**Transcript**

August 5, 2024, 3:55PM

0:43
Alright, so good morning everyone.
My name is Jens Christiansen and one of the compliance inspectors for the state and Nevada Bureau of Air Pollution Control.
Today will be discussing source testing.
This is one of five webinar series the BAPC will be presenting to industry.
I would like everyone to write down any questions in the chat as we go through the presentation.
I'll pause a few times for questions and there will be plenty of time at the end of the presentation for additional questions.
Also, this webinar is being recorded and will be posted to the DCNR YouTube channel if there are any questions we can't answer, we will get back to you.
So some people love to hear themselves speak.
I'm not one of those people.
I'll try to keep this presentation succinct, quick overview.
I'll discuss the Clean Air Act criteria pollutants.
Some visual representations of pollution, permitting classifications, testing requirements, most common reasons for invalidations, what to look for when observing source testing, important testing requirements, and finally invalidations and failures.
So to get an idea of why we got to this moment in time, how we got to this moment in time, we need to go back to 1970, when the Clean Air Act was passed, Congress recognized the need for regulating air pollution, the vessel to regulate this pollution fell to the Environmental Protection Agency, or EPA.
EPA established National Ambient air quality standards Max for seven criteria pollutants: ozone, carbon monoxide, particulate matter, both PM10 and PM2.5, lead, sulfur dioxide, and oxides of nitrogen.
Nevada may adopt more stringent ambient air quality standards.
Current example of this would be hydrogen sulfide.
EPA direct states to achieve these standards. An air quality operating permit is, in essence, an allowance to pollute up to a certain threshold.
EPA has emission factors listed on their website, known as AP-42, if you're involved in the permitting process.

40 CFR part 60 is the place to go if you have any questions about regulated pollutants. Don't worry, it's a pretty light read. Non-criteria pollutants that I didn't mention are considered hazardous air pollutants or HAPs for short.
EPA lists 189 pollutants that fall into this category.
These pollutants are also within the scope of regulatory authority, so some examples we see regularly include pentane, mercury, and cyanide compounds.
Source testing is the confirmation that the emission factors and equipment are operating as intended.
So Figure 1, Paris 2016, vehicle emissions, domestic wood fires, and nearly windless conditions led to hazardous air quality.
And then another example down below the field photos from a mine in Nevada. In 2004, scientists discovered the highest level of methyl mercury, a known neurotoxin ever measured in a natural body of water in the Great Salt Lake in Utah.
Source testing on the rosters at this mine were significantly higher than the required limit. Following the implementation of the Nevada Mercury Control program across the state, a different mine installed what we now know as common mercury control equipment.
They saw a dramatic reduction in mercury air emissions from nearly 900 pounds in 2006 to less than 1 pound in 2007.
The take away from these examples is that air pollution is not stationary.
In broad terms, downwind neighborhoods, states, and countries get the pollution Nevada generates, and we get their upwind pollution.
So when and where, now that we have a basis for why source testing matters, we can discuss permit classifications.
Class 1 permits are subject to federal requirements under 40 CFR Part 70, facility wide potential to emit is greater than 100 tons per year of any criteria pollutant, 10 tons per year of an individual HAP or 25 tons per year of combined HAPS.
Class 2 permits are for facilities that are below Class 1 thresholds and are greater than 5 tons per year of PM, 50 tons per year of CO, etc.
If your company's potential to emit is less than the criteria specified for Class 2 permits, you do not need an air quality operating permit with state and Nevada, this is of course pending a determination letter from NDEP.
All permitted facilities must meet the Nevada and National Ambient air quality standards and applicable federal requirements.
Class 2 permits typically have testing requirements in two places, either initial performance testing found in Section 4 or Section 5 with the applicable frequency, midpoint, annual and renewal. Class 1 permits have federal requirements under 40 CFR part 70 or Title V, and as such the section numbering is different from Class 2 permits the ordering of testing is identical to that of Class 2 permits, but initial testing can be found in Section 2.
All other testing requirements can be found in the specific operating conditions of the permit, normally Section 6. Operating Permits to Construct generally only require initial testing.
It is worth noting that Operating Permits to Construct are state only Class 1 air quality operating permits. For the mines and attendance, mercury operating permits have testing requirements in Section 2, and finally cola permits generally only require testing if a hot mix asphalt plant is on site and it has not been tested in the last five years.
If so, testing requirements can be found in section two of the permit and under 40 CFR part 60.93.
If you have any questions regarding the permit requirements, please see the presentation on how to read your permit and example permit for clarification.
As many of you have likely experienced, source testing is a small niche field.
Getting in touch with them to schedule testing is best done well in advance to ensure that testing is being conducted within the time frame required of your permit.
This is especially true for renewal testing.
All permits that NEDP issues have the same permit renewal testing language.
“At least 90 days prior to the expiration of this operating permit, but no earlier than 365 days before the date of expiration.”
It is strongly recommended that this testing is done closer to 365 days before expiration, equipment failure or source tester availability is not a valid reason for missing the testing deadline. NDEP has the authority to prevent equipment from operating in the case that testing is not conducted.
Are there any questions so far?
No questions.
Most common causes for invalidation.
This is an overview of the technical section.
We'll be covering all of these topics in greater detail, so leak checks are one of the most common causes for invalidation.
Rinsing testing equipment is a close second.
Isokinetics can be problematic in a few ways.
Holding the probe during testing is not allowed.
Same goes for testing with the probe supported by a manlift.
Reference method 201A has a lot of math.
There are 47 equations used in this method.

