Opportunities for Mercury Abatement – Part 1

US mercury regulation and the cement industry

The United States Environmental Protection Agency (EPA) has established National Emissions Standards for Hazardous Air Pollution (NESHAP). These standards were first applied to the US cement industry in 1999 with a focus on particulate matter, visible stack opacity, total hydrocarbons and dioxin/furans. The first mercury emissions limit was proposed in 2006 at 41 µg/dscm at 7% O_2 (34.5 µg/Nm^3 at 10% O_2) based on an annual 3-hour stack test. During the following years this rule was challenged by industry and environmental groups.

On 20 December 2012, in response to a federal court decision, the EPA finalised amendments to the air toxic's rule for Portland cement manufacturers. Based on industry petitions and technical information, the Agency amended the rule, thereby saving the industry an estimated US$52 million in implementation costs.[1] The NESHAP emission levels, set using a MACT (Maximum Achievable Control Technology) approach, limit annual mercury emissions in existing cement facilities to 55 lb/million t of clinker (8 – 13 µg/Nm^3) and 21 lb (3 – 5 µg/Nm^3) for new kilns. Emissions must be continuously monitored when the cement NESHAP regulations take effect on 9 September 2015.

The US EPA estimates that the regulations will result in a 92% reduction in annual mercury emissions and calculates that the emissions restrictions will cost the industry US$350 million a year to implement.[2] The Portland Cement Association puts the cost of compliance at US$3.4 billion.[3]

The rule requires 30-day compliance using continuous emissions monitoring (CEMS) or traps. Due to the complex procedures to correct for "over-span" readings with CEMS, many are considering the use of CEMS for daily process control and traps for annual certification. Mercury emissions from a process bypass or separate coal mill stack require continuous flow monitoring and annual mercury testing.

Many cement facilities are presently managing mercury, with states such as Florida initiating mercury limits on all new kilns built after 2005. Other plants with significant mercury emissions have installed control devices as well. To date, the reliance on dust shuttling and in more severe cases activated carbon injection, is common practice. Testing continues on alternative reduction strategies.

Mercury process challenges

Mercury emissions levels and the mercury cycle in the pyroprocess are known to vary considerably by plant. Considering the present level of mercury emissions for active cement plants and the target emission level of 55 lb/million t of clinker production, over 50% of the industry will need some form of mercury management, with 29 plants facing a reduction in excess of 40%. Knowing the mercury inputs from raw materials and fuels provides the mercury source data. However, this combined with intermittent emissions data is not enough to develop a mercury abatement strategy.

Only after modelling the inputs, the mercury cycles and continuous emissions, can an appropriate strategy be developed. The total mercury at various points in the process must be known. More importantly, the types or speciation of the mercury throughout the process must be understood.

Understanding the level of ionic mercury in the process is critical to developing a successful mitigation plan.

Written by Daniel Crowley, Titan America, USA. This is an abridged version of the full article, which appeared in the January 2014 issue of World Cement. Subscribers can view the full article by logging in.

Note

This article is based on the paper 'Mercury Emissions and Abatement Measures' presented at the 7th International VDZ Congress 2013. It has been edited to *World Cement*'s house style.

References

1. 'EPA Published Fact Sheet: Final Amendments to Air Toxics Standards for Portland Cement Manufacturing,' http://www.epa.gov/airquality/cement

2. 'EPA Fact Sheet: Final Amendments to National Air Toxics Emissions Standards and New Source Performance Standards For Portland Cement Manufacturing,' www.epa.gov/airtoxics/pcem/pcem_fs_080910.pdf (August 2010).

3. 'PCA Market Intelligence Group: Impact of Existing and Proposed EPA Standards on the US Cement Industry,' http://www.cement.org/Econ_ Anal_%202-1-11.pdf (March 2011).