

## **The complete studies of sequence stratigraphy of Sarvak and Kajdomi formations in the South Pars gas field**

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### **Abstract**

*The South Pars gas field is located about 100 Km south of Asalooeyeh on the border line of Iran and Qatar in the Persian gulf. In this study, sequence stratigraphy of Sarvak and Kajdomi Formations have been interpreted based on studies of thin section samples from well number 1 and 3 as well as using gamma ray and sonic logs. Based on this study, one depositional sequence (3<sup>rd</sup> order cycle) in Kajdomi and two depositional sequences (3<sup>rd</sup> order cycle) in Sarvak Formations have been identified. This study reveals that the sequence boundaries at the base and top of Kajdomi and top of Sarvak Formations are discontinues and type one (SB1) while the sequence boundary between 1<sup>st</sup> and 2ed depositional sequences in Sarvak Formation is type 2 (SB2).*

**Key Words:** *South Pars, Kajdomi, Sarvak, sequence stratigraphy*

### **Preface**

In recent years, the International oil companies have used the science of sequence Stratigraphy for Exploration and production of their oil fields. (Morsal Negad 2005, Mohamad Khani 2002). The recognition of the sequences and their minute members that form the sequences as groups of facies. Parasequences are the main parts in sequence Stratigraphy (Meyer and Emery 1996, Lasemy 2001). Sequence Stratigraphy has a very good power in forecasting changes in porosity, Reservoir characteristic and lithology (Cany and Ocanell 1998, Tabatabaee 2005). In this research it is tried to with the data obtained from thin sections and also those from sonic/GR logs, the sequences of the Formations of Kazhdomy and Sarvak in the area of study considered in wells No.1 and 3 are recognized and studied.

### **The Regional Geology**

The South Pars gas Field, is one of the greatest gas fields in the world (Afrooz, 1992). This gas Field is located in Persian Gulf and on the border line between Iran and Qatar at a distance 100 km from Asalue harbure (Naderi Khujin, 2004). This field is in the Northern part of the North Dome of Qatar (Najm abadi 2003).

The sequence Stratigraphy of Kazhdumy Fm. in the well No.1 of South Pars gas Field:

Regarding the data obtained, the disconformity in the area, this formation is separated from Kazhdumy formation having Albian age. The sequence (I) in Kazhdumy formation with Albian age having 43m thickness, overlies by SB<sub>1</sub> sequence border on Darian Formation, which is the same Disconformable Surface between Aptian and Albian, and having extremely facies change of Lithology, missing of time and existence of glauconite and Iron oxides, is marked (Hadi Hosseini, 2008). In fact it can be said that this Section is the result of an

important transgression of the Sea on the surface of Disconformity, is deposited. With the transgression of the sea on this disconformity, the section TST of this sequence is deposited, and contains the group of open sea facies. This section that has a thickness of 22m, contains sponge spicules and a small amount of planctonic forams. The surface of maximum transgression MFS in the 22m base of this formation and between shaly layers and open sea facies are located. This surface is characterized by the changes in sedimentary environments and also by changes in the abundance and extension fossils such as orbitolina and Trocholina. The section HST has a thickness of 21m and is composed of marsh deposits. In this section orbitolina is seen abundantly. The fossils of Trocholina are rare. The top boundary of the sequence due to change of the age and lithology is of kind of SB<sub>2</sub> and is located on top of Kazhdumy Fm. (Fig 2)

The sequence Stratigraphy of Sarvak Fm. in the well No.1 of South Pars gas Field:

The sequence II in this formation has a thickness of 55m and has Cenomanian age. The lower boundary of this sequence regarding the above mentioned reasons is SB<sub>2</sub> kind and is located at the top of Kazhdumy formation. The group of TST facies have a thickness of 38 m. The maximum flooding surface (MFS) is at the depth of 38 m of Maddud member. The group of HST facies, are 15 m and contain limy deposits of marsh and shoal, and among the most important benthic forams are Orbitolina and Trocholina. This group of facies are also located in the Maddud member of the Sarvak formation. The upper boundary of this sequence due to existence of Laterite in thin sections is of the kind of SB<sub>1</sub> and is seen at 1m of the base of Ahmadi shale.

