June 2, 2006

Mr. J. Wick Havens, Chief
Division of Air Resource Management
Bureau of Air Quality
P.O. Box 8468
Harrisburg, PA 17105-8468

Via E-Mail (jhavens@state.pa.us) and Certified Mail

Re: Various Ozone Transport Region Measures Under Consideration by the Ozone Transport Commission and the Mid-Atlantic/Northeast Visibility Union (Pa Bulletin Notice April 28, 2006)

Dear Mr. Havens:

In the above-referenced notice the Department of Environmental Protection (Department) announced they are involved in a process that is considering candidate control measures for development of model rules for various source categories. The candidate source categories specifically included Cement Plants. Hercules Cement Company, dba Buzzi Unicem USA – Stockertown Plant (Buzzi Unicem), owns and operates a Portland cement manufacturing facility in Stockertown, Pennsylvania, and may be affected by the proposed control measures. As such we offer the following comments for consideration.

Buzzi Unicem has several concerns with control measures being considered by the OTC for cement kilns. In brief these are:

1. The recommended control measure of 2.0 lbs. NO_X/ton of clinker is not an achievable rate at each Pennsylvania cement manufacturing plant, and may not even be achievable on average across the Pennsylvania cement industry.

2. The expectation that installing SNCR on all cement process types will be sufficient to reduce NOx emissions at each plant to the 2.0 lbs./ton limit is unrealistic and would be counter-active to the Economic/Industrial Sustainability Concept for the Commonwealth as elaborated by the Secretary over an entire range of environmental concerns, i.e., Global Warming and CO2 Sequestration, Acid Rain, etc.

3. SCR is not sufficiently developed to make it commercially available in the U.S. and; therefore, should not be considered a control technology.

4. The Department should not support or impose costly and burdensome regulations on any industry sector without first demonstrating that such regulations will provide measurable, cost-effective progress toward attaining the 8 hour ozone NAAQS.

5. The Department should consider allowing the cement industry to opt into a system where emission reduction credits could be generated and traded.

These comments are elaborated on more fully below.

1. The recommended control measure of 2.0 lbs. NO_X/ton of clinker is not an achievable rate at each Pennsylvania cement manufacturing plant, and may not even be achievable on average across the Pennsylvania cement industry.

   It is well documented that NOx emissions from cement kilns can be highly variable from kiln-to-kiln and plant-to-plant. In fact cement kiln NOx emissions are driven by so many different operating parameters (e.g. fuel-type and firing configuration, raw material mix, and product type), that emissions for a given kiln at a single plant can experience significant variability within the normal range of operations.

   NOx formation in a cement kiln occurs by several mechanisms. Nitrogen in the fuel will oxidize to form NOx, as will nitrogen in the feed stock. These mechanisms are called Fuel NOx and Feed NOx, respectively. While these reactions do occur and contribute slightly to the over all NOx formation, the dominant NOx-forming mechanism is from heating the nitrogen-rich ambient air that is used for combustion in the pyro-process. The NOx that is formed by this mechanism is called Thermal NOx.

   The raw materials in a cement pyroprocessing system undergo four steps to produce clinker. These are raw material drying, preheating, calcining and incipient fusion ("burning" or "sintering"). All cement pyroprocessing systems utilize a rotary kiln in which the raw feed components are fused into a calcium-silicate mineral referred to as "clinker". This sintering process takes place in the high-temperature "burning zone" of a kiln system. The material temperature in the burning zone must be sufficient to complete the chemical reactions between calcium oxide and the siliceous, argillaceous and ferriferous components of the raw material mix. Although this temperature is similar in all plants, i.e., approximately 1,480^{o}C (2,700^{o}F), it is dependent on the chemistry of the raw material mix and other factors, and is not constant even in the same kiln system.

   At all cement plants in Pennsylvania, cement clinker is produced using one of four pyro-processing types of systems: long wet (LW), long dry (LD), preheater (PH), or preheater with precalciner (PH/PC). Each of these systems achieve the first three steps of the pyroprocess differently.

   - In a wet kiln system, the raw materials are introduced into the rotary kilns as aqueous slurry. The evaporation of the water in the slurry requires a significant amount of energy. As a result, LW kilns can have a prolonged drying period in the upper zone of the rotating kiln.

- In a LD kiln system, the raw materials are introduced into the rotary kiln as a dry powder. This results in a drying zone much shorter than that of an LW kiln system.

