

Study of Generation Conditions of Lower Part of Productive Series in Case of Absheron Oil-Gas Bearing Region

Seyidov VM* and Khalilova LN

Department of Exploration Oil, Azerbaijan State Oil and Industrial University, 20, Azadlig av, Baku, AZ1010, Azerbaijan

Abstract

Determination of facial nature of reservoirs has the major value for exploration for oil and gas traps. It is known that lithological traps are mainly related to sand bodies, however not all sand bodies are necessarily traps. Therefore, it is important to perform detailed studies of generation of sand bodies within the limits of studied North-Absheron zone of uplifts in aim to outline most favorable areas for exploration of lithological traps and related to them oil and gas deposits.

The study was done by use of technique of logging facies, which allowed defining the genesis of Productive Series layers in Early Pliocene in North-Absheron zone of uplifts. Applied methodology of logging facies is quite effective since it makes possible to perform interpretation visually analyzing spontaneous polarization (SP) and gamma-log (GL) curves.

Keywords: Productive series (PS); Lithological and Facies analysis; Generation conditions; Lithological traps; Logging curves

Introduction

Most lithological hydrocarbon traps in North-Absheron zone of uplifts are related to sedimentation in deltas, delta channels, riverbeds and sand bars. For this reason, the identification of ancient fluvial-deltaic units is the important criteria indicating possibility of detection of large hydrocarbon accumulations [1-4]. In this respect, the major attention in this paper is devoted to study of facies and sedimentation of sand bodies and embracing them shaly deposits.

The study target is one of the structures in North-Absheron zone of uplifts – the West-Absheron structure studied by exploration drilling. Studies covered the lower part of Productive Series. According to seismic-stratigraphic analysis the West Absheron structure in the Early Pliocene was located within the limits of fluvial-deltaic system of Paleo-Volga [5]. The major target of our study included deposits of Pre Kirmaky and Kirmaky suites of Productive Series evaluated as hydrocarbon bearing deposits. The study also covered Post Kirmaky sand, Post Kirmaky shale and Fasile suites of Productive Series [6].

Means and Methods

By processing and interpretation of SP and GL curves we have defined type of facies, facies groups and facies units for lower portion and Fasile suite of Productive Series applying data acquired in wells West-Absheron X1 – West Absheron X6 (well numbers are conditional). To evaluate conditions under which facies were generated and sedimentation environment, by GL and SP diagrams drawn for wells West Absheron X1 – West Absheron X6 we have performed correlation of similar facies groups defined earlier (Figures 1-3). The analysis of drawn correlation profiles has been done.

Results

Figures 1-3 display correlation lines for Pre Kirmaky, Kirmaky, Post Kirmaky sand, Post Kirmaky shale and Fasila suite of PS in West-Absheron area. It can be seen from Figure 1 that on correlation line of deposits of Pre Kirmaky suite in West-Absheron it is traced only one type of facies of river channels and flood plains, which was generating under continental environment.

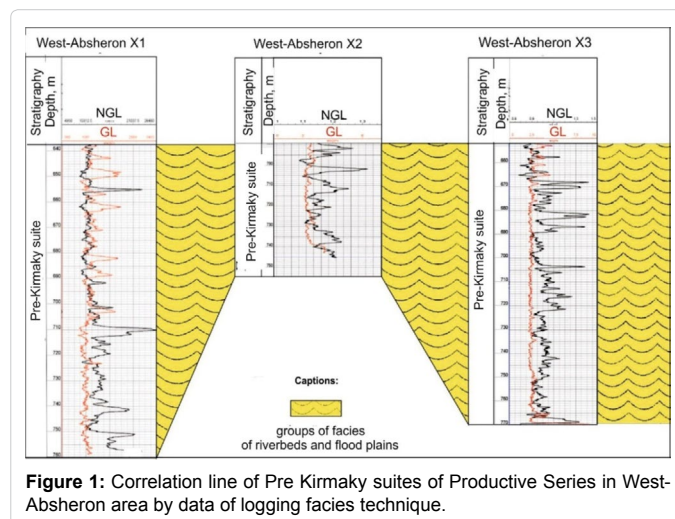


Figure 1: Correlation line of Pre Kirmaky suites of Productive Series in West-Absheron area by data of logging facies technique.

