Depositional setting of the Cretaceous Guadalupe Formation, Colombia – Nexen's partnership in the Guando Oil Field

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ABSTRACT

Nexen Inc. is partner with Petrobras and Ecopetrol in the Guando oil field in the Boqueron Block, Upper Magdalena Valley of Colombia. The field, operated by Petrobras, has an estimated OIP of 350 mmbbls, and is currently producing more than 7000 bopd from the Cretaceous Lower Guadalupe Formation. The Lower Guadalupe Formation is ~550 ft thick, with high net-to-gross ratio. The Guando field is situated in the western foothills of the Eastern Cordillera as a subthrust play beneath the Boqueron fault, where the older Villeta Formation has been thrust over Guadalupe sands, sealing the reservoir. The trap is a west-dipping monocline truncated by the Boqueron fault. Source rock is the Cretaceous Villeta Formation with maximum burial and hydrocarbon generation occurring in deeper synclines.

Detailed core analysis shows that the reservoir is a complex interfingering of transgressive and regressive shallow-marine deposits resulting from fluctuating relative sea levels. Field-wide bounding surfaces include wave-ravinement surfaces, tidal-ravinement surfaces, sequence boundaries; firm grounds revealed by the *Glossifungites* ichnofacies, and flooding surfaces. Highstand progradational environments include proximal and distal shelf deposits as well as distal offshore marine shales. Highstand deposits are pervasively cemented with syndepositional phosphate. Transgressive environments include tidal-inlet deposits and an estuary-complex facies association; one tidal inlet complex is dominated by micritic carbonate and oyster deposits with minor siliciclastic sandstone facies association. No nonmarine strata are preserved. The best reservoirs occur in transgressive tidal inlet and incised valley facies with porosity exceeding 25 % and permeability of up to 100's of mD. PSDM processing of the 3D seismic allowed recognition of basal incised valley deposits as well as tear faults. Reservoir permeability is enhanced by a complex naturally-occurring fracture system.