The Geology of Coal-Bed Intervals from the East Midlands Coal Fields, UK

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Background Information

• Locations: Lodge House Mine, Derbyshire, UK
• In the coal mine there are 6 individual coal seams that occur within the Pennine Middle Coal Measures Formation and the lowest interval is what is being studied for this project.
• Rock samples are from the Carboniferous (Pennsylvanian) time period about 322 million years ago.
• Towards the beginning of the Carboniferous time period, the UK was thought to be more towards the equator and rains of a shallow water.
• Sea level fluctuated during this time period due to the melting of glaciers and with that came the development of older and deltas thus enabling the beginning formation of coal due to the water's receding.

Results

• The maximum TOC is 9.5% which occurs at 60 cm above the coal seam of the 3rd Waterlow. Refer to figure 4.
• The minimum TOC is 3.2% which occurs at 860 cm above the coal seam of the 3rd Waterlow. Refers to figure 4.
• The majority of the samples range from 4-10 TOC.
• The bottom 80 cm had the highest TOC (60%) or highest categorizing it as coal (organic shale and is almost 10 times higher than the rest of the section).
• The maximum TOC is 4.5% which occurs at 26 cm above the coal seam of the 2nd Waterlow. Refer to figure 4.
• The minimum TOC is 3.5% which occurs at 130 cm above the coal seam of the 2nd Waterlow. Refer to figure 4.
• The maximum clay/silt is 90% which occurs at 300 cm above the coal seam. Refer to figure 4.
• The minimum clay/silt is 41.8% which occurs at 520 cm above the coal seam. Refer to figure 6.
• The average distribution of fine-grained sand is approximately 20% by volume.

Field Interpretations

• Field observations such as ripplecross laminations, wave bedding, wave ripples, and lamination indicate that this interval represents a lake and progression of a lake-delta.
• Refer to the section on environmental interpretations.
• Field interpretations were not part of my study but are part of the larger study. It is possible to connect the field observations with the lab work I completed.

Discussion

• The TOC content showed there was not a gradual transition from a swamp environment to a lake environment. Refer to figures 4 and 7.
• There was a rapid change from an environment with low oxygen that preserved organic material to a more oxygenated lake with more sediment input of silt/clay.
• The cause of this rapid transition could be due to the process of avulsion and/or sea level change.
• Grain size distribution supports the idea of a proximal deltaic lacustrine transition. Refer to figures 6 and 7.
• This is demonstrated by the largest percentage of clay/silt present above the 3rd and 2nd Waterlow coal seams and are described as a distal deltaic delta.
• The transition into the proximal lacustrine delta is demonstrated by the containing of clay/silt to fine sand.

References

• Davies-Vollum, K.S. Manuscript Great Laramie delta deposits and their effects on coal mining in a surface mine in Derbyshire, England.