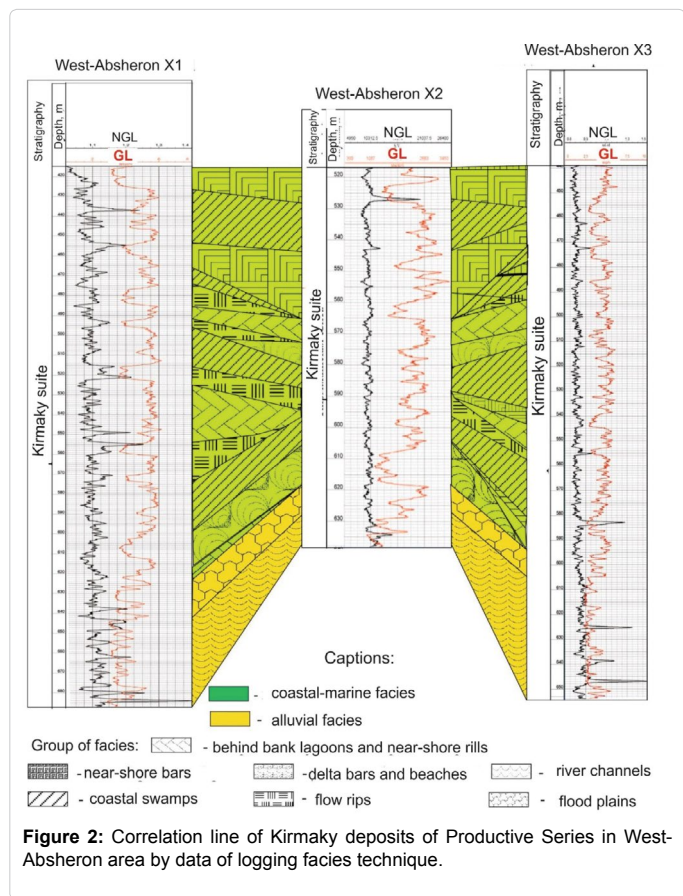
Analysis of correlation line of Kirmaky suite deposits in West-Absheron area by the data of logging facies technique displayed that foot of the suite is made of alluvial facies including facies of river channels and flood plains. Sedimentation environment here is continental. Alluvial deposits are substituted by deltaic facies in upward direction. These changes are observed within 420-620 m depths interval. The transient nature of sedimentation is characteristic for this interval. Towards the middle part of the section the facies of delta bars, rip flows, swamps and near shore bars are observed. To the top of the section

*Corresponding author: Seyidov VM, Department of Exploration Oil, Azerbaijan State Oil and Industrial University, 20, Azadlig av, Baku, AZ1010, Azerbaijan, Tel: +994503754897; E-mail: 1961sv@mail.ru

