

# SCR Catalyst Blinding for Subbituminous and Lignitic Coals: Field Results

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## Summary

Blinding of selective catalytic reduction (SCR) catalysts has been hypothesized to result from the sulfation or phosphation of small alkali- and alkaline-earth-rich ash produced upon the combustion of lower-rank subbituminous and lignitic coals. A project is currently under way at utilities burning low-rank fuels such as Powder River Basin (PRB) subbituminous and lignitic coals to determine the potential impacts of these coals on SCR catalysts. These lower-rank fuels have a high amount of organically associated alkali and alkaline-earth elements that may be problematic at SCR operating temperatures. An SCR slipstream reactor has been installed at a 500-MW cyclone-fired boiler burning a PRB coal. The reactor is a 7.5-in<sup>2</sup> × 9-ft-long steel housing consisting of two sections: a flow straightener and a catalyst test section. Two purge nozzles are installed ahead of each catalyst sections to remove accumulated dust. Strip heaters are installed on each catalyst section, and the entire housing is insulated for temperature control. The reactor isokinetically extracts flue gas from the unit at 400 acfm and maintains the temperature of the flue gas between 600° and 700°F. Operating data are saved every minute and written to a file on the control computer.

After 2 months (1464 hours) of operation, a catalyst sample was removed. A portion of the catalyst leading edge was masked with fly ash. However, the ash deposit was extremely friable and not bound tightly to the catalyst. It is believed this type of deposition could be controlled with sootblowing. The pulsing frequency has been changed from once daily to four times daily to control this deposition.

Scanning electron microscope and x-ray diffraction (XRD) analysis of the catalyst and ash deposit samples indicate the presence of calcium sulfate. The sulfate was seen as a thin coating or small beads on the ash particles. The XRD analysis confirmed the presence of anhydrite (CaSO<sub>4</sub>) in the ash deposit.

The reactor will continue to be monitored until six months of operating time has been achieved. Future installations will be at a pulverized coal-fired unit burning a PRB coal and a cyclone-fired unit firing North Dakota lignite. All installations will be for a duration of 6 months, with catalyst samples taken every 2 months.