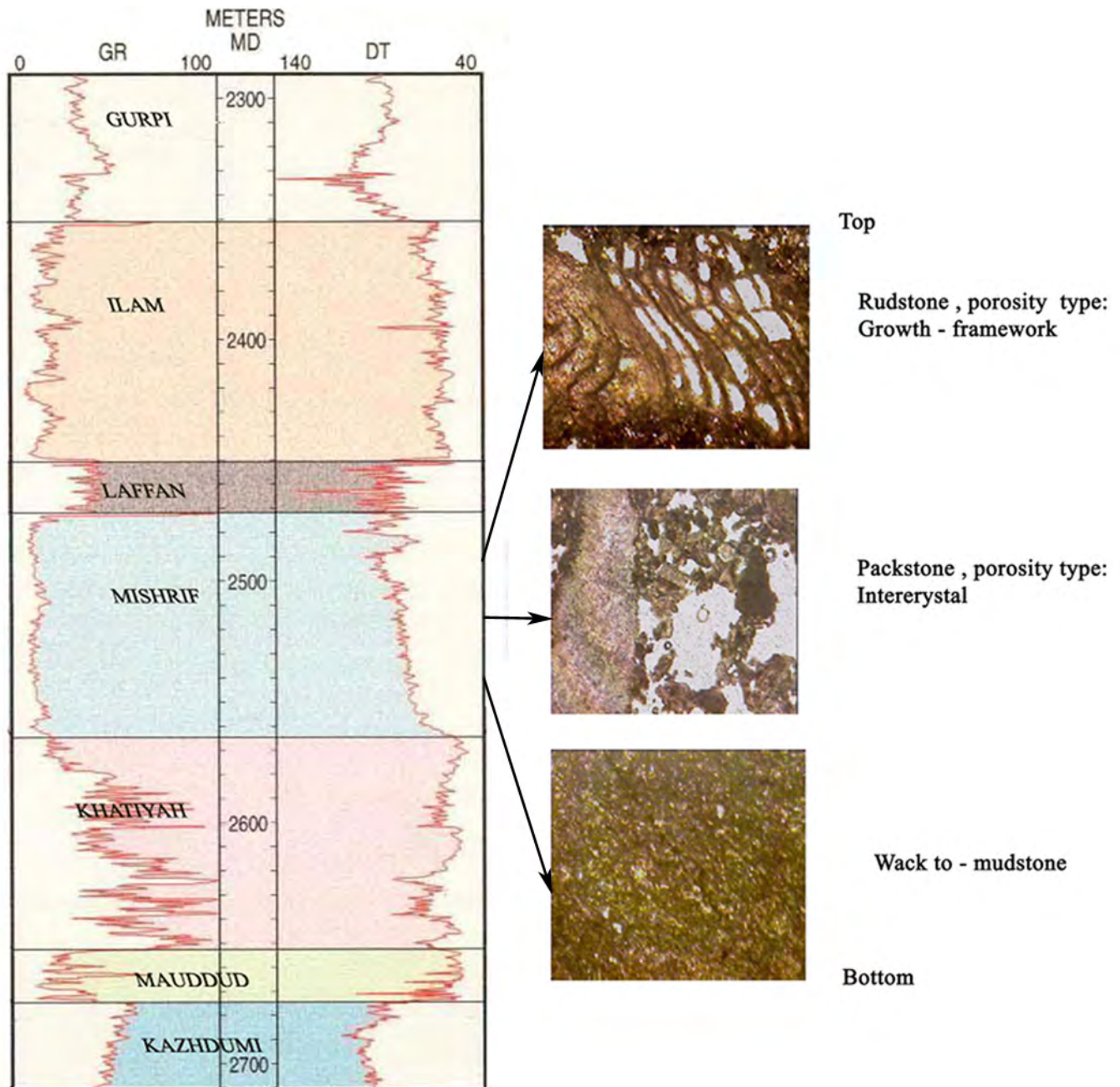
This studies reveal that petrophysical characteristic varies from top to bottom, the upper part of the Mishrif contains a very good porosity/permeability. On the contrary the lower part transition zone of the Mishrif contains a very low porosity/permeability. The porosity seems to be principally of the dissolution processes with dissolution of bioclasts. Most of the dissolution porosities are develop above water table, usually, a carbonate rock must be not only emergent but also exposed or nearly so to subaerial erosion. Inter connection of pore system seem to be excellent, that provides a highly permeable zone and consequently excellent reservoir.