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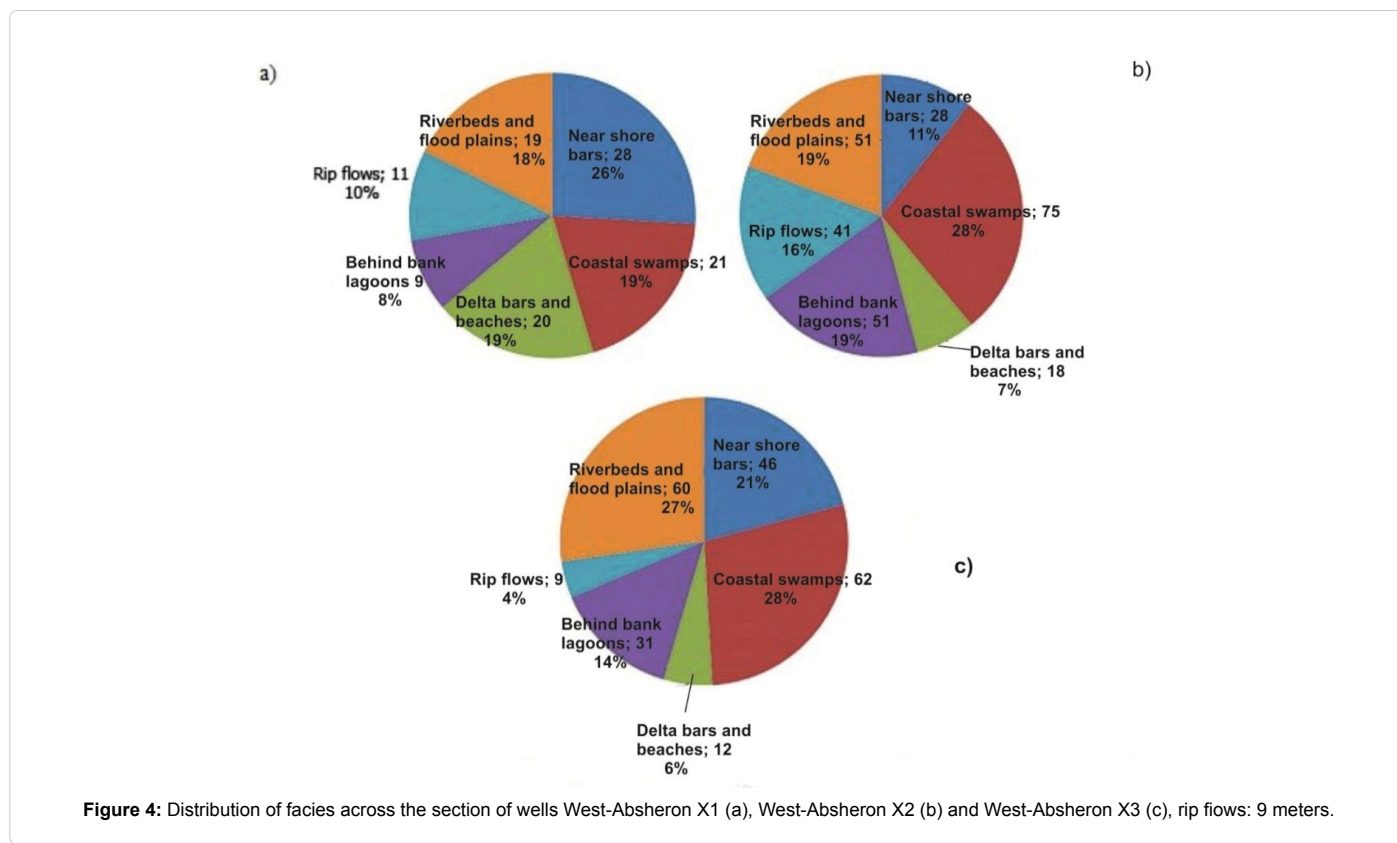
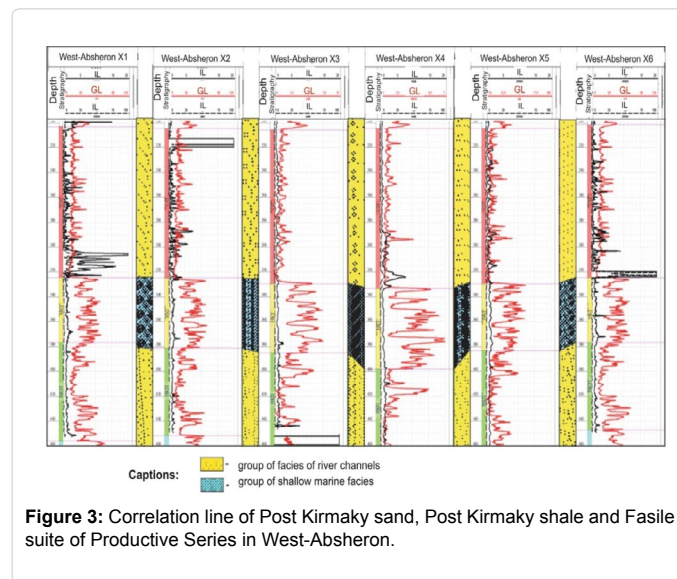
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at 520-560 m depth interval it can be seen that coastal swamps are replaced by near-shore bars related to underwater plain of deltaic unit.

