INTERPLAY OF DEPOSITIONAL AND DIAGENETIC CONTROLS ON SANDSTONE RESERVOIR QUALITY

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The correct determination of reservoir facies, i.e., lithofacies or groups of lithofacies with petrophysical significance, is essential for modeling and predicting performance of hydrocarbon, water and waste-disposal sandstone reservoirs. A common practice in reservoir characterization is to directly relate reservoir facies to depositional facies, using attributes as grain size, sorting, sedimentary structures and other primary features, hoping that the permeability structure will be similar to the depositional framework. Diagenesis, on this approach, is considered small-scale noise, which generates irregularities on the primary structure, but does not change its essential features.

Examples from different depositional enviroments in Brazilian onshore and offshore basins show, otherwise, that diagenesis can, more often than not, significantly affect the reservoir macrostructure. Relationships between depositional and diagenetic features are extensively documented in cores, logs, and using advanced techniques as probe permeametry and geostatistical modeling . The nature and relative intensity of these interactions result in important modifications on the reservoir structure, which should be taken into account for adequate reservoir characterization.

This paper discusses the effects of chlorite fringes in lacustrine deltaic sandstone reservoirs, carbonate and microquartz cements in marine turbiditic sandstones and infiltrated clays in fluvial sandstones. These and other examples found in Brazil and elsewhere suggest that is perfectly viable to improve reservoir models including macroscale effects of diagenesis, which are not irrelevant nor too difficult to determine as previously thought.