Mercury stack emission sampling strategies

Stack emissions of mercury are of interest for a number of different sources including waste/sludge incinerators, cement kilns and coal-fired power plants. For these types of sources, stack emission-concentrations may vary depending on the fuel and/or the waste/feed stream and process/control operating conditions. These variations can pose significant challenges when trying to document mercury emissions over an extended period of time.

As a result of the Clean Air Mercury Rule, many coal-fired power plants will install continuous mercury emission monitoring systems which will be able to track variations in emission concentrations in real-time. However, many other source-types will rely on periodic emission tests to document their mercury emissions. Typically these tests occur every one to five years and usually consist of three test runs performed over the course of about 8 hours in a single day. If the test period occurs during the high or low point of the emission trend cycle, then the emission data documented by the test will be biased in relation to the true emissions over longer time periods.

If mercury emissions are expected to vary significantly over time and documenting accurate emission values is a must, then a few other testing strategies are possible. The first two are appropriate for stacks that have relatively low particulate matter emissions and most of the mercury in the stack gas is expected to be in gaseous form (not particle-bound).

USEPA Method 30B was promulgated recently primarily for use on coal-fired boilers. However, it has been successfully applied to other source-types. The principle of the method is to draw a know volume of stack gas through a carbon trap, which adsorbs gaseous mercury. The carbon traps are analyzed in a laboratory.

Method 30B has been used in one form or another for several years now and has proven to work well. Test run durations can last from fractions of an hour to several days or even a week or two. The sample equipment and experienced test firms are readily available. However, the method cannot document an emission trend over the course of a test run. Instead a single, average value for the test period is obtained. If the period of an emission trend cycle is expected to last a few to several days then Method 30B might be a good, cost-effective choice.

EPA Method 30A was promulgated the same time as Method 30B, and for the same application. Method 30A can also be used on other source types. With this method, gaseous stack mercury concentrations are analyzed onsite real/semi-real time. It’s essentially the installation of a temporary continuous emission monitoring system.

The real advantage of Method 30A is the ability to document emission trends lasting from minutes to hours, days, weeks, months and years. However, sampling hardware as needed for this application and test firms experienced with the methodology are both limited at this time. These limitations are expected to improve in the next few years as new hardware is brought to market, which should also help make the method more cost-effective to run.

For sources where a large portion of the total mercury emissions are bound to particulate matter in the stack gas, another approach may be needed. EPA Methods 29, 101A and ASTM D6784-98 (Ontario Hydro) are all similar to Method 30B in that they will provide one average emission value over the course of a test run. Here, both particle-bound and gaseous mercury emissions are captured with the sample train and the samples are analyzed at a laboratory. Run durations can be varied between fractions of an hour up to twelve hours and more. However, unlike Methods 30A and 30B, all these methods must be attended by sample technicians throughout each test run. This tends to make these methods the least cost-effective for test programs lasting more than one day. To apply these methods effectively where emission are expected to vary significantly, samples could be taken at times when the highest and lowest emissions are expected over the course of hours, days or weeks.

With any one of these approaches, good planning and research are essential. Analysis of process samples (i.e. fuel, feed material, product, ash), study of variability in the process/pollution control device operation and literature studies may all provide clues. Finally, the test firm should provide some input on the desired outcome of the test.

Avogadro Environmental Corporation | 1350 Sulivan Trail Suite A, Easton, PA 18040 | 610-599-8776