
Geostatistical Modeling of Lower Cotton Valley Sands in the Carthage Field, Panola County, Texas, Optimizes Placement of Horizontal Wells

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ABSTRACT

Reservoir properties in Lower Cotton Valley sands are commonly modeled using summed properties over an entire reservoir interval. As a result, insufficient detail often misleads the industry's idea of reservoir quality, resulting in less than optimum well placement and limits the ability to predict well performance accurately. In this paper, the authors illustrate how to use existing log curves to determine high resolution properties laterally by using geostatistics and honoring all available control points. This method produces the reservoir description that is required to optimize well placement, particularly horizontal well placement, and to quantify their true economic benefit.

This study focuses upon the use of the approach mentioned above to locate the areas of better quality Cotton Valley reservoirs for horizontal well placement. The authors investigated the vertical and lateral variation of lower Cotton Valley sands, CV5 through CV6. CV5A is the uppermost reservoir underlying middle Cotton Valley sands. CV5 sands are stacked, upper shoreface barrier islands with associated back bay and lower shoreface facies. The incised CV6 sands vary in thickness and quality. CV6 lies directly beneath the CV5B and above the Bossier shale.

Detailed log analysis began the process. Geostatistical modeling of the final log interpretation was next. Vertical layering of the model using variogram analysis enabled a detailed representation of petrophysical property variations. Maps of rock quality (gas porosity, net pay to gross, and permeability) were made for each of the subdivisions within CV5 and CV6, revealing stratigraphic variations previously unseen in Cotton Valley studies. Reservoir pressure maps from simulation added information regarding remaining reserve potential.

Results showed that CV5 and CV6 contain stratigraphic variations that, when considered, help optimize horizontal well placement as already proven by some operators in the area. Indeed, the performance of some of these wells supports our conclusion that the detailed study of CV5 and CV6 will provide a source of additional Cotton Valley gas potential which can be maximized through horizontal drilling.