Lower Cretaceous Depostes of Zagros: a Carbonate Ramp between Neo-Tethyan Continental Shelf and Arabian Platform Border

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Abstract:
Fahlyan is one of the upper Khami group Formations with lower Cretaceous (neocomian-aptian) age. This Formation does not have any outcrops in south-west of Iran and Dezful embayment region. It is memorable because of reservoir properties is memorable in geological point of view, sedimentary environments and Oil industry. This Formation studied in several subsurface sections of south Dezful embayment so far. Signs showing Fahlyan Formation had been deposit between Neotethian and Arabian platform. And confirming with existent Theory for this region.

Key words: Lower Cretaceous, Dezful embayment, Neotethian, platform

Introduction
Iran has different depositional-structural regions, Zagros is one of these regions. Thereupon of no magnetism activities and existence of several source rocks, reservoir rocks with good porosity and good cap rocks prepares individual conditions for manufacture and stack hydrocarbon. Then this region is the most petroliferous depositional extent of the world. Fahlyan is one of the reservoir Formations of Zagros dependent on khami group with Neocomian age. In the study we can ducted, it was found that good of by the geophysics and thin sections result of wells digged with National Oil Company of Iran in oil fields, on absence outcrop of this Formation in northern Dezful embayment. These studies accomplishing toward more reconnaissance of deposit conditions and other qualifications (Fig. 1).

Jurassic to Cretaceous Neo-Tethyan Continental Shelf
Overlying the Permian–Triassic platform successions, lower most Jurassic to upper Turonian strata form a number of megasequences that accumulated on a shallow continental-shelf, facing north and northeast toward Neo-Tethys (James and Wynd, 1965). Megasequences contain many petroleum source and reservoir rocks. The overlying units of megasequences all display gradual facies changes from coastal and sabkha-type clastic strata, evaporites, and dolomites on the southwest to shallow-water, high-energy-environment limestones, and finally to deep-marine, pelagic and hemipelagic lime mudstones and marls on the northeast. The uppermost Jurassic to lower Cretaceous Fahlyan, Gadvan, and Dariyan inner and outer shelf carbonates and argillites (Shakib, 1994), which are collectively about 750 meters thick in the central part of the belt (Dezful embayment), but thin to the southeast (Fars Province) to only 250 to 300 meters in thickness (compare stratigraphic columns).
Method of study
The first stage includes data collection on relevant studies done on this Formation. Then laboratory works start and paying study of thin sections. Study of thin sections start from upper part of Formation due to mixing of samples takes from well cutting method and boundary of facieses distinct with first incoming of new facies. Nomination of facieses done with expanded Dunham classification. After microscopic stage microfacies belts interpreting by using of standard microfacies of Wilson from both of wells. Next stage is modulating gained information with well logging data. Then drawing simulation of environmental model with softwares (Fig.6). Last stage containing deduction and presentation of results.

Explanation of microfacies
Microscopic moduling and studies of constituent elements of each thin section onward percent of skeletal and none skeletal grains, cement and matrix lead to recognizing 17 microfacies in 4 groups and relating each of these groups to a subenvironment.

Group A
A1: Spiculite Wackestone (Fig2-A&B).
A2: Pellet Bioclast Wackestone (Fig2-C).
A3: Argillaceous Lime Mudstone (Fig2-D).

Group B:
B1: Pellet Bioclast Packstone (Fig3-A).
B2: Intraclast Pellet Pack\Grainstone (Fig3-B).
B3: Oolite Intraclast Grainstone (Fig3-C).
B4: Pellet Grainstone (Fig3-D).
B5: Tubiphytes Packstone (Fig.3-E).
B6: Lithocodium Boundstone (Fig.3-F).

Group C:
C1: Benthic foraminifer Green algae Packstone (Fig.4-A).
C2: Bioclast Pelloid Packstone (Fig.4-B).
C3: Pelloid Bioclast Wackestone (Fig.4-C).
C4: Fossiliferous Mudstone (Fig.4-D).
C5: Pelloid Packstone (Fig.4-E).

Group D:
D1: Silty Mudstone (Fig.5-A).
D2: Quartz arenite (Fig.5-B).
D3: Pellet Intraclast Pack\Grainstone (Fig.5-C).

