The study of Asmari formation stratigraphy in basis of fracture and porosity to determine the injection well location

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Abstract: Asmari formation with upper-san oligocene underlying miocene is considered as the most limited horizon of oil production in south-west of Iran which might be seen in Dezful, Lorestan, and Fars downfall. It is the main reservoir of many oil fields. This formation together with lime lithology dolomite, and chil layers is located on the Pabde formation deep sediments in a co-gradient manner, and it is covered by Gachsaran formation evaporating sediments at the top. In order to study stratigraphy to characterize porosity and formation fractures, the main features of petrology and the main diange processes were studied by petrographic techniques, and the porosity changes and saturation on neutron vectors, Gama, and electric resistance were investigated by the data for well measuring. Furthermore, various porosities were estimated according to lag deviation, and it was clarified that carbonate faces mainly enjoy moldic vugy, and inter-crystal porosity. And, using MNPLOT confirmed the predominance of carbonate lithology, and the clay mineral was distinguished based on cross plot Thorium-Potassium. Roz and Dips vectors for walls and supports were provided at different parts of the formation to investigate the fractures and faults. Geolog software 6- version 6 was used in drawing cross-plots and logs for all the computations. Having studied the reservoir quality based on petrology features, porosity changes, diange main effects, cementation intensity, and saturation, the best locations for drilling in the oil fields were chosen.[Tavakoli P, Sedighi R, Hamzeyi H . **The study of Asmari formation stratigraphy in basis of fracture and porosity to determine the injection well location .** *J Am Sci* 2013;9(2):7-11]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 2

Key words: Asmari , Formation , Stratigraphy , Fracture , Porosity , Injection Well location

1. Introduction

Asmari formation is as old as Oligo-miocene, the main reservoir stone of raw oil in the South West of Iran which is seen all over Zagros, but its most complete sequence is in Dezful dent.Busk and mayo were the first people who named the lime stones succession from Cretaceous to Eocene Asmari. Richardson (1924) selected and measured the Asmari formation in Asmari mountain and GeleTorsh valley as the cutting sample. Lees (1993) studied the previous researches, and San called it Oligo-miocene. In addition, he divided the Asmari cutting sample in the South East of Masjed Soleyman into three parts as lower, middle, and upper, and classified the base Andirit under the lime classes. Thomas (1984) was the first person who defined Asmari, but James and Wynd (1948) exactly studied and formally introduced Asmari, and provided its callus-graphic bio-features.Adams and Bourgeois (1967), Wells (1967), and Jalali (1987) studied the Asmari microfacies and lithology characteristics. In recent years, many investigations have been conducted on Asmari formation by different researchers. Some of them include the study of alluvial environment of Asmari formation in Dezful (Seyrafian, 2000), Borujen (Seyrafian et al, 1996), central Zagros (Seyrafian and Hamedani, 2003), the study of alluvial environment and Asmari sequences in Southern Dezful (Raisi and Lassemi, 2000), sequential stratigraphy and alluvial environment in Ramin oil field (Aram, 2004), sequential stratigraphy and alluvial environment in Copal oil field (Omid pour, 2004), the study of Asmari alluvial environment and stratigraphy life in Aghajari Well 30 (Yazdani et al, 2004), Asmari sequential stratigraphy in Parsi oil field (Hassanvand, 2005), and bio stratigraphy microfacies, and Asmari formation alluvial environment in Copal oil field well 444 (Avariani et al, 2006).

The studies of Henson (1948), Tacey (1994), Drooger and Sacin (1959), Kalantari (1967), Adams and Bourgeois (1967), and Loeblich and Tapan (1989) were used to identify the Asmari Foraminifers. Dunham method (1962) was used to classify the stones, and the model of Wilson (1975), Flugel (2004), and Carrozi (1989), was used to classify the microfacies and analyze them.

In lithology point of view, Asmari formation includes limestone, Dolomite lime stone, and clay limestone (Adams, Bourgeois, 1967). Kalhor evaporation section is located in Zagros basin North West, with middle Asmari lime stones is located in a middle finger manner, but sandstone microfacies replaces lime layers in the south east of Ahvaz.

According to the conducted studies on Asmari ecologic microfacies globi jerinid fossils, globorotalides, briozoers, Moluccas, echinodermaata, opercolina, large lipidocyclines, moss – likes, KoralinaceA, Hetrostegina, Neo Aloulina,

Amphysetegina, Koralin algae (Litophilum and litotamnium), dendrites, penropolico, miliods, coral, Miojipsinoids, Ekinoderm, Strakood, mollusca were found. In addition to the abovementioned bioclests, Aide, ploid, intraclest and Coartez also exist.
Evaporation molds, ecologic turbulence effects, dissolved fossa, and bird eye fabric existed as well as laminic structures. And its carbonated stones enjoy bird eye, inter crystal, moldic, hold, and vuggy porosities.

The most important quality of Asmari reservoir is the existence of developed natural fractures and breaks. The Caresti spring of Bibi Tarkhun and Griva confirm this issue. This high density of break and fracture in Asmari reservoir could be attributed to compressed carbonated layers which are highly delicate, or it may be due to porous dolomites. Sometimes, as the result of clay mineral increase, this delicacy decreases and their compression lessens.