Reference method 5 has about 15 equations.
Another testing concern is concurrent moisture and gaseous testing.
And finally on the process side, the two things you as facility staff should be aware of are operating rates and leaks in the exhaust stack.
With this said, NDEP may be present for any and all source testing.
The reason for doing so is to limit invalidations that cost time, money, and resources.
If compliance staff are on site to observe testing, there's no guarantee that testing will be valid and passing, but we always try to work through concerns as they pop up. Again, preventing Invalidations is the goal.
If compliance staff are not on site for a source test and a question arises, please contact your inspector or the compliance supervisor, either major source or minor source.
Now we can move on to the technical portion of the presentation.
Here we have a standard EPA reference method 5 particulate matter sampling train.
I'll be referring to various components of the sampling train throughout these slides, and I'll try to define these terms as best as I can, but if you guys have any questions, just type them in the chat so we can address them
If we're looking at this photo, we can see at the inlet side, we've got a nozzle that will be collecting the actual particulate matter.
In this case, we've got a filter holder kind of in the middle of the box that will be collected in the filterable portion, and then we've got some knockout impingers on the backside.
This dry gas meter and airtight pump don't actually look like this in person.
It's just kind of a black box, if you will.
And if you guys have seen source testing on site, you'll know what I'm talking about there. Anyway, as the name implies, a post test leak check is done at the end of the sampling run.
Post test leak checks should only be plugging the nozzle.
If the testing company adjusts any part of the train to tighten it, the run is invalid.
Leak checks are required to be for at least one minute.
Isokinetic sampling is a term used to compare velocity of the stack gas to the velocity of the sampling train at the pitot tube head. Oversampling results in excess particulate matter being sucked up into the train. Under-sampling results in less particulate being sucked up into the train.
Therefore, most EPA reference methods have a particulate sampling requirements that allow for a 10% difference in either direction for that over or under-sampling. Leak checks are the verification that the gas volume collected is only drawn from the nozzle and not due to a leak in the system. A good source testing company will do the pretest leak check, even though EPA reference methods do not require it.
During cleanup, the number of rinses for all particulate testing is important.
Each rinse gets about 80% of the remaining sample collected on the testing equipment, nozzle probe and impingers. After the 1st rinse, 20% of the sample is still in the sampling equipment after the 2nd rinse, 4% of the sample remains after the third rinse only about .8% of the sample remains.
All gaseous testing must be concurrent with moisture and velocity measurements for the entire duration of the run.
If particulate matter testing is being performed simultaneously with gaseous testing, the duration shall match.
For example, NEDP requires gaseous testing to be one hour in duration.
However, if the flow rate for the system is low such that 60 dry standard cubic feet cannot be collected in one hour, both sampling trench shall continue until the minimum sample volume has been met for the particulate requirement. Same goes for the inverse.
If sixty drive standard cubic feet can be collected in 30 minutes.
Sampling will still be for an hour to meet the one-hour gaseous requirement.
Are there any questions?
Yeah, Scott Kirchoff, go ahead and talk if it'll let you.
Scott, it says that there you go.

 **Scott Kirchhoff** 23:22
Hey, can you hear me now?

23:23
Yep.

 **Scott Kirchhoff** 23:26
Sorry about that.
There was like it was hard to tell when I could speak.
Well, thank you for doing this today.
I really I really appreciate it.
Quick question on rinsing.
Can you talk a little bit more about what that is exactly and what you rinse and what you use to rinse it with?