The sequence III which is located in Ahmadi member has a thickness of 33 m. The group of TST facies of this sequence has a thickness of 11m and its facies is composed of open sea sediments. The maximum surface of transgression (MFS) in this sequence is at the 11m of the base of Ahmadi member of the Sarvak Fm. and is between the layers of argillaceous limestones. The group of facies of HST have a thickness amounting 22m and includes marsh facies. The top boundary of the sequence is of SB<sub>1</sub> kind and is located at the top of Ahmadi shale and the disconformity aging Toronian (Fm3).

The sequence Stratigraphy of Kazhdumy Fm. in the well No.3 of South Pars gas Field:

The Kazhdumy Fm. in the well No.3 of South Pars has a thickness of 41m. The sequence I in the well No.3 is the same as this formation in the well No.1 and has Albian age. The sequence boundary is of the kind SB<sub>1</sub> and overlies the Darian Formation (the disconformable surface between Aptian and Albian). The sequence I has a thickness of 41m. The facies group TST which is formed from open sea sediments has a thickness of 16 m. The surface of the maximum transgression (MFS) is between the shaly layers and is at the 16 m of the base of Kazhdumy Fm. The group of HST facies have a thickness of 25 m, and is composed of marsh facies. The upper boundary of the sequence is SB<sub>2</sub> kind and is located between shaly layers of Kazhdumy and dolomitic layers of the Maddud. (Fig4)

The sequence Stratigraphy of Sarvak Fm. in the well No.3 of South Pars gas Field:

The sequence II having Cenomanian age has a thickness of 23m. The TST group of facies have 4m thickness and is composed of open sea facies. The surface of maximum transgression (MFS) is located at the 4m of the base of Sarvak (Maddud member). The HST group of facies are also located in Maddud member. These group of facies have a thickness of 19m and are composed of marsh facies. The foraminifera of orbitolina and Trocholina are plentifully

seen in these facies. The upper boundary of the sequence II, as described in the well No.1, due to existence of laterite is of the kind of SB<sub>1</sub> and is located at the base of Ahmadi shales. The sequence III has a thickness of 24m that is located in Ahmadi shale. The TST group of facies in this sequence have a thickness of 6m and are composed of open sea facies. Also in these group of facies, the Rotalla (from the Index fossils of the Ilam Formation) have been seen. The surface of maximum transgression in this sequence is located at the 6<sup>th</sup> meter of the base of the Ahmadi shale. The HST group of facies have a thickness of 20m and are marsh facies. The upper boundary of sequence III, due to the disconformity between cenomanian and toronian is of the kind of SB<sub>1</sub>. (Fig 5)

### **The results**

On the basis of sequence Stratigraphy Studies of the Kazhdomy and Sarvak formations, three Sedimentary sequence cycles of their order for the deposits of these two Formation are recognized which are composed of the sequence I with the age of early Albian which includes the lower and middle Kazhdomy, sequence II with the age of late Albian early cenomanian, which comprises from the top of Kazhdomy Fm. To the top of Maddud member of the Sarvak Fm., sequence III with age of late cenomanian in the Ahmadi member of Sarvak Fm. The Top boundary of sarvak is distinct by erosional surface and long time gap on it, because the paleontological Studies indicate that the age of sarvak Fm. is possibly up to the end of cenomanian and abruptly is overlaid by Ilam Fm. with the age of santonian, which confirms the time gap (Stratigraphic gap) from cenomanian to Paleocene. The existence of such a great disconformity indicates outcoming of the platform due to tectonic movements, and as a result movement of salt (salt Domes) or faulting or reactivation of basement faults.

