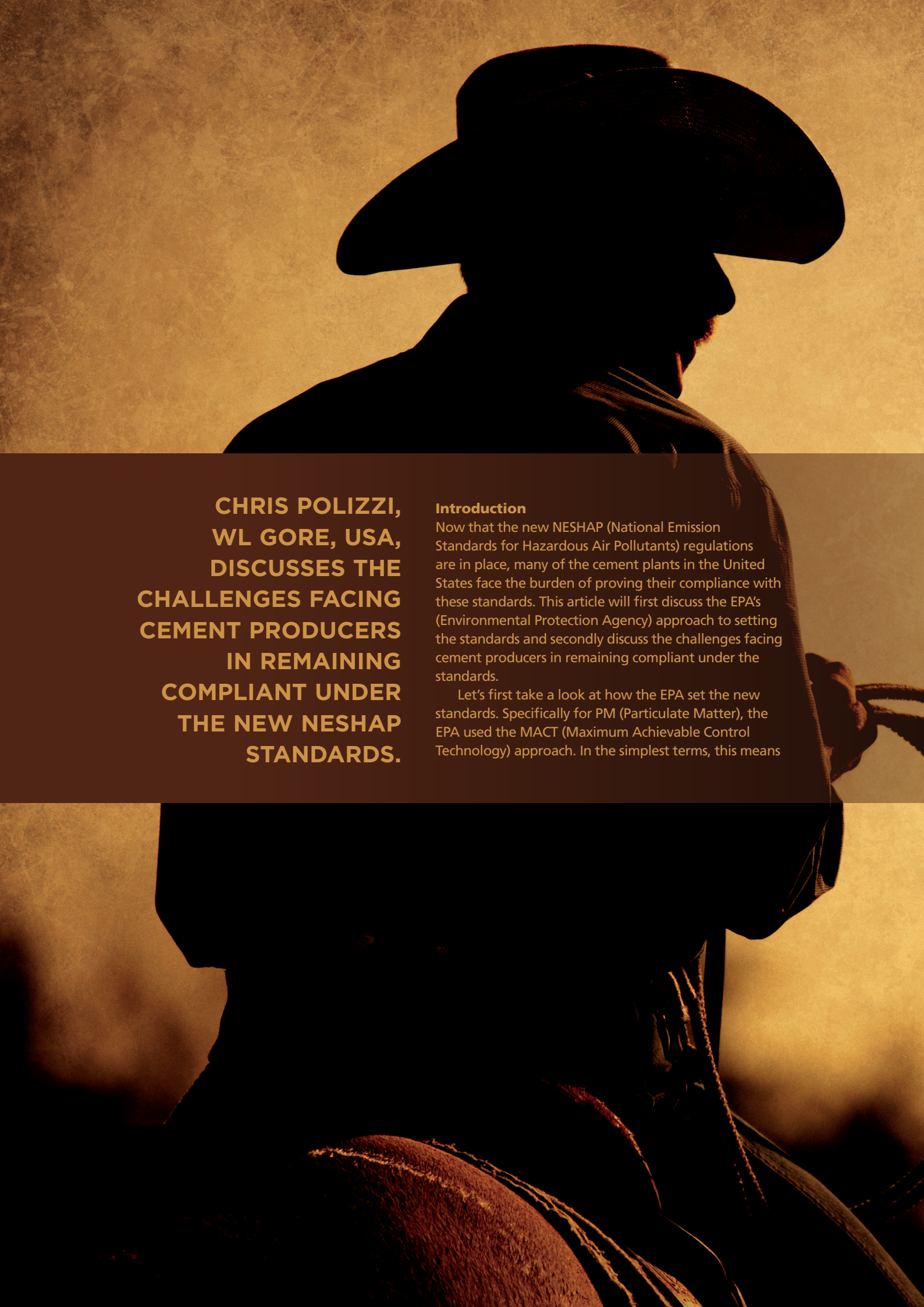

CHRIS POLIZZI, WL GORE, USA, DISCUSSES THE CHALLENGES FACING CEMENT PRODUCERS IN REMAINING COMPLIANT UNDER THE NEW NESHAP STANDARDS.

