

Discussion:

The wells W-A, C, D, E, F & G are drilled on cross trend highs and are gas bearing. Wells W-O, H, L, S & R are drilled on lows and are dry. From fence diagram and well data it is observed that hydrocarbon bearing sands in Olpad field are distributed in TS1, TS2, and TS3 units of Tarakesvar Formation, whereas TS4 and TS5 are devoid of hydrocarbons. Wells W-B, E and I have good reservoir development in TS1 and TS2 units. TS2 sand is developed in wells W-A, B, C, E, H and I and is gas bearing in wells, W-B, C and E. The sand is shaled out southwards in the wells W-L and J. The sand reappears in the well W-D and is gas bearing. Further South the sand encountered in well W-Q is oil bearing. TS3 unit is developed only in the area of the wells W-C, H, and W-R. It is shaled out towards N-E in the wells W-E, B and A. TS3 is gas bearing in the well W-C. It is thus evident that the individual sand units of Tarakesvar Formation are discretely distributed in the area. To precisely know the extension of the reservoir sand, the model based seismic inversion was attempted on seismic lines A-A', B-B', C-C', D-D', E-E', and F-F' passing through the drilled wells and the generated impedance sections were analyzed. To understand the veracity of the inversion method and its application to delineate the extension of arenaceous units, the technique has been applied on a 2D seismic section AA' passing through known hydrocarbon bearing well WQ. The zone of interest at this well is Tarakesvar Formation which is having five sub-units TS1 and TS5. The very low range of impedance values exhibited on the acoustic impedance section at well W-Q shows that they correspond to the TS2 sand unit of Tarakesvar Formation. The very high range of impedance values depicted in dark value of impedance range are depicted in yellow and green blue color and the sand units with hydrocarbon are having yellow color. The range of color and its variation corresponds to the micro and gross variation of impedance, which further can be attributed to the heterogeneity of the medium. The same inference has been extended to the entire section and the presence of the arenaceous unit is envisaged. Similarly in the impedance section of F-F' (fig-6) the continuous and thick arenaceous unit of Babaguru Formation is conspicuous. Impedance section clearly shows the discontinuous sands in the lower part and fairly good continuity in the upper part of Tarakesvar Formation. The interpreted section is shown in figure 7. The computed impedance sections of D-D' and C-C' also exhibited similar range of impedance values for the sub units of Tarakesvar and Babaguru Formations. Therefore, the assessment made from the impedance sections to identify the sand units corroborates with the observations of the fence diagram and further the impedance sections have the advantage of extending the sands where well data is not available. When the range of impedance values corresponding to arenaceous section is identified then a further lower range discriminated by the color obviously has the potential bearing on the

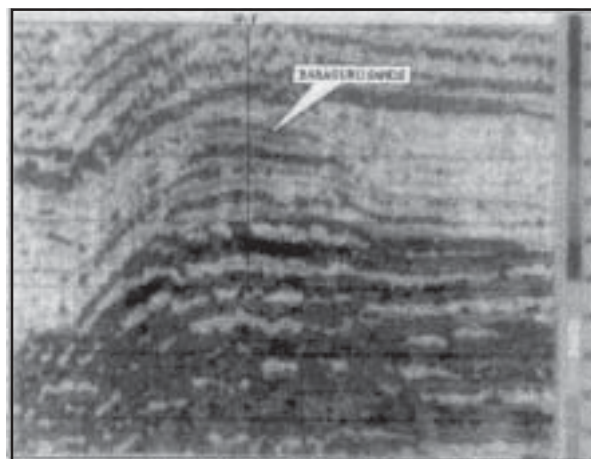


Fig. 6: Impedance section passing through well F. The range of impedance values depicted by green to yellow colour indicates gas sands.

