



## Well logs evaluation to analyze petrophysical properties in the pre salt section well 1-BRSA-1146-RJS, Atapu Field, Santos Basin.

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### Abstract

The pre-salt carbonates reservoirs present many challenges for their exploitation due to heterogeneities and complexities. Therefore, the petrophysical evaluation is an important step to characterize the reservoirs to reduce risks associated with hydrocarbon exploitation. The Santos Basin is considered as the largest offshore sedimentary basin in production in Brazil and is increasingly achieving recognition due to high productivity. In the pre-salt section of Santos Basin, the stratigraphic successions of interest as reservoirs are constituted by the coquinas in Itapema Formation (Barremian/Aptian) and shales and spherulites in Barra Velha Formation (Aptian). As these rock facies presents extremely complex permo-porous properties and depositional characteristics, the study of its petrophysics parameters, alongside with well reports and geophysical well logs helps to understand the reservoir behavior. The focus of this work is to evaluate the 1-BRSA-1146-RJS well of the Atapu Field, Santos Basin, to study the permo-porous characteristics presented in Barra Velha and Itapema Formations. The petrophysics parameters such as clay volume and water saturation were calculated using the Gamma Ray Index (IGR) and Archie equation, respectively, and the conventional curves obtained from the well logs, were used as basis for the lithology interpretation. This integration allowed to classify zones which may or not present potential hydrocarbon accumulation: ITF-1 (Itapema Fm) and BVF-1, BVF-2 and BVF-3 (Barra Velha Fm). The caliper presented good response and does not show any important alteration. ITF-1 shows a homogenous behavior in well logs responses and the lithology is composed mostly by coquinas. The well logs show low Gamma Ray (GR) values, high amount of free fluids and NMR effective porosity (PHIE), high values for permeability Timor-Coates (KTIM) and resistivity. Between 5246m to 5256m is observed high values of silica that can be correlated to a more closed porosity system which is described in the well reports. The Barra Velha Fm exhibits a more heterogeneous behavior and it is composed mostly by microbial limestones recurrently silicified with occasionally organic matter. In BVF-1 presents good reservoir properties with low GR values, high amount of free fluids, PHIE and total porosity (PHIT), increase of resistivity, high values for shear transit time (DTSM) which can indicate a potential productive zone. Then, in BVF-2 it is observed a very contrasting behavior with lightly decreases of KTIM, free fluids, resistivity, DTSM and increase of water saturation. Finally, BVF-3 it is observed a non-reservoir behavior with high GR values and water saturation, decrease of resistivity, high density (RHOZ) which correlates to a slightly DTSM decrease that means low porosity property which increases wave propagation velocity consequently lowering transit time. The analyses of geophysical well logs allowed understanding the reservoir properties and identifying the potential productive zones. The Itapema Fm presents a cleaner formation than Barra Velha, despite the smaller interval and higher values of silica. In the Barra Velha Fm is also observed good reservoir properties but it's a more heterogeneous region with higher GR values due to intercalations with organic matter and consequently loss of porosity and permeability properties.

**KEYWORDS:** Petrophysics, Well logs, Santos Basin