Generally, there are three groups of fracture in Asmari reservoir, including longitudinal fracture in layering extension, latitudinal fractures perpendicular to transverse, and cross-fractures in the internal areas of the oblique. The lower Asmari fractures are mainly microscopic and they have so much disperesed .Knowing the way that the breaks and fractures are developed and compressed in the underlying reservoirs play an important role in computing the reservoir parameters in different fields. Depicting diagram is a way that used to identify them. Furthermore, the highly compressed places of the fractures and breaks can be chosen to determine the appropriate place of the injective wells in this way.

Many studies were carried out to know the sequential stratigraphy of Asmari formation in different regions. A diameter of lands whose lower and upper borders are restricted by two sequential stratigraphies is called sequence, regardless the diameter and lithology. Sequential stratigraphy is a science in which strata sequences are interpreted by breaks such as erosion, submerging levels, or gradual borders. Sequences with low system tract LST or group of progressive microfacies or TST were identified in the Asmari of microfacies sequences with high system tract HST. HST sequences are the sediments deposited between the least decrease of the sea relative level and index increase in the sedimentary space. TST sequences are the sediments which are immediately placed on the progressing surface.

2.Stratigraphy

Gradient and extension of the cracks and the layers thickness were determined by these vectors, and consequently led to a particular model between the formation fractures and faults.The studies to know the stratigraphy status and microfacies of Asmari formation were conducted in two stages. The first stage was to do thin cuttings from the cores obtained from drilling. The experimental studies were conducted in the second stage then, benthonic foraminifers were identified and some biozones were introduced according to their dispersion.

In this project, three collective zones were identified according to the micro fossil dispersion:
-Collective zone no. 1

The fossils of this collective zone include:

Nummulites Vascus, Nummulites fichteli, Nummulites inter medius sp., Eulepidina sp., Nephrolepidina sp., Operculina complanata, Archaias operculiniformis, Miliola sp., Quinquelculina sp., Schlumbergerina sp., Astrotrillina asmariensis, Astotillina howchini, Astrotrillina paucialveoluta, Spiroclypeus ranganae, Elphidium sp., Rotalia vinnutti, Heterostegina costata. Amphistegina sp., Spiroloculina sp,Textularia sp., Pyrgo sp., Polymorphinid sp., Tubucellaria sjp., Peneroplis evolutus., Triloculina trigonula., Triloculina tricarinata, Ammonia beccari, beccari, Planorbulina sp., Borelis pygmea,Praerhapydionina sp., Pseudollituonell delicate, Lithouthaminium sp., Lithophyllum sp., Gasteropoda., Ostracoda, Ditrupa sp., Rotallia sp., Echinioda.

This fossil collection can be compared to Adams and Bourgeois(1967) ecologic zone no. 3 called Eulepidina, Nummulites assemblage zone. Pelagic fossils of Pabde formation and Asmari Nummulites can be seen in the lower parts of this zone which indicates the gradual border of Asmari and Pabde formation. The age of this zone can be considered as lower to upper oligocene and equal to the underlying Asmari. Lime and Dolomite lime are the lithology of this fossiled addition, and contextually, it is often wackestone, packstone, and rarely Grainstone.
-Collective zone No. 2

The fossils of this zone include:
Archaias oerculinigormis, Archaias asmaricus, Archaias hensoni, Miogypsinoides complanatus, Archaias kirkukensis, Valvulinid sp., Meandropsinairanica , Miliola sp., Quinquelculina sp., Schlumbergerina sp., Astrotrillina asmariensis, Astrotrillina howvhini, Astrotrillina paucialveoluta, Spirolinacylhnduceu, Textularia sp., Polymorphinid sp., Peneroplis sp., Heterostegina, Pyrgo, Reusslla sp., Discorbis sp., Ammomia beccarri, Cibicides sp., Lithouthaminium sp., Lithophyllum sp., Gasteropoda, Ostracoda.

This fossil collection may be comparable to ecologic zone No 2 of Adams and Bourgeois (1967), named Miogypsinoides, Archaias, Valvulinid sp. 1

assemblage zone and they are equivalent to the middle Asmari to the lower san miocene. The stone combination of this zone includes lime and Dolomite, and they are often Wackestone, Packstone, and Mudstone contextually.

-Collective zone No. 3

The fossils of this collective zone are as the following:

Borelis melocurdina, Milioli sp., Dendritina rangi, Rotallia vinnutti, Elphidium sp., Quinquelculina sp., Reussella sp., Pyrgo sp., Discorbis sp., Ammonia Beccari, Chilostomella sp., Schlumbergerina sp.

This fossil collection may be comparable to Adams and Bourgeois (1967) Zone no. 3, named Borelis group, Meandropsina assemblage zone, and it is equivalent to the upper Asmari to the underlying san miocene. Its lithology is lime and dolomite lime and its context is mudstone, and less than Wackestone and Packstone.

Micro microfacies details

Ten microfacies were identified which can be categorized in four collection (O. R. B. L) according to skeletal and non – skeletal components.

