

Unintended Effects of EPA's Recent Ozone Transport Rule

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Summary

Compliance with several recent environmental regulations has the potential to change the marketability of CCPs (coal combustion products) in the near future. One such regulation is U.S. EPA's recent (Regional Ozone Transport Rulemaking) [Federal Register 63, 57356, October 27, 1998, Finding of Significant Contribution and Rulemaking for Certain States in the Ozone Transport Assessment Group Region for Purposes of Reducing Regional Transport of Ozone] (ROTR). The ROTR affects 22 states, all states east of the Mississippi, with the exception of Florida, Maine, and Vermont, and including Missouri and the District of Columbia. The low levels (0.15 lbs/mmBtu) of NO_x emissions allowed under the ROTR will require control methods more effective than low NO_x burners (LNBs).

The most likely technologies to be employed are SCR (selective catalytic reduction) and SNCR (selective non-catalytic reduction). Both these technologies utilize ammonia in the reduction of NO_x. Both processes are inefficient in their use of ammonia and some ammonia 'slips' through the system and may be deposited on the ash as free ammonia or as ammonium sulfate.

The leading use for coal fly ash is as a pozzolanic admixture in concrete. In 1997 approximately half of the 17.5 million metric tons of fly ash use occurred in concrete applications. When ammoniated ash is used in concrete mixes the ammonia is 'off gassed' as the ash becomes wet in an alkaline environment. This release of ammonia leads to odor problems, particularly in confined spaces with poor ventilation. There are also concerns about the long-term exposure of workers.

The use of SCR and SNCR in U.S. utilities is still in the experimental phase and not much information is available about the U.S. installations. The installation of 6 SCR and 8 SNCR systems in the U.S. have been reported. The European experience is often used to gain insights into the effects of secondary NO_x controls. In the Netherlands it is reported that a well designed SNCR system can produce ash containing < 50 ppm ammonia, and resulting ash has no detrimental effects on the applicability of the ash. Hardly any odor problems are expected during the handling or disposal of ash containing less than 100 ppm ammonia, light odor nuisance may be expected at an ammonia level of 200 ppm. A German paper states that fly ash containing up to 200 ppm ammonia could be used in concrete without affecting the concrete workers. The ammonia concentrations in ash from SNCR systems were found to range from 100-500 ppm.

The relationship between ammonia slip and the amount of ammonia that ends up on the ash is not well documented and is currently being researched. A general relationship derived from European data shows that slip values of 2 ppm(v) (flue gas) yield fly ash ammonia concentrations of approximately 100 ppm(w). Factors that influence the amount of ammonia slip include: ratio of ammonia/NO, non-uniform mixing of ammonia with the flue gas (SCR and SNCR), aging of the catalyst (SCR) and poor temperature control at the injection point (SNCR). The amount of ash in the flue gas will also be a factor.

In order to assess these effects, ACAA conducted a survey. The survey consisted of 10 questions and was designed to be quickly answered and returned to ACAA with little effort.

Due to variability within utility plants this survey was conducted on a generating unit level. A total of 325 of the 1226 (27%) coal-fired generating units in the USA responded to the survey. Of the units responding 195 of the 325 units (60%) would require additional NO_x control due to the October 27, 1998 action. Of the 325 units reporting 131 were not affected by EPA's action. Of those 131 units, 101 were located in non-OTAG states. Of the 195 units that are affected 101 (52%) planned to use ammonia as part of their NO_x control measures.

The utilities report that at least 2.7 million tons (short tons) of fly ash may be rendered unusable for pozzolan markets. This represents 30% of the 9 million tons of fly ash used in cement and concrete applications in the USA in 1997. An additional 1.4 million tons of fly ash would be rendered unusable for applications other than cement and concrete applications. In total more than 4 million tons of fly ash would be rendered unusable for any for their current application and would likely require disposal. This represents 21% of the total ash currently used in the USA.

At least \$16 million in ash marketing would be lost if these 4 million tons of ash are not marketed. At least \$27 million dollars in additional disposal costs will be incurred by the utilities due to ash that has been rendered unfit for market due to these latest actions by EPA.

The ACAA survey covers ash that would be beneficially used, it does not cover ash that would be disposed. In 1997 32% of all fly ash was used and 28% of all CCPs were used. A study by Resource Data International estimates the ROTR will impact 31 million metric tons of fly ash. This is roughly 8 times as much ash reported in the ACAA survey, but the ACAA only covered about 25% of the coal-fired units in the U.S. and only surveyed ash that is being used.

The ROTR has the potential to impact approximately 60% of the U.S. coal fired generating capacity. The European experience suggests that units equipped with well designed SCR units may be able to produce fly ash that has low ammonia levels and can be used in concrete applications. The European experience also suggests that the SNCR systems will likely produce ash with higher levels of ammonia.

The American Coal Ash Association has activated a task force to advocate the adoption of standards for the use of ammoniated fly ash.