Post Kirmaky suite on correlation line of deposits of Post Kirmaky sand, Post Kirmaky shale and Fasila in West-Absheron area is represented by facies of deltaic unit slope featured by transient environment of sedimentation. It is replaced by shallow marine facies in upward direction. This type of facies embraces the whole Post Kirmaky shale suite. Sedimentation nature here is marine. Above this group of facies we observe facies of river channels and flood plains,



Type of facies	Total thickness, m
Near- shore bars	28
Coastal swamps	21
Delta bar and beaches	20
Behind bank lagoons	9
Rip flows	11
River channels and flood plains	19

Table 1: Shows thicknesses of various types of facies in sections of wells West-Absheron X1, West-Absheron X2 and West-Absheron X3 and the correlation data.

Type of facies	Total thickness, m
Near- shore bars	28
Coastal swamps	75
Delta bar and beaches	18
Behind bank lagoons	51
Rip flows	41
River channels and flood plains	51

Table 2: Shows thicknesses of various types of facies in sections of wells West-Absheron X1, West-Absheron X2 and West-Absheron X3 and the correlation data.

Type of facies	Total thickness, m
Near-shore bars	46
Coastal swamps	62
Delta bar and beaches	12
Behind bank lagoons	31
Rip flows	9
River channels and flood plains	60

Table 3: Shows thicknesses of various types of facies in sections of wells West-Absheron X1, West-Absheron X2 and West-Absheron X3 and the correlation data.

which embrace the whole Fasila suite. Sedimentation environment is continental. Thus, in the lower part of Productive Series we have outlined facies of transgressive-regressive deltaic units.

Figure 4 shows circular diagrams of distribution of various types of facies across the section of wells West Absheron X1-X3. Analysis displayed that in the section of Kirmaky suite the near shore facies and facies of river channels are dominating. Delta bars and rip flows have the lowest thickness. Hydrocarbon bearing reservoirs have been identified in all of these four types of facies (Tables 1-3).

Summary

-Pre Kirmaky and Kirmaky suite of Productive Series with domination of near-shore bar and river channel facies are hydrocarbon bearing deposits in areas of West-Absheron.

-Kirmaky suite made of facies of near-shore bars, coastal swamps, delta bars, behind bank lagoons, river channels, etc. belongs to alluvial-deltaic sediments.

-Pre Kirmaky suite made of facies of river channels and flood plains belong to pure alluvial sediments;

-Marine sediments involve Post Kirmaky shale suite, made of shallow marine facies.

-Within the lower portion of Productive Series the facies of transgressive deltaic units are dominating.

-Total thickness of facies of near-shore and delta bars, river channels and rip flows with identified oil and gas reservoirs constitutes 58-73% of the total thickness of Kirmaky suite. The major part of oil-gas bearing layers in this suite belongs to facies of river channels and near-shore bars. This means that major accumulations of oil and gas are attributed to deposits of alluvial and deltaic genesis.

When searching for traps of oil and gas, the establishment of the facial nature of the collectors is of paramount importance. It is known that lithological traps are mainly associated with sand bodies, but not all sand bodies can be them. This circumstance forces us to make a detailed study of the conditions for the formation of sand bodies within the prospective area of the Severo-Absheron uplift zone in order to choose among them the most promising ones in search of lithological traps and, possibly, associated oil and gas deposits.

The method of logging facies was applied in the work, which made it possible to determine the genesis of the strata of the productive strata of the early Pliocene in the North-Absheron uplift zone. The applied technique of logging facies is qualitative, as it allows for interpretation by visually analyzing the shape of the spontaneous polarization (PS) and gamma-ray logging (GK) curves.

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