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Application of Sequence Stratigraphic Approach to Integrated Field Management Processes: East Fault Block, Hawkins Field, Wood County, Texas

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An integrated sequence stratigraphic/engineering study of the Woodbine reservoir in the East Fault Block of the Hawkins Field was undertaken to optimize depletion and operating strategies and profitability of a unique immiscible gas drive/gravity drainage EOR project in a complex fluvially dominated reservoir system. Specific study objectives were to reduce future development drilling requirements, improve success and performance of all future well workovers, and maximize EOR reserves recovery through enhanced depletion and operating strategies. The study objectives were achieved through a two-phase iterative and integrated work process: 1) delineation and mapping of reservoir geometries and continuities, and 2) integration of production data with the sequence stratigraphic framework of the reservoir.

The 500-foot-thick Woodbine reservoir is divisible into two fluvially dominated sequence sets. The lower sequence set is characterized by sand-prone, high-frequency sequences marked by multistory, laterally extensive lowstand channels, overlain by thin, laterally discontinuous flood-plain mudstones of the transgressive systems tract. The sequences of the upper sequence set contain thinner, laterally discontinuous lowstand channels and are dominated by fine-grained floodplain deposits of the transgressive systems tract. The sequences display an overall retrogradational stacking arrangement marked by a progressive upward decrease in overall reservoir net/gross and lateral continuity and a corresponding increase in thickness and continuity of the flood-plain mudstone components.

Integration of production data with the sequence stratigraphic framework resulted in identification of complex flow unit geometries, and documentation of the movement of fluid contacts through tortuous reservoir pathways over time. Significant results were achieved in all aspects of production operations, including a major reduction in development drilling requirements and a dramatic increase in well workover success rates and performance. EOR project profitability has been increased by improved reserves recovery, accelerated oil production, and reduced operating costs.

Biographical Sketches

Dr. Rahmanian received his M.S. (1975) and Ph.D. (1979) degrees in Geology from the Colorado School of Mines and Pennsylvania State University, respectively. He was a professor of Geology at the University of Vermont until 1981 when he joined Exxon Production Research Company. At Exxon, Dr. Rahmanian has spent most of his career in development and worldwide application of sequence stratigraphic concepts and related reservoir characterization techniques to hydrocarbon exploration and production practices. As a Geological Associate, he is currently a member of the Field Studies Group of the Houston Production Organization, Exxon Company, U.S.A. and is involved in staff training and development of new hydrocarbon resources in the Onshore Texas Gulf of Mexico fields.

John M. Clayton received his M.S. degree in Geology from the University of Oklahoma in 1965. He joined Exxon the same year. In addition to a working background in several foreign countries, he has extensive experience in evaluation and development of onshore Texas Gulf of Mexico fields. As a Geological Associate, he is currently a member of the Field Studies Group of the Houston Production Organization, Exxon Company, U.S.A. ■