Introduction

Now that the new NESHAP (National Emission Standards for Hazardous Air Pollutants) regulations are in place, many of the cement plants in the United States face the burden of proving their compliance with these standards. This article will first discuss the EPA's (Environmental Protection Agency) approach to setting the standards and secondly discuss the challenges facing cement producers in remaining compliant under the standards.

Let's first take a look at how the EPA set the new standards. Specifically for PM (Particulate Matter), the EPA used the MACT (Maximum Achievable Control Technology) approach. In the simplest terms, this means


THE
GOOD,
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the EPA gathered stack test data from cement plants that will be affected by the rule. This data collection would exclude cement plants falling under the CISWI (Commercial/Industrial Solid Waste Incinerators) and HWC (Hazardous Waste Combustor) rules. Once the EPA had gathered the PM stack tests, the results were sorted and analysed from the best performing (lowest emitting plant) to the worst performing (highest emitting plant). The MACT approach takes into consideration the best performing 12% of the sources and sets the limit at the average of the best performing 12%. This is the limit for existing plants and is 0.07 lb/t of clinker. By setting the standard with this approach, most of the plants would have to do something differently than they had in the past to be compliant. The MACT approach also sets the limit for any new plant or a significantly modified plant equal to the best performing data point that was found. In the case of PM, the NSPS (New Source Performance Standards) level is 0.02 lb/t of clinker. To make things significantly more challenging to the cement industry, although the standard for existing plants was set using the average of the best performing 12% of the data points based on *annual* stack tests, the new regulation requires plants to prove compliance on an *ongoing* basis using a CPMS (Continuous Parametric Monitoring System). Many plants have said that the need to prove compliance via a CPMS is more challenging than the absolute limit itself. Let's discuss the implications of the requirement of a CPMS and a few possible scenarios plants are likely to encounter.

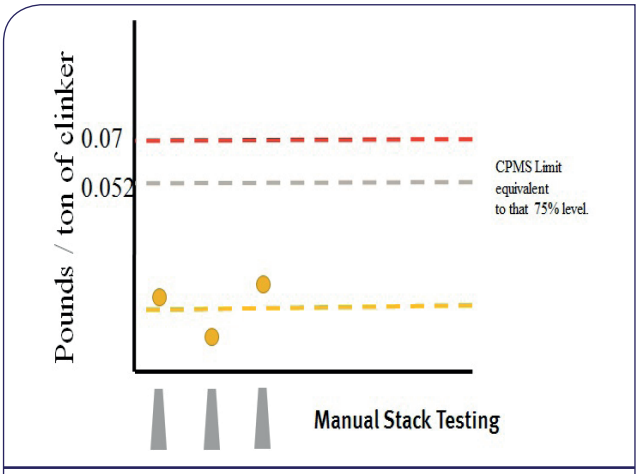

Figure 1. Very low method 5 stack test results.

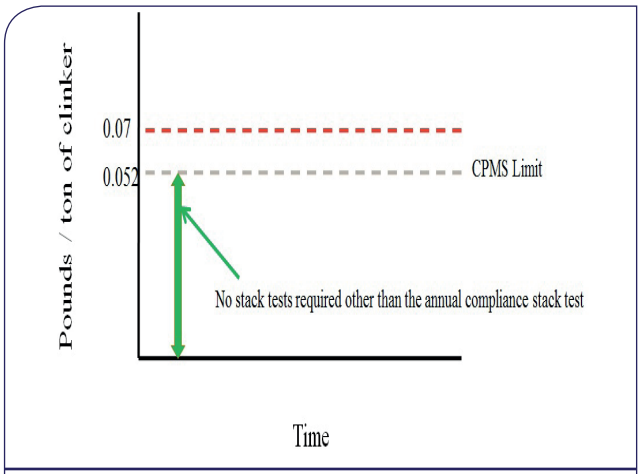

Figure 2. CPMS limit when results are less than 75% of the limit.