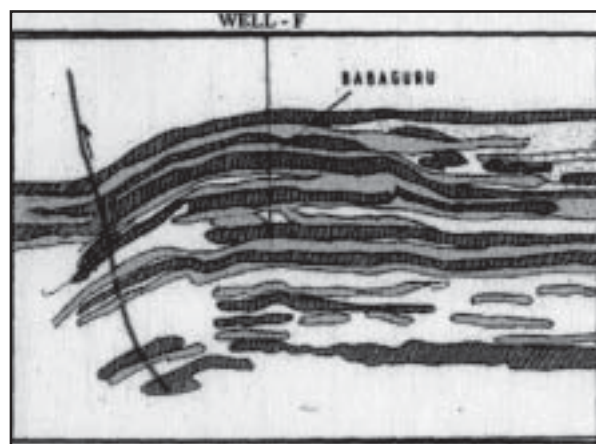


Fig. 7: Interpreted impedance section FF'

petrophysical character of the lithology. The impedance section of the line C-C' (fig8) passes close to three drilled wells out of which, two (W-F and G) are gas bearing in Babaguru sands. W-F is a blowout well and both the wells exhibited typically the lowest range of impedance value. The third well W-O is a dry well and has a different range of impedance values corresponding to Babaguru Formation. Therefore the discrimination of colors with respect to the variation in the range of impedance values would bring out an understanding of the heterogeneity of the medium. Thus the vertical lateral variations and their extensions and the areas where porous zones are present could be assessed from the acoustic impedance sections. The interpreted section of C-C' is shown in the figure 9.

The structure associated with horst configuration were already proved to be gas bearing on the crestal part of Olpad structure. Similar features on the plunging part of the structure where the presence of sands was supported by the inversion studies have been identified for future exploration.

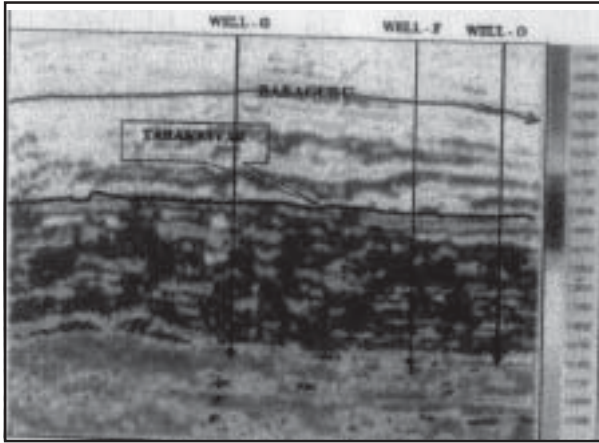


Fig.8: Impedance section passing through wells W-G, F and O. The third well O is dry and is clearly explained by the impedance section.

Conclusions

Seismic inversion analysis has been very helpful in finding out the microdetailed vertico-lateral extension of the lithological units in the study area which is having sparse well control. The inversion results corroborate well with the fence diagram also. The three lower units of Tarakesvar are found to be discrete in nature whereas the other two upper units are fairly continuous. Babaguru sands are continuous in the entire area and the reservoir facies development is expected to be much better as compared to other sands. This study has allowed to isolate the areas of better reservoir facies which may be prospective for hydrocarbon exploration.

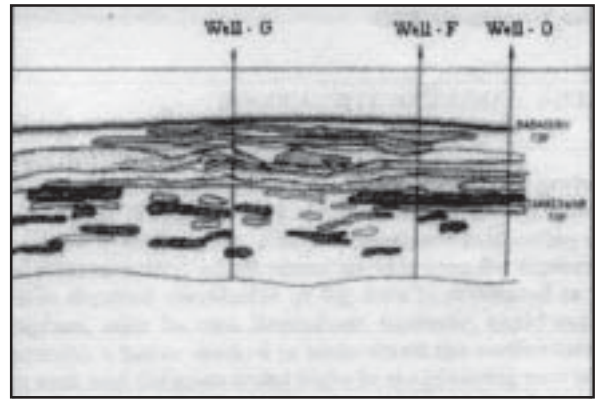


Fig.9 : Interpreted version of the impedance section C-C'.

Acknowledgements:

The authors are grateful to Mr. Y. B. Sinha, Director (Exploration) for permitting the publication of the paper in S.P.G. proceedings. The authors also express their gratitude to Mr. Daljit Singh, Basin Manager, Western Onshore, Baroda for his encouragement and help through the course of the study.

Reference :

A report on 'Micro-detailed correlation, dispersal pattern of reservoir facies and hydrocarbon distribution model in Olpad -Dandi area,' (Unpublished)