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A Data-Driven Workflow for Production Optimization and Efficient Reservoir Management Using a Multi-Disciplinary Approach

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ABSTRACT

An integrated Reservoir Management (RM) approach, combining various subsurface data, geological reservoir characterization and surface data, was applied to an unconsolidated sand reservoir. The goal of the study was to provide recommendations for production optimization by integrating data and analyses from various disciplines. Geological information, such as, sand distribution, depth structure, log character, rock property distribution, proximity to gas cap or water zone, and fluid-flow-barrier, were analyzed to characterize the reservoir zone contributing to well production. A critical review of existing perforation zones in terms of all the above factors was performed. Horizontal wells posed more complexity as they had to be compared to a few vertical wells in the proximity. Well placement, completions, cementing quality, sand production, artificial lift system and production performance were investigated along with classical reservoir engineering studies. In addition, the well history and reservoir characterization were reviewed in detail and integrated with the production analysis. This comprehensive analysis helped in providing holistic recommendations for optimizing production from individual wells. Risk analysis was performed to prioritize the recommendations based on the “impact vs. level of risk”. For example, in some wells, recommendations to add perforations were assigned a higher risk because of the questionable quality of the cement. Low risk options, such as, increasing bean size were recommended for immediate implementation to realize quick gain in production. Higher risk options are in the process of further evaluations to reduce uncertainty. Wells with significant gas production were recommended to be either shut-in to preserve reservoir energy or reduce the bean size to decrease the gas-oil-ratio. The production from one of the wells, X1, is increased by 20% by changing the bean size. A similar trend has also been observed on a different producer X2. Further production gain is expected as the other recommendations are implemented. In summary, a multi-disciplinary approach integrating geology, reservoir and production engineering, and surface facilities helped the operator to realize quick gain in production and optimize field performance through effective reservoir management.