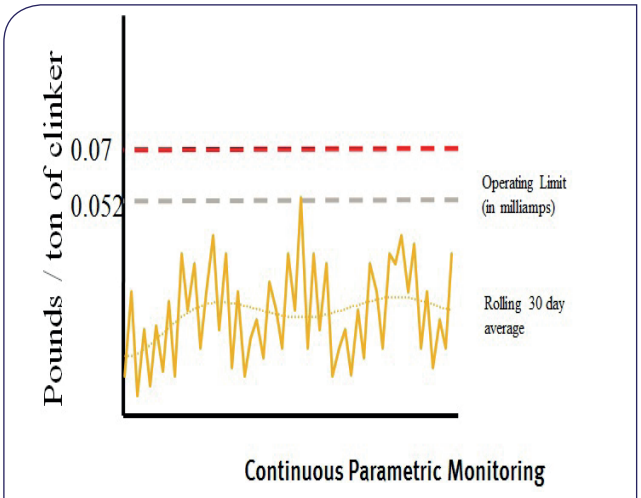

Figure 3. Daily spikes above the limit do not require action.

Annually, plants will have to prove their compliance with the PM standard by performing a method 5 stack test on the kiln stack. These are typically three tests with the mill on and three tests with the mill off. As most plants realise by now, the emissions from the tests with the mill down will be higher than the tests while the mill is running. While performing the method 5 stack tests, correlations will have to be performed equating the results of the stack tests in lb per hour to another signal (typically an electronic signal in milliamps) from stack monitoring equipment. The output signal from the stack monitoring equipment will now be the plant's ongoing CPMS signal. This signal, on a 30-day rolling average, is what the plants will be most interested in since if the site specific CPMS is exceeded, the plant has 48 hours to perform repairs and also must pay for and perform another method 5 stack test to prove the plant is actually compliant. Below are some examples.

Example 1. 'The Good' – extremely low method 5 stack test

One possible scenario is that you have just installed all brand new membrane bags and new cages in your baghouse and have visually inspected all welds for potential leaks and thoroughly cleaned the tubesheets, outlet dampers, main outlet manifold, replaced non-operating solenoids and diaphragm valves. Another possible scenario is that maybe you have a brand new baghouse, which has stainless steel tubesheets and clean air plenums with brand new membrane bags in it. Regardless of the scenario, let's assume it is stack test day, you have prepared well and you get the very good results shown in Figure 1.

Because your stack test results were less than 75% of the 0.07 lb/t of clinker limit, the regulation states that the plant's site specific CPMS operating limit is scaled to the 75% level or 0.052 lb/t of clinker (Figure 2).

This affords the plant a good deal of margin to operate the plant before any required remedial action is necessary. Daily spikes above the plant's specific CPMS operating limit of 0.052 lb/t of clinker will not require any action on the plant's part. Even if a daily spike happened to be above the 0.07 lb/t of clinker level, the plant would not be required to do anything, although it may not be a bad idea to investigate what is causing the daily excursion in either of these cases (Figure 3).

However if the 30-day rolling average hits the plant's site specific CPMS operating limit of 0.052 lb/t of clinker, the plant is now required by law to make remedial actions within 48 hours and perform a new method 5 stack test within 45 days to prove the plant is compliant (Figure 4).

This presents the plant with an unbudgeted expense. It may also present the issue where the typical stack testing company used in the past is unavailable and a new unfamiliar company is required to come onsite to perform the testing. Based on the results of this new stack test, a new CPMS limit is established. As long as the stack test confirms you are below the 0.07 lb/t of clinker, there is no violation, although the plant has incurred the unanticipated cost of a stack test. Each time the plant exceeds the site specific CPMS, remedial action and a method 5 stack test is required.

Example 2. 'The Bad' – a stack test right at the 75% limit of 0.052 lb/t of clinker

Maybe your bags are 18 months old or you have excessive corrosion in your baghouse or maybe your clean air compartment doors or lid do not seal optimally and your baghouse is continually sucking in potentially dusty air from around the baghouse. Assume then your method 5 stack test results are precisely at the 75% of the limit level or 0.052 lb/t of clinker. Your plant is not in violation; however this means you now have to operate on a rolling average below this level all the time. There is no operating buffer between your stack test level and your CPMS site specific operating level as in the first example. This is actually the same scenario as any stack test between 0.052 and 0.07 lb/t of clinker. This means any time the rolling average eclipses your stack test level, the plant must make remedial actions within 48 hours and perform a new method 5 stack test within 45 days to prove the plant is compliant. As you now know, based on the results of this new stack test, a new CPMS limit is established (Figure 5).

If your stack test confirms you are below the 0.07 lb/t of clinker, there is no violation and you must reset your CPMS to this new stack test level. If your stack test confirms you are above the 0.07 lb/t of clinker level, you are now out of compliance and subject to a violation.