### **References**

- Afroz, A. 1992: The final report of well No.3 of South pars gas field in Persian Gulf (management of Exploration).
- Cant, D., and Ocanell, Sh., 1998, Applied Clastic Sequence Stratigraphy, Belfield Resources, 210 p
- Emery D., and Meyers, K., 1996, Sequence Stratigraphy, Blackwell Science, 279 p.
- Insalaco, E., Virgone, A., Courme, B., Gaillot, J., Kamali, M., Moallemi, A., Lotfpour, M., Monibi, S., 2006. Upper Dalan Member and Kangan Formation between the Zagros Mountains and offshore Fars, Iran: depositional system, biostratigraphy and stratigraphic architecture. GeoArabia 11, No. 2, Gulf PetroLink, Bahrain, pp 75-176.
- Lasemy, I. 2000: The facies, sedimentary environments and sequence stratigraphy of the upper Precambrian and Paleozoic of Iran, The Geological survey of Iran.
- Mohammad khane, H. 1993: The sedimentary environments and sequence stratigraphy of Fahlian Fm. In the Rag sefid and khonriz oil fields in southern part of the Dezful Embayment
- Morsal nejad, D. 2006: The sedimentary environments and sequence stratigraphy of Sarvak Fm. in Anaran (Lurestan) MSc Thesis.
- Naderi khojin, M., 1994: Paleontology study of the Kazhdomy Fm. In the South pars gas field (Tehran University)

Najmabady.S 1992: The completion Report of The well No.1 of the South pars gas field in Persian Gulf (management of Exploration).

Tabatabaei. P 1994: the facies, sedimenta environments and Stratigraphy of Bozpar Anticlin(S.W of Iran) the MSc Thesis.

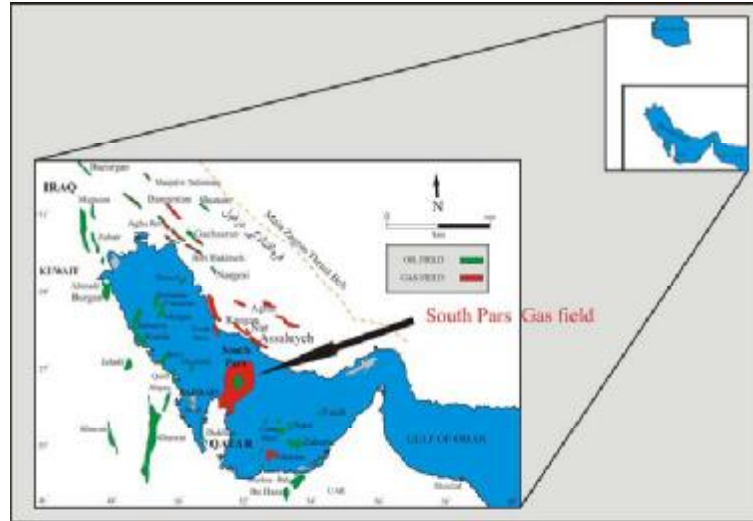


Fig1, shows the map of the South Pars in the vicinity of the other oil and gas Fields of Persian Gulf and Dezful Embaymen.