- In preheater systems, dry raw material mix is fed into stationary, vertically-oriented tower containing a vessel or series of vessels. Material exiting at the bottom of the tower is then deposited in the rotating kiln (albeit much shorter than LW or LD systems) to complete the pyro-processing. This arrangement allows for much more complete initial mixing of raw feed and hot kiln gases, and promotes energy transfer efficiency. Upon exiting the preheater tower, the raw materials are sufficiently heated so that calcination can commence immediately in the rotary kiln.

- PC/PH systems are a variation of the original PH systems. In the PH/PC kiln system, a vessel is inserted between the preheater tower and the rotary kiln in which as much as 60% of the total system fuel is efficiently burned in direct contact with raw material from the preheater tower to initiate calcination before the material enters the rotating kiln. Thermal energy efficiency is the greatest in the precalciner kiln system.

With this variety of process types, the process temperature profiles are different in ways that can affect the generation and emission of NO_x. Therefore, to impose one emission standard on all four kiln types is not realistic, regardless of control technologies. The main reasons for this are that not all kilns are the same and the raw materials and fuel inputs are site specific. These components, along with the kiln type, have a direct impact on NO_X emissions and the ability to control them.

Additionally, the level of control for a given technology is not readily predictable in situations where it is required to retro-fit a technology to an existing facility. Technologies are often not fully effective if applied as a retrofit, even if they are technically feasible and can physically be accommodated by the equipment configuration of the existing source. By contrast, control technologies can be optimized during the design and construction of a new kiln line. In these cases, engineering evaluations can assess the operation of a given technology and the new line can be designed to minimize aspects of operation and physical equipment configuration that could reduce the efficiency of the intended control. Retro-fitting controls to existing equipment does not provide this opportunity and, more often than not, adversely affects the ability of the control to perform. As a result, the level of a retro-fit control demonstrated on one kiln system cannot automatically be assumed applicable to other existing kilns, especially if they are of different process-types. Therefore, assuming that all kilns in Pennsylvania will be able to perform at NOx emission rates established at kilns in other states and/or countries is an unreasonable expectation, particularly since almost all of these are newly constructed kilns.

2. The expectation that installing SNCR on all cement process types will be sufficient to reduce NOx emissions at each plant to the 2.0 lbs./ton limit is unrealistic and would be counter-active to the Economic/Industrial Sustainability Concept for the Commonwealth as elaborated by the Secretary over an entire range of environmental concerns, i.e., Global Warming and CO2 Sequestration, Acid Rain, etc.

   With an SNCR control NOx is reacted with ammonia or urea in an environment with a specific temperature range and for a sufficient residence time. The effective temperature range for a SNCR system is approximately 1600°-2000°F. Below the effective temperature, ammonia present in the gas stream does not react and "ammonia slip" occurs. Likewise, if excessive quantities of ammonia/urea are injected, some un-reacted ammonia will pass through the system, again resulting in slip. Either case will result in a release of ammonia from the stack and could result in producing a detached plume, causing an opacity compliance issue

   If injection occurs at temperatures above the effective range, ammonia present in the gas stream will react to form additional NOx, and NO_X emissions may actually increase.

   SNCR has been shown to be a viable NO_X control technology on cement kilns that utilize the preheater or preheater/precalciner process. However, SNCR is very dependent on temperature and residence time and, even with optimization, will only provide a certain degree of reduction prior to experiencing an ammonia slip. As explained above, NOx emissions can be highly variable between cement kilns. Systems with relatively high baseline NOx emissions may be able to demonstrate relatively high reduction percentages. Conversely, kilns with relatively low baseline emissions will be challenged by the "diminishing returns" effect. Simply put, the greater concentration of NOx in a given volume, the more opportunity there will be for ammonia to react. As the concentration decreases, reaction opportunities are reduced and interferences prohibiting reactions are increased. Therefore, the implementation of SNCR on existing PH and PH/PC kilns will be very site specific. As such, the assumption that all PH and PH/PC kilns can achieve a 2.0 lb/ton emission rate is unrealistic.

   For the rest of the kiln process types, SNCR is not a proven technology in the U.S. This would be an innovative control technology for these types of kilns and; therefore, reduction rates can not be reliablely predicted at this time.

3. SCR is not sufficiently developed to make it commercially available in the U.S. and; therefore, should not be considered a control technology.