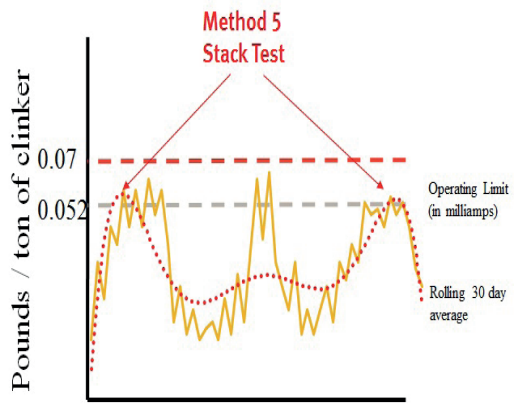

Figure 4. Exceeding the CPMS 30 day rolling average requires action.

Example 3. 'The Ugly' – multiple excursions above your CPMS limit

Maybe you have an older baghouse in need of repairs or maybe your filter bags are not performing as well as you would have hoped. Maybe your hopper evacuation system malfunctioned and caused some bags to fail; you replaced them but did not clean up well enough and some residual dust was left in the clean air plenum. Under any of the scenarios, you are likely to eclipse your plant site-specific CPMS limit. One of the more surprising parts of the regulation to many plant managers is the fact that if you eclipse your plant site-specific CPMS limit four times during a 1-year period you are assumed to be in violation. This could be the case even if your CPMS never goes above the actual limit of 0.07 lb/t of clinker. This could also be the case even if your four resulting method 5 stack tests also all confirm you are below the 0.07 lb/t of clinker. By the sheer fact that you eclipse your site specific CPMS four times, you can be subject to a violation (Figure 6).

As you can see, the limit is low if the plant falls into the existing plant category and extremely low if the plant falls into the NSPS category. The addition of a CPMS requirement will have a dramatic effect on the ability to remain consistently in compliance. Attention to all aspects of the baghouse, the filter bags, the cages, the cleaning system, the operation of the baghouse, and preventative maintenance will all be essential. The current thinking from many cement plants is that the result of these new regulations will have a net effect of an overall shorter effective bag life. Plants that have been used to getting 5 years life are hoping to get 3 to 4 years ideally without having to schedule and pay for unexpected method 5 stack tests. Plants that currently get only 3 to 4 years bag life have even bigger concerns and challenges ahead of them. To best counteract this, some plants have invested in new baghouses or significant baghouse rehabilitations. Anything that can be done to eliminate and prevent rust anywhere on the clean side of the tubesheet will help. Installing door

seal gaskets, lid gaskets, etc. to ideally eliminate any and all false air in leakage will not only help prevent corrosion, but will also prevent the influx of potentially dust laden air. Replacing all the cages when a plant installs new membrane filter bags to ensure the most optimal fit possible will likely become the new normal. Testing using FilterSense® leak detection equipment has shown that membrane filter bags emit dust through their stitches with each pulse. These spikes can easily be 50 times higher than the baseline emissions between pulses. Figure 7 shows emissions of membrane bags over a 1-hour period.

By itself this may not be the cause to replace an entire site of bags, but may contribute to a site-specific exceedance if one or more other sources of emissions are also present. This may be the case especially later in bag life when pulse frequency is likely to be increased. To combat seam leakage during pulsing, Gore has developed and launched GORE® Low Emission Filter Bags for strict environmental compliance, which include a patented seam tape technology, effectively covering up every stitch hole on the filter bags. These filters have shown to eliminate the emission spikes corresponding with pulsing of the filter bags. Adopting improved baghouse maintenance programmes, monitoring key parameters of baghouse performance, installing high performance membrane filter bags and new cages, and keeping the stitches leak-free during pulsing, together best prepare the cement plant to start from a position of the lowest possible emissions. This affords the plant the maximum amount of operating room prior to hitting the site-specific operating limit.

