DEPOSITIONAL MODEL FOR LIGNITE OCCURRENCE IN THE WILCOX GROUP OF SOUTH-CENTRAL MISSISSIPPI

Walter L. O'Niell[1]

ABSTRACT

The Wilcox Group has been mapped within an 18-county area of south-central Mississippi. Eleven lignite isopleth and sand facies maps have been prepared using data gathered from 715 oil well logs. Evaluation of net sand (sand isolith), maximum sand body (thickest individual sand body) and percent sand maps reveals sand body geometries indicative of fluvial and deltaic sedimentation.

A meanderbelt system dominated deposition of the Wilcox Group in northwest Mississippi. This fluvial system supplied sediment southward and westward into a principally deltaic environment. In 1948 Echols and Malkin named this lower Eocene delta complex the Holly Springs Delta System, but did not delineate its areal extent. Galloway mapped the lower Eocene of the western Gulf Coast in 1968, but, due to the large scale of his area of study, utilized only about 60 logs for the southwest part of Mississippi.

The fluvial and deltaic systems merge near the northern end of the study area. A linear, belt-like sand-body geometry is found in Madison and northern Warren and Hinds counties. This pattern is diagnostic of a fluvial environment. Southward, encompassing the remainder of the study area, the geometry becomes lobate and elongate, suggestive of highly constructive deltaic sedimentation.

Well log responses (log signatures) were also examined within the southern part of the study area. Distributary mouth bars, pro-delta muds, delta plain facies and other distinctly deltaic deposits are clearly visible. Along the northern end of the study area, log curves are characteristic of fluvial sedimentation.

An isophacous map, a structure contour map, and well log cross sections were also constructed from the subsurface data. The maps and cross sections aided in the identification of principal depositional centers and tectonic features and were used to assist correlation between well logs. Both the maps and cross sections support the conclusion that Wilcox environments of deposition in south-central Mississippi varied southward from fluvial to deltaic.

Variations occur between the upper and lower sections of the Wilcox Group. The lower Wilcox delta lobes are larger than those of the upper Wilcox and contain more lignite seams and greater sand percentages. Development of the upper Wilcox lobes may have been restrained by the influence of marine forces and/or a subdued sediment input. Nevertheless, the deltas within each of these sections were constructive and contain appreciable amounts of lignite.

As many as 44 individual Wilcox lignite seams have been recognized in the well logs examined. Lignite, developed from peat accumulations in swampy or marshy environments, forms as small isolated pods within interlobe embayments of constructive delta systems. More significant deposits originate from blanket peats which built up over foundered channels and delta lobes. Consequently, the most numerous, laterally continuous coal seams coincide with greater sand percentages (over 50%) and larger net amounts of sand. Any further, more detailed lignite exploration should concentrate on these "high-sand" areas.

The Wilcox lignite in south-central Mississippi is too deep to strip mine. The feasibility of in situ gasificaton of some of these seams is currently unkown. Considering these factors, a more important application of this study may be for petroleum exploration. Paleochannels and other sand bodies within the Wilcox Group are proven producers of both oil and gas. The maps constructed for south-central Mississippi, detailing a number of areas of abundant sand, could serve as a guide to potential exploration sites.

[1]Mississippi Mineral Resources Institute, University, MS 38677