The isopach map of the Mishrif Formation in this area shows, whenever the Mishrif is missing or laterally changed into the Khatiyah facies the Sarvak formation is not oil prospective, mainly because of absence of the reservoir.

The well log correlations through Fateh, Sirri D, Sirri C and Sirri A clearly indicates that the depositional sequence within the Khatiyah increases from east to west (From Fateh Field to Sirri A Field). The thickness and facies within each sequence remains consistent through the correlation panel. The sedimentological and geochemical studies demonstrated that Khatiyah sequences to be basinal deposits forming the source rock for the Mishrif reservoir.

The absence of thickness variation of the different sequences within the Khatiyah through several structures demonstrates that no structure deformation occurred during Khatiyah deposition. The correlation between sequences in the Khatiyah corresponds to time lines. The well log correlation panel suggests that the Khatiyah thickens regularly from east to west. The Mishrif shallow marine reef deposit facies progrades east to west onto Khatiyah marine sediments.

The Mishrif Formation in the Fateh Field in the eastern part of the correlation panel corresponds to sequences 7, 8 and 9 of the Khatiyah. A significant part of the Mishrif has been eroded by the Upper Cretaceous Unconformity in the crestal of the Fateh field. In the most crestal part of the Fateh Field even the Khatiyah has been partially eroded.



**Photomicrograph of Thin Sections From Mishrif Formation .**

There is a gradual transition between the Khatiyah to Mishrif facies, but the thickness of the transition zone varies from area to area on Sirri C and Sirri X1 the transitional part (forereef) has a thickness of approximately 70 ft thick, whereas on Sirri D the transitional interval much thinner.

The thinning of the Mishrif on the crest of structure is largely related to the erosion of the Mishrif on a structural high during the Early Upper Cretaceous uplift, which created the present structures.

On the Sirri A, the Upper Cretaceous Unconformity has removed part of Khatiyah. There is no evidence as to whether the Mishrif was deposited on the Top Khatiyah on the Sirri A area.

#### Top Ilam

The Top Ilam limestone on the sonic log corresponds to a sharp positive deflection and on the synthetic seismogram zero phase reverse polarity corresponds to a strong black peak. On the well correlation panel the Top Ilam is a characteristic regional geological marker and on the 3D seismic data corresponds to a strong and continuous black peak event. The picking of the Top Ilam can be performed with high degree of confidence.

#### Top Laffan (base Ilam)

The Top Laffan shale on the sonic log corresponds to sharp negative deflection. On the synthetic seismogram is represented by a strong trough. On the 3D seismic data the horizon is very continuous over the entire 3D data set and can be picked with high degree of confidence. The thickness of the Laffan varies between 10 and 20 m in this area.

#### Top Mishrif Reservoir

Top Mishrif on sonic log is well defined and on the GR log corresponds to sharp negative deflection. However due to thin bed effect of the overlying Laffan shale, no clear seismic event can be attributed to the top Mishrif (due to the limited resolution of the seismic data at this depth).

#### Top Khatiyah

The Top Khatiyah on the sonic log corresponds to transitional facies change. Which results in variations in acoustic impedance. In this case the reflection corresponds to a black peak.

#### Intra-Khatiyah

The Intra-Khatiyah is a strong black peak, which was identified on the synthetic seismogram and 3D seismic data.

#### Top Mauddud

The Top Mauddud similar to Intra-Khatiyah and corresponds to a strong and continuous black peak, which can be picked and mapped with a high degree of confidence. The Top of Maudud on the GR log corresponds to sharp negative deflection.