
Mineralogical, Geothermal, and Porosity Analysis of the Eagle Mills Formation, Newton County, Mississippi

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ABSTRACT

The Eagle Mills Formation is known to contain organic-rich lacustrine source rocks along the peripheral graben system of the northern Gulf of Mexico Basin. This formation is characterized by Late Triassic–Early Triassic aged fluvial to lacustrine facies and syn-rift sediments, which record the early development of the basin. To interpret the early development of the basin, the whole-rock mineralogy, geothermal gradient, porosity, and fluid saturation of the Eagle Mills Formation was determined to identify vertical heterogeneity and depth-dependent properties not previously known. Considering this, data on the Eagle Mills is sparse and not very well documented. However, cuttings data managed at the Mississippi Department of Environmental Quality (MDEQ), provide a narrow volume of material to analyze under natural thermal and geochemical conditions.

Based on X-ray powder diffraction (XRD) for a well located in Newton County, Mississippi, the Eagle Mills is primarily composed of detrital and diagenetic albite, calcite, muscovite, orthoclase, and quartz. Corrected bottom-hole-temperatures derived from log data show that the average geothermal gradient for the Eagle Mills in the well is 1.7°F/100 ft (28°C/km), and the subsurface temperature of the collected samples were 221.4, 221.5, and 221.75°F (105.2, 105.3, and 105.4°C) at 12,420, 12,430, and 12,440 ft (measured depth), respectively. Considering this, the thermal conditions in the Eagle Mills favor the formation of quartz and feldspar overgrowths, authigenic albite, calcite cements, the conversion of 2:1 clay minerals to muscovite, and maturation. With respect to reservoir development, petrophysical log analysis shows that the Eagle Mills increases in porosity, fluid saturation, and calcite concentration with depth. However, the secondary porosity window is narrow, and does not include the entire Eagle Mills interval. The results presented here supplement a larger geologic problem and can be used as a preliminary source for a more robust sedimentologic and geochemical study.

INTRODUCTION

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