

An Overview of Challenges for Field Development in the South West Area of a Shallow Heavy Oil Reservoir in Kuwait: A Case Study

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ABSTRACT

This paper presents a case study with an overview of challenges for field development from geology, reservoir characterization and thermal testing perspective, in a shallow heavy oil reservoir located in North of Kuwait with depths ranging from ~450' in south west (SW) to relatively deeper ~800' TVD in the north. The reservoir is a large fluvial-deltaic system undergoing development in the north area using thermal recovery, piloting activities in the south. The most challenging area for development is SW as it features the shallowest depths (~ 450'TVD depth), lowest oil API (~11 to 13), highest oil viscosities (~1200-2500cp), lowest reservoir pressures (~50-80 psi) and thinnest sealing shale. We identified, reviewed and analyzed the critical reservoir data and information required for optimum development of the shallow SW reservoir area including data needed for reservoir characterization and mapping from appraisal wells. Another challenging aspect was establishing oil presence through coring, logging and fluid sampling in a highly unconsolidated formation. We completed assessment of resources with geological maps, reservoir modelling and subsequently production testing carried out in two wells. SW part is landward and having fluvial affinity. Fluid entrapment governs typically by stratigraphy rather than structural. Sand bodies are thick and is in the form of multi stacked channels. The reservoir sand is loose due to less compaction and lack of argillaceous matter. The sediments have undergone significant diagenetic alteration in the form of cementation which played a critical role in fluid entrapment. Reservoir charging was dependent on oil volume migrated upward, seal on top and permeable sand facies existed laterally. Cyclic Steam Stimulation production testing were carried out in two wells. First well produced successfully with moderate rate for relatively prolonged period while other well showed poorer performance. Development of this SW area is challenging due to shallowness/ low reservoir pressure, thin sealing shale and low API viscous oil. Initial thermal testing was carried out for information gathering. Innovative non-thermal development methods are needed in the SW area like tailor made horizontal wells and surfactant - polymer flooding.