Elimination of Pabdeh and Kazhdumi as source rocks for Asmari-Jahrum and Bangestan formations in Bandar Abbas hinterland and Eastern part of Persian Gulf

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Abstract

So far the source rocks for Asmari –Jahrum and Bangestan reservoirs are unknown and with correlation to SW-IRAN Pabdeh-Gurpi and Kazhdumi were nominated to be the major source rocks for the mentioned reservoir. This research an end over to accept or reject the proposal. Organic geochemical studies have been carried out to assess the qualities of Pabdeh and Kazhdumi formations penetrated by three wells (Suru-1,Sarkhun-1,Tusan-2) in the Hormuz strait(Fig.1).The Hormuz strait is located in Bandar Abbas hinterland. The samples from the Kazhdumi formation interval are rated as fair to poor quality source rock based on TOC contents of 0/12 to 0.93 wt.% and S2 yields of 0.21 to 3.81 mg/g Rock. The samples from the Pabdeh Formation interval are rated as good quality source rock based on TOC contents of 0.49 to 3.36 and S2 contents of 0.16 to 15.55 but is generally immature for hydrocarbon generation based on Tmax and vitrinite reflectance (Fig.2). Within most of the well sections, source rock potential tends to increase towards the top of the formation .1D Basin modeling indicates that this interval in this area does not reach sufficient maturity for hydrocarbon generation in this depth and reaches.

1.Introduction

In order to achievement the mentioned objectives the Rock-Eval pyrolysis is the most widely used method for screening the petroleum generation potential and thermal maturity of organic rich rocks (Hunt, 1979).In this study this method is intended as a analysis of the organic matter in Hormuz strait.

More complete information on the hydrocarbon potential in this study would be obtained by combining the pyrolysis data with kerogen elemental composition analysis, vitrinite reflectance and Basin modeling by (Pars Basin Modeler) PBM software. In this study organic geochemical have been carried out by cutting samples of three wells (Sarkhun-1(SA-1), Tusan-2(TU-2),Hormuz-1(HA-1))(Fig.1).We do so using rock-Eval analysis results.

2.Geological setting

The Zagros Orogenic Belt of Iran is one of the most prolific petroliferous areas accounting for approx. 12% of proven global reserves. An extensive geochemical database was assembled which allowed the regional distribution and thickness of source units to be established (Bordenave and Nili, 1973; Burwood1978). The stratigraphic succession on the Arabian Plate, of which the Persian Gulf and the Strait of Hormuz form a part, is very strongly influenced by the interplay of plate tectonic events, climatic variations and eustacy. This has, in turn, had an impact on the play types and hydrocarbon

distribution. Pabdeh Formation is argillaceous sedimentation continued through Paleocene and Eocene time in the Dezful Embayment and in Fars, and until the end of the Oligocene in Lurestan.

Kazhdumi Formation at the end of Aptian time the Khami limestones were transgressed by marls and argillaceous limestones of the Kazhdumi Formation. (Bordenave, 1990). (Fig 1).

3. Method of study

Rock- Eval analysis is standard screening technique used for evaluating the source rock potential of a sedimentary basin(Lafargue., 1998). All samples were analyzed for total organic carbon (TOC) by means of Rock-Eval 6 instrument. An approximately 70 mg samples of pulverized whole rock is placed in the pyrolysis oven, which has nitrogen atmosphere at is temperature of 300 °C ;after two minutes the temperature is increased to 650 oC at arate of 25 oC/min(Behar et al.,2001;Lafargue et al.,1998;Fpwler et al.,2005)

4. Results and Discussion

4.1.Pabdeh Formation

The Rock- Eval pyrolysis results of samples from Pabdeh Formation in studied wells shows that seveny percent of the samples have TOC values >0.5 wt. %, the minimum limit for hydrocarbon generation. TOC contents ranged from 0.49 to 3.36 wt. %, indicating that in it is fair to very good source rock potential (Fig.2c). Small amounts of S1 and S2 indicating that in terms of quantity, it is fair to poor source rock. In term of quantity , Hydrogen indices (HI) are generally between 75 to 584(average 290) mgHC/gTOC , indicate that the kerogens comprise mixtures of oil and gas-prone material. Plots on the HI vs Tmax diagram of samples from the three wells in the Hormuz area, indicate organic matters that are predominantly of Type II& III kerogen (Fig.2d).Measured mean vitrinite reflectance and Tmax values suggest that the interval is immature for oil generation.(Fig.2 a and b)

4.2.Kazhihnni Formations

Samples from the Kazhdumi Formation interval are rated as very poor to poor quality source rocks, based on TOC contents of 0.15 to 0.93 % and S2 yields of 0.21 to 3.81 mgHC/*gRock* (Figure2c). Hydrogen indices ranging from 66 to 594 for the sample indicate that the interval contains oil and gas-prone kerogen.

