

Explaining Production - A Review of Unexpected Production During the Initial Appraisal of a Organic Rich Shale Play by Integrating Geology and Petrophysics with Production, Woodford Shale, USA

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Abstract

This paper presents a review of the integration of geologic and petrophysical interpretation explaining unpredicted production results. It was found that a subzone of the reservoir that had been labeled as a non-significant contributor to production is likely the dominant contributor. The Woodford shale play in the US Anadarko Basin has been a prolific producer, yielding mean EUR's of approximately 450 MBO in non-core regions. The core of the Woodford has been well developed with the gas rich 'Cana Field' in Canadian County, Oklahoma. Recently exploration of the oil rich-updip extent of the resource has found highly prospective, oil rich results. Despite having a petrophysical model calibrated to core in the play; production results have not met initial assessments of calculated oil in place after 28 horizontal wells have been brought online. There was no significant trend between OOIP estimates and production. In this study, Production results (initial 30 day average) were compared to petrophysical properties, stratigraphic thickness, facies variation, and lateral placement. The Woodford and overlying Osage Limestone formation were analyzed as isolated and commingled flow unit. The distinctive Woodford 'Chert' interval was also isolated and used for evaluation. Initial geologic work gave a misleading concept that Osage Thickness contributed to stronger production. This was found to be immaterial. The strongest correlation found was the relationship between the Woodford Chert interval's OOIP and production ($r = 0.81$). There was no notable correlation ($r = 0.20$) between the non-Chert Woodford OOIP volume to production. A general trend between maturities was also identified; slightly immature wells resulted in unpredictable results. This was very significant for the characterization of the Woodford Reservoir. Previous landing targets kept our drilling window away from the Woodford Chert zone. Future appraisal efforts and better understanding of the Woodford should account focus on characterization of the Chert zone. Additionally, more efforts should be made to understand the optimal completion design for the zone.