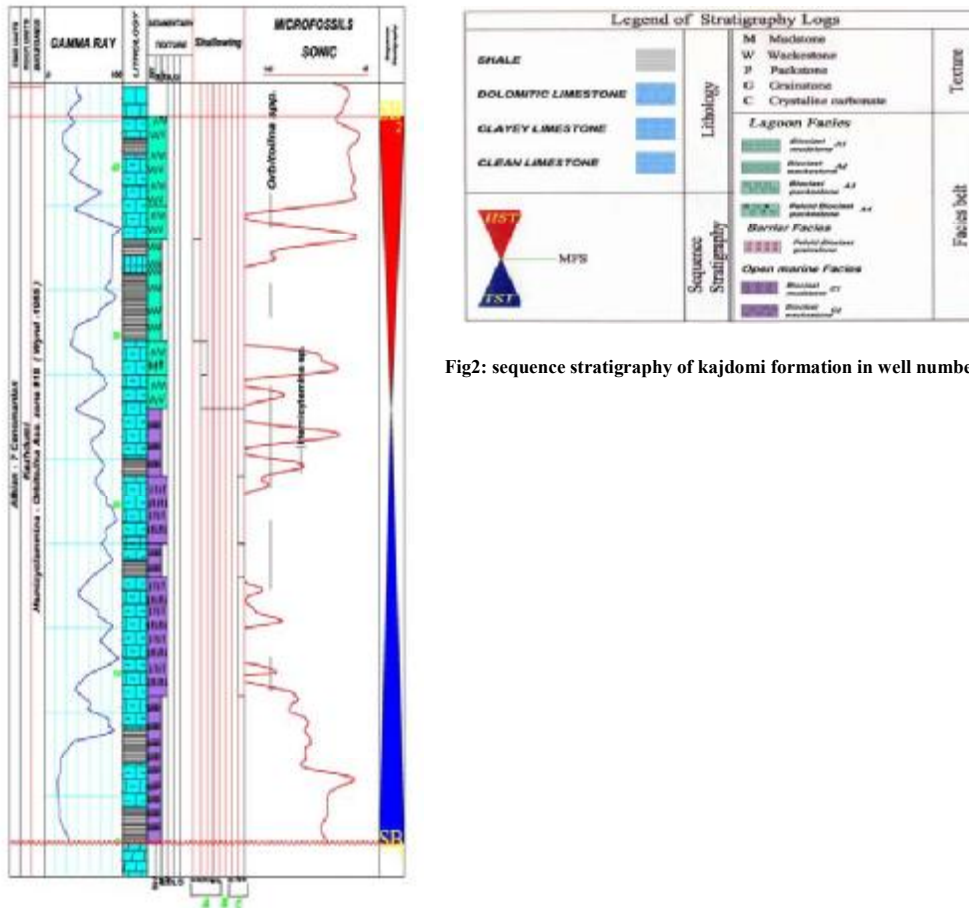


Fig2: sequence stratigraphy of kajdomi formation in well number 1

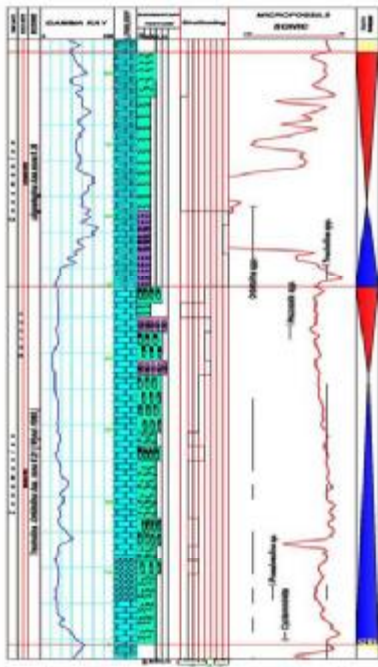


Fig3: sequence stratigraphy of sarvak formation in well number 1

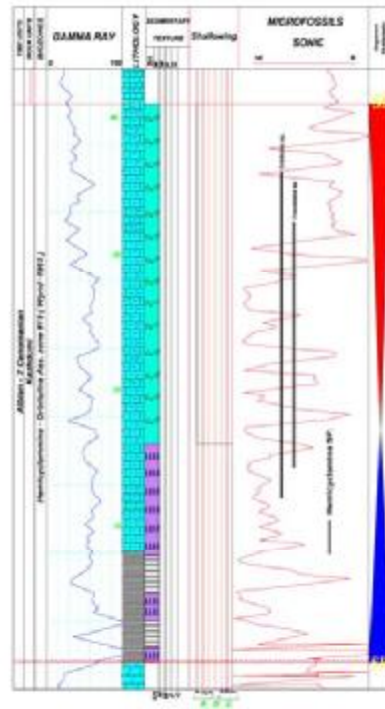


Fig4: sequence stratigraphy of sarvak formation in well number 3