The measured mean vitrinite reflectance values suggest that the interval is immature to early mature for oil generation. Rock-Eval Tmax values are in reasonable accordance with the levels of maturity indicated by vitrinite reflectance data, with the highest values recorded (438°C) suggesting that the interval is no more than early mature.

Thirteen picked claystone samples from the Kazhdumi Formation. The claystones had TOC contents and S2 yields indicate that the claystones from the upper part of the interval have no significant source rock potential, whereas those from the lower part o f the interval have poor to fair source rock potential.

In the Hormuz d-1 (HD-1) S2 in this samples is greater than S1,thus Rock -Eval results indicated that samples had high contents of free hydrocarbons, and subsequent extraction and confined that these samples had also been affected by oil-based mud contamination.

5. Conclusion

Pabdeh and Kazhdumi formations is recognized as a potential source rock in other part of Iran but in this area as fair to poor quality and immature and gas prone
quantity source rock based on TOC, Tmax, RO%. Where present in the analysed well sections, the Pabdeh Formation is generally immature for hydrocarbon generation, although basin modelling indicates that the interval does reach sufficient maturity for hydrocarbon generation in the deeper parts of the study area(Stat oil, 2003)
A corresponding plot on the HI–Tmax diagram (Peters,1986) indicates an entirely gas generative potential for the source rocks and demonstrates that the kerogen type mostly includes Type II/III.(Fig.2d)
Previous works haven shown that Khanehkat Formation as possible source rock for Bangesten reservoir of Suru-1 and Sarkhun-1 and some additional evidence from basin modeling also obtained gas to source correlation require. Isotopic studies which have not done yet.

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Figures

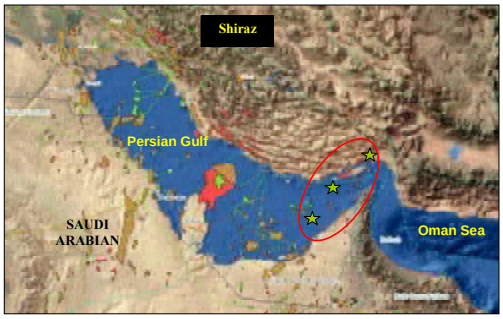

Figure 1:Location of study well in Hormuz area

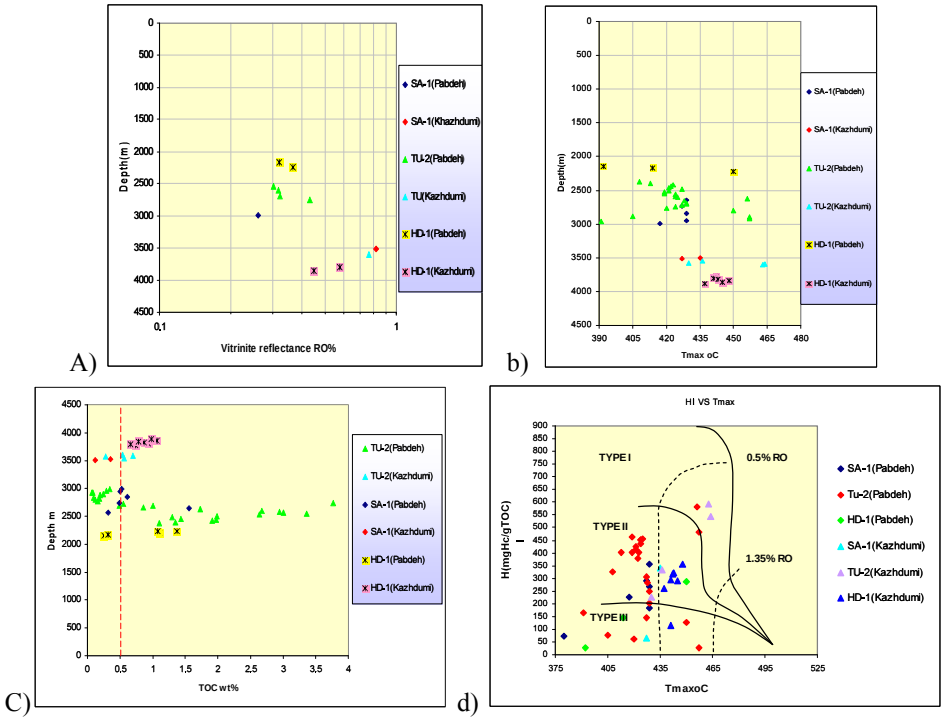

Fig.2.A) vitrinite reflectance against of depth b) Tmax against of depth c) TOC against of depth d) Tmax against of HI