

## **Reservoir Petrofacies of the Echinocyamus Formation (Talara Basin, Peru): an Approach for High-Resolution Reservoir Characterization**

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The Echinocyamus Formation comprises complex fluvial and deltaic reservoirs deposited during the Lower Eocene in the fore-arc Talara Basin (NW Peru). Detailed petrographic analysis performed with the Petroledge® system yielded crucial information on the main controls on the quality and heterogeneity of these reservoirs.

The sandstones are feldspathic litharenites, rich in andesitic volcanic rock fragments, low-grade meta-sedimentary and meta-volcanic rocks. Common diagenetic constituents include smectite, calcite, albite, quartz overgrowths, mud pseudomatrix, pyrite and titanium minerals. Zeolite and siderite occur only in fluvial sandstones.

Twelve reservoir petrofacies were defined by the combination of depositional structures, textures and primary composition with dominant diagenetic processes and products: Rims-Porous, Intraclastic, Conglomeratic, Overgrowths, Rims-Compacted, Zeolite-Calcite, Fine-Porous, Post-Comp-Calcite, Pre-Comp-Calcite, Smectite-Filled, Fine-Unsorted, and Fine-Compacted. These petrofacies are associated in different proportions in the fluvial and deltaic depositional domains.

Packing is normal to tight, and deformation of ductile grains into pseudomatrix is common. Intergranular porosity averages 7.5% in the fluvial and 4.6% in the deltaic sandstones. Grain dissolution porosity attains up to 8% in the fluvial and 10.3% in the deltaic. Intergranular cements reduce porosity and decrease permeability both in deltaic and fluvial intervals, especially in the petrofacies Rims-Compacted, Fine-Porous, and Smectite-Filled. This effect is stronger in the fluvial interval, where smectite is the main cement controlling permeability. Fluvial reservoirs always display higher porosity and permeability

than deltaic reservoirs and, within the latter, delta-plain deposits are relatively better than delta-front. Objectively-defined reservoir petrofacies were a significant and operational tool for understanding the heterogeneous distribution of quality within the extremely complex Echinocyamus reservoirs.