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Optimization of Infill Drilling in Naturally-Fractured Tight-Gas Reservoirs in the San Juan Basin

Multi-disciplinary reservoir characterization and simulation studies of naturally-fractured tight-gas reservoirs are being conducted to optimize infill drilling in the San Juan Basin. Production from tight-gas sandstone reservoirs of the Mesaverde and Dakotae formations in the San Juan Basin is highly dependent on natural fractures. Fractures not only enhance the overall permeability of these reservoirs, they also create significant permeability anisotropy and cause the drainage area around wells to be elliptical. Pilot studies with 80-acre well spacing have been analyzed in the main fairway of the basin where well productivity is high and away from the fairway along the basin margins where well productivity tends to be much lower. Included in the comprehensive analysis is reservoir characterization techniques, decline curve analysis, and flow simulation. Reservoir characterization studies indicate that regional fracture intensity is higher in the fairway and contributes to high well productivity. Well tests indicate a horizontal permeability anisotropy within the Mesaverde reservoirs of about 10:1. Reservoir simulation studies show that infill drilling on at least 80-acre well spacing is required to effectively produce these reservoirs and optimal infill well locations should be based on elliptical well drainage patterns. ''Sweet spot'' wells with high rates and cumulative production and significantly higher permeability anisotropy are also found in the fairway along NE-SW trends. These wells have been correlated to fracture swarms of closely spaced fractures associated with faults or flexures that were identified using horizon attributes derived from conventional P-wave 3-D seismic surveys.