

Case Study of Optimizing Oil Recoveries and Parent-Child Relationships in the Gallup Sandstone, San Juan Basin, New Mexico

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Abstract

Active horizontal development in the San Juan Basin provides valuable information about how older (parent) and newer (child) wells interact. The operator has performed a case study on the dynamics of reservoir pressure and impacts of operating strategies on horizontal Gallup Sandstone oil production. Operator seeks to validate development techniques to circumvent detrimental impact of offset depletion and consistently achieve forecast production. The Gallup Sandstone is an oil-rich, yet underdeveloped system. This study and ongoing work aim to maximize future oil production in the southern portion of the San Juan Basin.

A basin-wide petrophysical model was developed to quantitatively measure original-oil-in-place (OOIP). This carefully calibrated model dictates type curve risking based on observed recovery factors, while also informing well spacing, development plans and an assessment of parent well drainage. Operator drilled and completed 31 wells between 2019 and 2021 monitoring parent-child production and pressure data, comparing well outcomes to OOIP-based expectations. Using data from existing parent/child interactions, pressure and production rates were analyzed to develop correlations between parent well oil rates, casing pressures, and child well production.

Horizontal Gallup Sandstone wells are high-rate oil producers with subnormal initial pressure. The impact of parent wells in the San Juan Basin can be avoided with thoughtful development practices and pressure management during flowback. Operator found that 12-month oil production from child wells improves by up to 101% when parent wells maintained at least 60% of their initial flowing bottomhole pressure. These results infer safe pressure ranges to maximize production from child well completions. Regional OOIP mapping contextualizes observed production results.

Recent observations on limiting initial oil rates to maximize reservoir pressure and preserve child well locations are applicable in many plays. In oil-rich reservoirs with subnormal pressure, novel approaches should be considered via collaboration between geology and engineering teams. With extremely competitive economics and a substantial resource of untapped oil reserves, the San Juan Basin will be a key Rockies oil producer and is well worth continued study. Outside the San Juan Basin, maximizing child well results is paramount for operators who seek to improve recoverable oil volumes. This study provides a platform for operators to reconsider pressure management and development strategies.

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