
Humma Marrat Reservoir, Partitioned Neutral Zone (PNZ) Case Study – Part 3: Historical Look-back at Volumetric Uncertainty during Delineation and Development

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A consistent design of experiments (DoE) based evaluation process was used to assess the magnitude of OOIP uncertainty as well as the relative contributions from uncertainty sources as a function of the historical development of the Humma Marrat reservoir in the Partitioned Neutral Zone (PNZ). The Jurassic-age limestone and dolomite Humma Marrat reservoir was discovered in 1998 and currently has five producers. The two additional delineation wells and two horizontal sidetracks drilled in 2005 are included in the study. Within the Marrat interval, three stratigraphic layers, known informally as the A, C, and E zones, are known to produce significant oil. Based on limited PLT data, approximately 70-75% of the current oil production is from the lower-most E zone, 15-20% from the A zone, and the remainder from the C zone.

The uncertainty sources in the DoE-based evaluation were: (1) structure (time-to-depth conversion and seismic interpretation uncertainty); (2) original oil-water contact (OOWC); (3) porosity histogram, and; (4) oil saturation histogram. All uncertainties except structure were evaluated independently for the A, C, and E zones. High, mid, and low-case values were determined using only the well log, core, and seismic data available after each well was drilled or as significant new data became available (e.g. reprocessed seismic volume in mid-2004). The time period covered by this look-back is from 2000 to late 2005.

Analysis of the DoE-based results show that the statistically significant contributors to OOIP uncertainty varied considerably as wells were drilled. The study results suggest that consistent use of a quantitative uncertainty assessment tool such as DoE may reduce the number of delineation wells needed and significantly impact delineation well location decisions.
