Recent Permian Cube Pilots: Geological Reasons for Successes or Failures

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Abstract

While the Permian Basin continues to drive US oil production growth and is a hub of capital investment, recent headlines are shifting focus from the resource depth to how the reservoirs will be developed to meet lofty expectations, if they can be met at all. The challenge facing operators has evolved from optimizing individual well completions to designing large-scale, multi-well projects, a task that relies heavily on understanding complex underlying geology and its interaction with well spacing and completion intensity. A detailed geological analysis, in conjunction with a study of spacing and completion parameters, can highlight trends within major formations that help explain the varying degrees of success among major spacing pilots.We performed a multidisciplinary analysis on notable spacing pilot projects in the Permian, focusing on how the reservoir changes within and between densely developed pads. To understand nuanced reservoir characteristics, we created a 3D geo-cellular model of the basin using over 3,000 vertical well logs with petrophysical analysis alongside advanced predictive tools such as electrofacies. In addition, all horizontal wells analyzed have detailed completion, production and spacing data. With this robust dataset, we can provide explanations for why certain pilots succeeded or failed. Specifically, we analyzed geological parameters such as porosity and hydrocarbon pore volume, we identified potential fracture barriers between landing zones and we associated electrofacies to landing zones with high success rates. Integrating completion and production metrics provides insight into optimal development strategies within a given geologic environment. The Delaware Basin is particularly exposed to the risk of well performance degradation given its relatively high proportion of standalone wells drilled

to date. While these standalone wells generally have been economic and driven by leasehold considerations, they are also detrimental to future development of bounding locations, both within and across zones. Midland Basin operators drill more co-completed wells, which may lower productivity on a single-well basis but generally improve spacing unit economics. Using our multidisciplinary toolset, we identified regions where certain zones may be at risk of performance degradation due to depletion.