

Structural Control of the Point Pleasant Formation Deposition and Production

Devin R. Fitzgerald¹, M. Wes Casto², and Robert B. Thomas, Sr.¹

¹Eastern Mountain Fuel

²Casto Petroleum Engineering

ABSTRACT

Early drilling and production observations in the Point Pleasant formation in Ohio suggest that structural setting influences production. To test structural setting versus production, Point Pleasant horizontal completions (~800 wells) were categorized into five structural settings based on Trenton and shallow residual mapping. The settings are (1) Structural High, (2) Transitional High, (3) Platform, (4) Basinal, and (5) Deep Basin. Cumulative production in terms of thousand cubic feet gas equivalent (Mcf) were calculated and normalized to Mcf/1,000 feet of lateral. The structural setting with the highest cumulative production after 24 months is the Basinal setting which produced 12% more reserves than the average, and 30% more than the Structural High, the worst performing structural setting. The Structural High, Transitional High, and Deep Basin settings all fell below the average 24 month production. The advantage of the Basinal setting is that it is structurally low, low relief, and normally near a carbonate source. These geologic elements limit the energy and oxygen within the basin while providing the proper carbonate-shale ratio. The Basinal setting offers the best environment for the deposition and preservation of organic material. Existence of the organic beds can be observed in cores, geophysical logs, and formation imaging logs. The Platform setting is a structurally elevated area inside the Basinal setting and has the advantages of the Basinal setting. Comparison of Point Pleasant core total organic carbon values between Structural High, Transitional High, and Basinal wells within similar thermal maturity bands show that more organic material is preserved in the Basinal setting than in the Structural High and Transitional High settings. The Deep Basin setting has total organic carbon values similar to the Basinal setting, but has lower carbonate-shale ratios and higher clay content that constrain production. The quantity, thickness, continuity, and subsequent preservation of the organic beds appear to be critical components in the enhancement of Point Pleasant production. The preservation of organic material in the Point Pleasant shale is controlled by underlying basement structures and Knox paleotopography. The organic beds may also be the starting point for an interconnected horizontal porosity system that develops as thermal maturity progresses.