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Trapping Vs. Breaching Seals in Salt Basins: A Case History of Macaroni and Mt. Massive, Auger Basin, Gulf of Mexico

The complex interaction between salt and surrounding sediments makes risk assessment of any prospect or play concept a challenge. In the Tertiary-Quaternary salt basins of the Gulf of Mexico, compartmentalization is the primary factor in setting up traps capable of retaining hydrocarbons. Compartmentalization of geopressed units is created mainly by the stresses resulting from interaction between sediment load and salt tectonics.

Examination of salt emplacement and displacement history as they relate to the surrounding sediments may shed light on sealing integrity of potential hydrocarbon traps.

The back-bone of assessing entrapment and sealing capacity is predicting pore pressure in the shale beds with respect to the measurable pressure in the reservoir sand facies. Moreover, defining the fracture pressure envelope in relationship to the effective stress window of that reservoir allows one to estimate hydrocarbon column height in a trap (its retention capacity).

This paper presents a case study comparing two play prospects on the southern flank of the Auger Basin, a

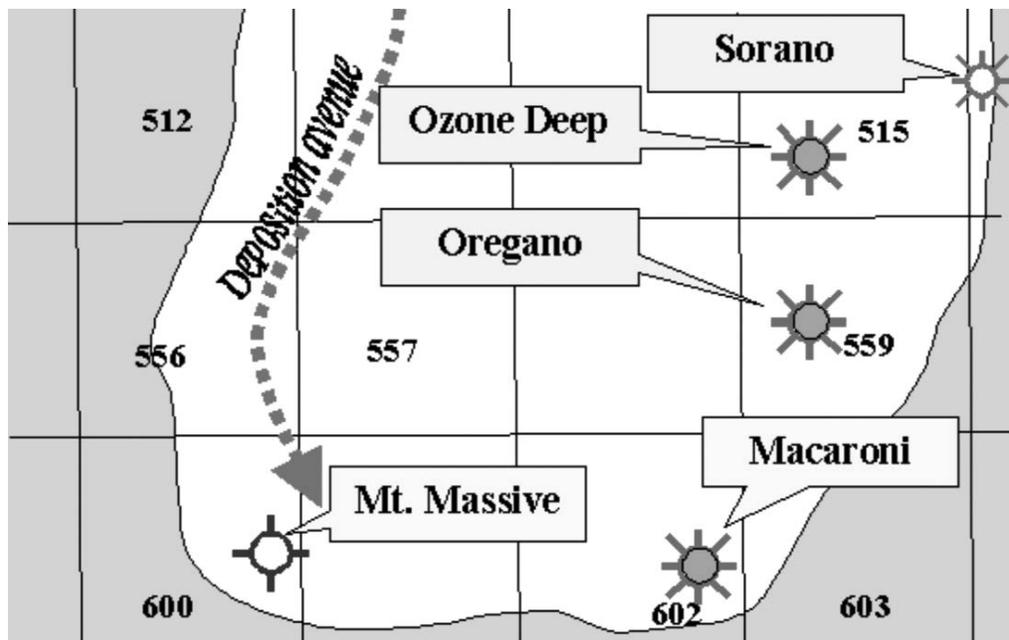
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highly prolific salt-withdrawal mini-basin in the deepwater of offshore Louisiana.

The Mt. Massive prospect (Garden Banks Block 600), located on the southwest side of Auger Basin, is separated from Macaroni Field (Garden Banks Block 602) by a trough. The plays share the same stratigraphic column, which thickens on the west side. Sediment feeder avenues for Mt. Massive on the

southern tier of Auger Basin were predicted to be in proximity to the western side of the

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A sketch map shows the salt boundary, depositional avenue, fields, and the location of Mt. Massive in relation to Macaroni Field.

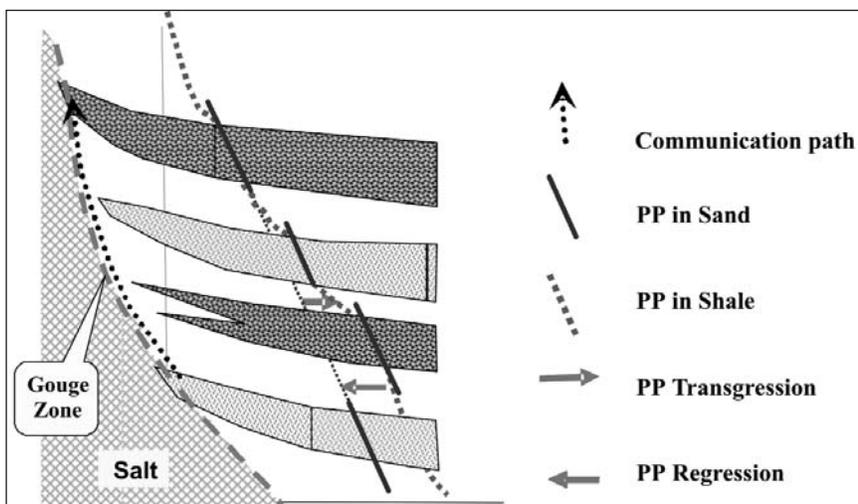
basin prior to salt piercing. Prior to testing the Mt. Massive prospect, it was compared with Macaroni Field and deemed a low-risk prospect. Once drilled, however, the results of the Garden Banks 600 #1 well were disappointing, as most of the target objectives were revealed to be wet sands, and the well was plugged and abandoned.

A post-drilling comparison of geopressure and sealing capacity shows that the Macaroni Field is in a different pressure compartment system than Mt. Massive. A ridge of salt at the flank of the field may offer an explanation for the effective seals at the targeted strata and resulting entrapment of commercial hydrocarbons at Macaroni Field. On the other hand, at the Mt. Massive prospect, a salt wall that bounds the southwestern flank of the Auger Basin is responsible for the breached seal. ■

Biographical sketch

DR. SELIM SHAKER earned his PhD in geology in 1973 at Assuit University in Egypt. He retired from Phillips in 2000 after 20 years of service and established Geopressure Analysis Services (G.A.S.). In his 30+ years of worldwide experience in the oil industry, his primary focus has been on the shelf and deepwater in the Gulf of Mexico. He has conducted several regional studies

and written numerous papers on the importance of geopressure compartmentalization with regard to play concepts, leads and prospect assessments.



A geopressure model shows PP transgression where reservoir type beds (sand) pinch out before they reach the salt gouge zone. On the other hand, regression (breach) takes place where salt pierces the reservoir section.

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