O 1: Pelagic foraminifera Nummulites Operculina Bioclast Wackestone to Packstone.

This microfacies can be compared to RFM 13 (Flugel, 2004).

O2: Nummulites Lepidocyclina Bioclast Wackestone to Packstone.

This micro microfacies can be compared to RFM (Flugel 2004).

O 3: Rotalia Eulepidina Lighophyllum Bioclst Grainstone

This micro microfacies can be compared to RFM 13 (Flugel, 2004).

R1: Benthonic Foraminifera Bioclast Wackestone to Packstone.

R2: Echinoid Bioclast Wackestone.

This micro microfacies can be compared to RFM 7 (Flugel, 2004).

R3: Miliolid Pelloid Bioclast Packstone to Grainstone.

This micro microfacies can be compared to RFM 16 (Flugel, 2004).

B: Ooid Grainstone.

This micro microfacies can be compared to RFM 29 (Flugel, 2004).

L 1: Asterotrillina Archaias Peneroplis Miliolid Bioclast Grainstone.

This micro microfacies can be compared to RFM 20.

L 2: Bioclast Mudstone with E vaporite cast.

This micro microfacies can be compared to RFM 22 (Flugel, 2004).

L 3: Lime Mudstone

This micro microfacies can be compared to RFM 22 (Flugel, 2004).

3. Discussion & results

The desert and laboratory studies revealed ten main microfacies in the sequence, including four debris and six sandstone microfacies. According to petrologic features, stratigraphy, geometrical form, nature of classification level, perpendicular microfacies situation (granulation, enlargeability, getting shallow, getting deeper), and thickness characteristics, and comparing them to standard microfacies, the sub-environments of microfacies and each collection were determined.

As we may see in figures 1 and 2 which show Warren & Root and Kazemi models, sedimentary sequence model was also used in the sequential stratigraphy studies. This model (figure 1) was proposed by Hunt and Tucher in 1992.

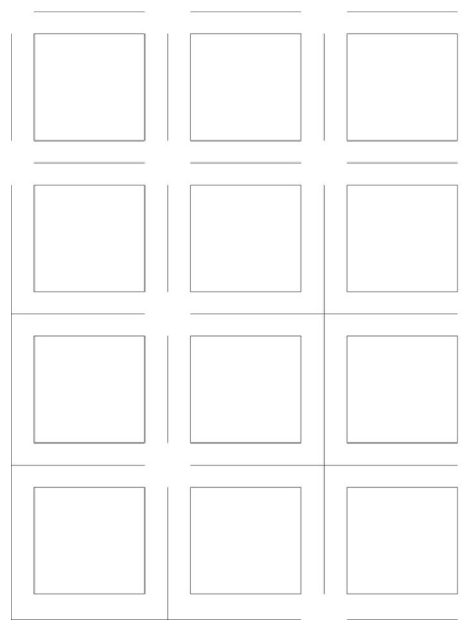

Figure 1: warren & root model

In this model (figure 2), each sedimentary sequence consists of four main tracts systems, including lowstand tract system, progressive tract system, highstand tract system, and downfall tract system. In distinguishing the sequential border of types 1 and 2, the new sequential stratigraphy methods, especially non-sea and ultra-tidal microfacies, were used. In specifying the strata surface, the main focus is on specifying the sequential border.

Since it is necessary to incorporate the results of sedimentology, stratiology, fossilology , and geochemistry studies with the tectonic and structural deformation studies in the region for a comprehensive investigation, the present research project macro- and microscopically used fossilized works and digenetic works of genoferic conditions together with microfacial studies to diagnose the main sequential surfaces and system tracts.

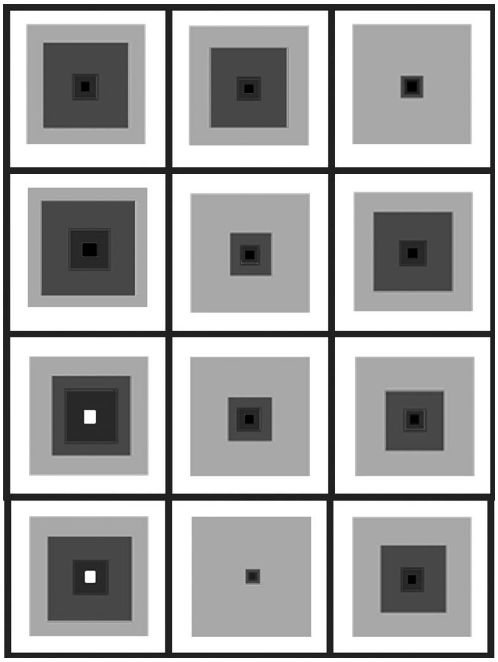

Figure 2: kazemi model

Using the results of both desert studies and laboratory investigations, and relying on the aforesaid criteria made it possible to recognize the appropriate location to choose the wells introduced for drilling to perform the injection operation on them, particularly gas injection to perform the injection on them, particularly gas injection in sinozoic sedimentary sequence, and consequently disintegrating the microfacies which build this sequence in the third order depositional sequence.

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