

3-D Geomodeling of the Exhausted Volume of a Reservoir

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In mature oil fields that have undergone years of exploitation with potentially hundreds or thousands of wells drilled, continuing successful recovery of the remaining oil in place can benefit from knowledge of the reservoir volume that has been exploited. This knowledge can be accessed via the completion history that the reservoir has experienced over its production history. Estimating the 3-D exhaustion volume is complicated by both complex well trajectories (deviated and horizontal wells) and variable completion methods that have changed over time (slotted liners, cased and perforated completions, etc).

The goal of 3-D exhaustion-volume modeling is to reveal the regions of the reservoir, given a particular development scenario (e.g., 5-acre spacing), that have not been within the drainage radii of producing wells. Time dependencies can further complicate the analysis as water injectors and producers that have been converted to injectors come into play.

After the 3-D exhaustion volume has been modeled, it can be visualized with other 3-D geological and petrophysical models and production data to investigate production anomalies, locate bypassed pay, plan new wells, calculate interference volumes, and aid in making adjustments to waterflood patterns. Also, either through traditional 2-D or 3-D volumetrics analysis, remaining moveable oil can be determined within the un-exhausted regions of the reservoir.