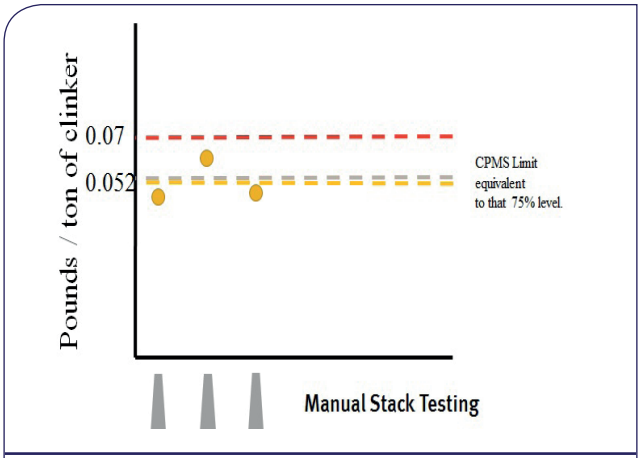

Figure 5. Method 5 stack test precisely at 75% of the limit.

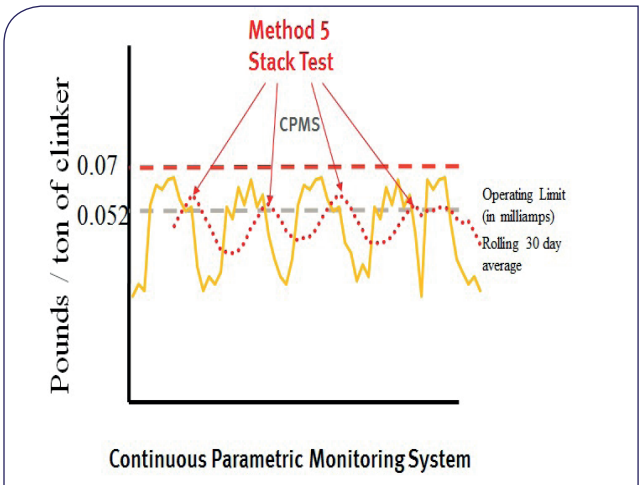

Figure 6. Exceeding a plant specific CPMS 4 times in a year is a violation.

Conclusion

In summary, the new regulations are going to require a holistic approach to the baghouse, its performance and filter bag selection. Having to prove compliance with the use of a CPMS increases the chances of unexpected costs and, worst case, potential downtime. Although the total net effect on bag life on many plants will be a decrease, plants that prepare and implement sound measures, as well as selecting robust and proven filter media, will minimise the impact on the plant.

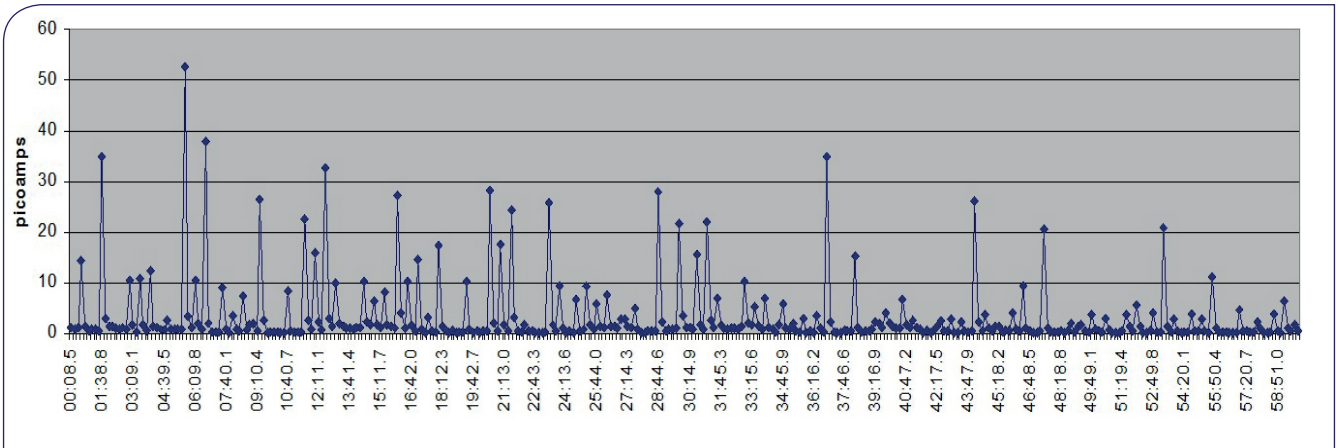

Figure 7. PM emissions through membrane filter bags as detected by FilterSense® equipment.