SCR for NO_X control is not a proven technology in the cement industry. Theoretically, SCR will reduce NO_X emissions by reacting NO_X with ammonia (NH3), in the presence of a catalyst, to form nitrogen and water. The exhaust gas stream is passed through a catalyst bed, typically a vanadium pentoxide catalyst, where the reaction occurs. There are several considerations that must be taken into account when designing an SCR control system and estimating the capital and operating costs. These include:

- Gas volumetric flow
- Amount of NO_X in the exhaust gas
- Required NO_X control
- Exhaust gas temperature
- Quantity of and composition of particulate in the exhaust gas (there may by catalyst poisons in the flue gas)
- Amount of SO_2 and SO_3 in the exhaust gas
- Allowable SO_2 and SO_3 oxidation rate
- Required catalyst life
- Allowable NH_3 slip
- Space available for equipment and tie-ins

The operating temperature within the SCR must be controlled to optimize efficiency, to control the SO_2 to SO_3 oxidation rate and to protect the catalyst. Operating temperatures in the SCR will range from approximately 600°-800°F. Lower temperatures may result in increased formation of ammonium bisulfate (NH_4HSO_4) as SO_3 reacts with NH_3 and water. Higher temperatures may sinter the catalyst (the catalytic components react with the ceramic substrate) thereby reducing the catalyst activation.

To-date, world-wide there is only one full-scale SCR system operating on a cement kiln. Significant time, effort and resources were required to bring this system to the point that it can perform reliably at that plant. According to the manager of the plant, there is no assurance that the design being used will perform equally any another kiln without additional effort and development.

The current state of SCR is best summed up in the attached document, sponsored by the Portland Cement Association. This document addresses the significant concerns surrounding the use of SCR on cement kilns.

4. PA DEP should not support or impose costly and burdensome regulations on any industry sector without first demonstrating that such regulations will provide measurable, cost-effective progress toward attaining the 8 hour ozone NAAQS.

   The economic well-being of the Commonwealth will not be advanced if the Department chooses to move forward with costly control measures that do not result in a significant contribution to attainment of the ozone standard. Unless there are assurances that significant progress will be made and that progress justifies the cost burden that will be placed on industry, the Department should not support the proposed control measures. Given the significant uncertainty currently involved in predicting the reliability and effectiveness of available controls to retro-fit projects, this demonstration cannot be made with any real confidence. Moving forward under these conditions could place the targeted industry sector at a competitive disadvantage with surrounding states.

   There is further evidence that would lead one to believe that even in the Lehigh Valley Berks Area were the bulk of the Pennsylvania Cement Industry production is concentrated, the impacts of NOx emissions do not cause the area itself, or easterly areas, to have problems. On the contrary, despite the large contribution from trucks and vehicles traveling from the Lehigh Valley to and from New York and Philadelphia, the LVB Area is fairing better with Ozone Action Days than the areas of SW Pa-Pitts. and SE Pa-Phila./Sus.Valley when comparing 2002, 2004 and 2005 season data (a study by the Department-Harrisburg) . In addition, year-to-date 2006 the LVB Area has fewer PM2.5 and Ozone Days called.

5. The Department should consider allowing the cement industry to opt into a system where emission reduction credits could be generated and traded.

   Further, Buzzi Unicem suggests that the Department give serious consideration to expanding the existing NOx cap-and-trade program. Alternatively, the Department should consider additional trading programs in which a facility be allowed to generate emission reductions by financing emission reductions either at onsite sources or at an offsite source in Pennsylvania that may provide for more cost-effective reductions. Reductions generated in this way could be used by the financing party to meet its emission targets or could be sold to other facilities needing emission credits. Under these circumstances, all emission reductions would be the property of the entity providing the financing rather than the facility at which emission reductions were accomplished.

   Beyond this, and given noted considerations, Buzzi Unicem would recommend the possibility of using trade revenues to subsidize such measures as Lower NOx Technologies, Part 75 Implementation and/or revenue sharing with Pa. Mass Transit to develop systems in the Lehigh Valley Berks Area. Such measures as could be overseen by the DEP or A Non-Profit Organization. A special timetable of between 5 and 10 years would be used in this program to optimize the revenues and properly evaluate the impact of such a pro-active partnership. Under this concept there would be much greater incentive to reduce the overall state emissions as compared to simply ratcheting down the cement industry and/or a plant that would desire to prove this growing Environmental Partnership concept true! There is evidence to support this type of concept nationally and it is much more consistent with the Secretary's Economic/Industry Sustainability Program for the Commonwealth of Pennsylvania. Finally Buzzi Unicem is partnering with concerns in Pennsylvania that are studying CO_2 sequestration.

Buzzi Unicem appreciates the opportunity to comment on this significant issue. We want to be part of the solution not part of the problem, and we look forward to working with the Department to develop an equitable and workable program, which we can all be assured will contribute to meeting the Department's air quality attainment objectives.

Sincerely,

Daniel B. Nugent
Director, Environmental Affairs

DBN

cc: K. Williams