Sedimentary Environment and offer a model:
After studying thin sections of Fahlyan Formation We can recognize 4 subenvironments: open marine, shoal, lagoon and tidal flat. Founded on Walter law and microfacies sequence this Formation show's shallow carbonate marine of ramp type (Fig.6).
Open marine microfacies:
This facies belth contain A1,A2 and A3 microfacies. Major allochemical grains of this microfacies are sponge spicule, radiolarians, echinoids and brachiopods. Sponge is one of the organisms that growing in deep marine and lake of oxygen and anaerobe conditions. So it is expected that these organisms be visible in lagoon and open marine. Radioliner is a pelagic organism and because of their silica nature of shells can be visible in deeper c.c.d boundary. In total presence of sponge spicule with radiolarians, brachiopods and echinoid fragments represent open marine settings. According to this study presence high content of micrite subsidiary condition is formed as a result of low energy and lower base wave. Besides existence silica allochems with secondary pyrite and high amount of clay minerals showing open deep or half deep marine conditions.

Shoal microfacies:
This subenvironment consists of B1, B2, B3, B4, B5, B6 microfacies. Presence of none skeletal Grains as oolite, rounded pellet with intracalasts and flaked skeletal grains as lithocodium, tubiphytes, echinoids, bivalves showing shallow marine with high wave energy. However condition of make pellet is lagoon but presence of this grains in this facies shows reworking and redepositing in cutting shoal channels. Also absence micrite in Matrixe and constitute cement is significant of out wash micrite due to high amount energy and Formation carbonate cement between grains did possible. Moreover good sorting of sedimentary grains and presence of oolite represent shallow marine and high energy settings. Lithocodiums growing in shallow lagoonal and reefal settings affected by moderate environmental stress (Flugel 2004). This organisms making patch reefs on inner part of shoal near lagoon.

Lagoon microfacies:
This subenvironment contains C1, C2, C3, C4, C5 microfacies. Low diversity of skeletal grains and high amount of pellet show a restricted environment. Moreover presence of miliolid, textularia, dasycladacean green algae, halimeda and ostracodes are sign of lagoonal environment. Other sign of Lagoon is micritization process. Micritization process inclusive conversion shell of grains to micrite in depositional environment and syndeposit or immediatly after depositing. This process is sign of low energy and silent settings. Though Walter law determines these microfacies.

Tidal Flat Microfacies:
This subenvironment consists of D1, D and D3 microfacies. Presence intracalast with lagoonal offspring and different size show an increased energy of environment in tempest conditions. Almost presence pseudomold of evaporitic minerals with regular and euhedral shapes and in the light of other adjacent microfacies representing depositing in tidal flat settings. Almost presence sand size quartz represent detrital Facies due to decrease relative sea level.

Conclusion:
The findings of this study showed that fahlyan Formation Deposited as a ramp carbonat. Almost other studies upon this formation in other fields in Dezful embayment and Persian
Gulf showed shallow depositional settings and with consideration in geographic position of Dezful embayment between Arabic platform and Orumieh Dokhtar belth and folded Zagros (These two zones known as result of suture neotethien basin). These signs reveal that Fahlyan Formation deposited between Neotethian and Arabian platform and confirming existent Theory for this region (Alavi, 2004).

References:


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Figure 1: Position of fields in middle east (a), Zagros (b) and Dezful embayment (c).

Figure 2: Spiculite Wackestone (A&B), Pellet Bioclast Wackestone (C), Argillaceous Lime Mudstone (D).
Figure 3: Pellet Bioclast Packstone (A), Intraclast Pellet Pack/Grainstone (B), Oolite Intraclast Grainstone (C), Pellet Grainstone (D), Tubiphytes Packstone (E), Lithocodium Boundstone (F).
Figure 4: Benthic foraminiferal Green algae Packstone (A), Bioclast Pelloid Packstone (B), Pelloid Bioclast Wackestone (C), Fossiliferous Mudstone (D), Pelloid Packstone (E).
Figure 5: Silty Mudstone(A), Quartz arenite(B), Pellet Intraclast Pack/Grainstone(C)

Figure 6: Simulation of ramp environment and related facies in Fahlyan Formation.