

Chemical Variation of Feed Coal and Coal Combustion Products from an Indiana Power Plant Utilizing Low Sulfur Powder River Basin Coal

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ABSTRACT

The U.S. Geological Survey in collaboration with a selected Indiana utility is studying a coal-fired power plant in order to determine the chemical properties of feed coal and the various coal combustion products (CCP). The major focus of this study is to evaluate the temporal chemical variability of the feed coal, fly ash and bottom ash. Main emphases will be placed on the abundance and modes of occurrence of selected trace elements that have been identified as environmentally sensitive.

This Indiana power plant exclusively utilizes low-sulfur coal (0.23-0.47 sulfur content) from the Wyodak-Anderson bed in the Powder River Basin. Samples collected for this study were done on a daily, weekly, and monthly basis in order to determine the changes in chemical and mineralogical composition. Most feed coal and fly ash samples were collected using automated sampling devices and the bottom ash was collected manually by the power plant. During this study, four sets of fly ash samples were collected. One was from the economizer (closest to the furnace), two from automated fly ash collectors, and one from the truck silo.

Although most of the feed coal originates from a single source, there was a certain amount of variation in the trace element chemistry. This probably corresponds to the vertical mineralogical variation (including various volcanic ash partings) that occurs within the thick Wyodak-Anderson coal bed (as thick as 120 feet thick). These variations are also reflected in the fly and bottom ash. The fly ash samples contained glass, quartz, perovskite, lime, and gehlenite and the bottom ash contained mainly quartz, feldspars, and augite. The abundant calcium mineral phases in the fly ash can probably be attributed to the presence of carbonate, clay, and various aluminophosphate minerals in the original feed coal.