

## **Horizontal Well Injector/Producer Pair Platong Field, Pattani Basin, Thailand**

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### **Abstract**

The 'X' Trend in the Pattani Basin of the Gulf of Thailand commenced oil production in 2001. The trend consists of a series of North-South oriented complexly faulted, extensional collapse grabens and tilted half grabens. The Miocene-age clastic reservoirs can be generally characterized as small-compartmentalized fluvial reservoirs (5-60 feet in thickness). The reservoir sands are composed of multiple channel sands that have locally complex vertical and areal stacking patterns. Connectivity within these reservoirs is impacted by potential barriers including both mud-filled abandoned channels and fault compartmentalization. Primary oil production is typically low due to an absence of aquifer support. Waterflooding has been implemented to improve hydrocarbon recovery and sustain field production.

The Alpha Platform was infilled in 2012 with two horizontal wells (Alpha-02H and Alpha-03H). The two infill horizontal wells targeted a >25' oil column in the 'X' reservoir sand which had a single existing deviated producer (Alpha-01) with low produced oil volumes due to water coning without gaslift capability. Both the Alpha-02H and Alpha-03H horizontal sections were placed at the same structural elevation below the gas cap in the upper portion of the oil leg. The wells were completed with three strings of casing and equipped with inflow control devices (ICD) and gas lift mandrels (GLM). Production commenced in February 2012 with combined oil production from the two horizontals ramping up to close to 4,000 bopd before both wells died with >90% water cut in February 2013. Alpha-03H was converted to a waterflood injector in August 2013 and commenced injection in the same month. After one month of maintaining a voidage replacement ratio (VRR) of 1:1 at Alpha-03H, the Alpha-02H GOR and water cut dropped substantially with oil production ramping up to close to 1,000 bopd. After waterflooding in December 2014 the reservoir, pressure had improved significantly. Within the two-year period of waterflooding, the Alpha-02H watered out and died. The horizontal waterflooding period has ended and the project's recovery factor (RF) is >30%. The Recovery Factor contribution from waterflood operations was >10%.

The reservoirs in the Gulf of Thailand are very complex and the reserves are quite marginal to develop. For these reasons, no dynamic modeling was attempted for this complexly faulted fluvial sand. A statistical model based on historical data was utilized to predict the benefit from both horizontal wells and waterflood operations. A comparison of current analogous reservoirs in the same trend with completed deviated injector/producer water floods shows about 50% higher recovery factor for this horizontal injector/producer waterflood.

The main lesson learned from utilizing horizontal wells as injectors is that it allows more flexibility in waterflood implementation and reservoir management strategy in complexly faulted reservoirs and potentially better connectivity leading to higher ultimate recovery factors. In order to capitalize on horizontal waterflood strategies it is necessary to fully utilize cross functional team work to identify target reservoirs from primary drilling programs and optimize production data by developing routine sampling collection methodologies.