23:42
Yeah, sure.
I think I'm going to pass this one off to Gregg.
He should be able to answer your question a little bit better than I will.
Yeah.
So I'll say it depends.
Each method has its own requirements.
I mean for a method 5 with the probe nozzle and all of the equipment that's required to be rinsed in that case, it's usually DI water, deionized water.
There are some cases where you have to rinse with, which I think Jens will get into in the next slide regarding method 29, there's potassium permanganate, which is another requirement to be rinsed.
There's also in method 202, I believe there's a hydrochloric acid rinse as well, so it does depend.
Usually the requirements are a known quantity in a lot of cases it's 100 milliliters and then three rinses within that 100 milliliters.
So again, it's kind of going back to that 80% rule where it's expected that approximately 80% of the sample will be caught with each rinse.
So while there's the three rinse thing, there's also the known quantity in like the case of method 29, there's 100 milliliters that's required to be used for that rinse, and that 100 milliliters is pretty important, because it's difficult to get a good rinse with less than 100 milliliters for three rinses.
However, if you get used more when we're talking about Mercury, we're talking about micrograms of a sample, so that could potentially dilute the sample if you have too much liquid being used, and it could just throw the numbers below the minimum detection limit because all of these methods for the analysis portion do have minimum detection limits.
But yeah, so I'm not sure if I answered your question or if you have any follow up questions, but I would say if you want any specifics on what you are looking for, we could talk about this later.
You can shoot me an e-mail and I can go into the specific methods that you're looking at for what you're looking at, what needs to be rinsed, and how often and with how much.

 **Scott Kirchhoff** 26:04
OK.
Just one more follow up.
Thank you, Gregg.
Where do you put the rents in into the apparatus?

 **Scott Kirchhoff** 26:09
Where does?
Where do you inject it?

26:12
So in those cases there is a separate container.
Usually it's a glass container that is holding the material that they will then wrap with like a Teflon tape to eliminate any potential for spilling the material or spilling the sample or anything like that, especially during transport, and then they have chain of custody that needs to be filled out properly and sent off as it gets sent to the lab as it gets to each step of the analysis process.

 **Scott Kirchhoff** 26:47
OK. OK. Alright.
Thank you, Gregg.

26:50
Yep.
And I think kind of to follow up on that, if we're looking at this figure 3 again, we kind of break this up into three separate portions.
We've got the nozzle side of things, the hot box side of things, which is essentially just where the filter is located, and then the cold side of things, which is where the impingers are at.
So each portion of these kind of gets its own separated rinse and that all gets collected into the bottles that Gregg was talking about.

 **Scott Kirchhoff** 27:17
Ah OK, so each section gets rinsed into the bottles with either the water or whatever is recommended.
OK, excellent.

27:23
Yep.

 **Scott Kirchhoff** 27:24
Thank you.

27:25
No problem.
Are there any other questions, Jenn?
That's it.
Yep, OK.
So, as Gregg was talking about briefly, EPA reference method 29, it's used for collection of mercury.
It states that the probe, liner, and nozzle must be rinsed, brushed, and rinsed again with acetone before the 0.1 normal nitric acid rinse.
As I mentioned, the number of rinses is important.
This method is intended for both particulate bound mercury and gaseous mercury, so recovery if both types is required reference method 29 users utilize this potassium permanganate to capture metals in the impingers.
Usually it's referred to as the purple stuff.
Two important notes for everyone: The potassium permanganate must be made within 24 hours of testing. Secondly, oxidation or browning of this chemical is typical.
It has no bearing on the source test results themselves.
Particulate matter is broken down into three categories defined by EPA.
PM10 is particulate matter that is 10 microns in diameter, while PM2.5 is particulate matter that is 2.5 microns in diameter. Condensable particulate matter exits the stack is a vapor, but exists as a liquid or a solid after being cooled by ambient conditions.
Condensable particulate matter is likely to exist for sources where combustion of some sort exists.
Basically, if it's above ambient, you can expect there will be some condensable particulate matter.
Reference method 201A is used to differentiate PM10 and 2.5 through 2 separate cyclones and, if desired, a condensable filter.
The method allows for an extra 10% for 20% total isokinetic flow difference to account for variability between each traverse.
Simply put, because cyclones are being used, the sampling rate cannot change during a run.
Specifically for smaller diameter stacks or variable flow exhaust stacks, this can be challenging.
EPA recognized this concern when designing this method and as a result 2 of 12 points or 5 out of 24 points of the traverse can be outside the 20% isokinetic range.
I know it's not on the slide, but we're going to talk about 5/202 a little bit here as well, just kind of comparing the two. Reference method 5/202 gathers PM2.5 through condensable particulate matter for the purposes of compliance demonstration with PM2.5 limits all particulate matter collected in a 5/202 is considered PM 2.5.
These two methods, as in 5/202 and 201A can be used together in a modified train setup to measure total PM, including filterable, PM2.5, PM10, and condensable PM the same isokinetic concerns I just mentioned exist for the modified 201A/202 setup.
Reference Method 201A has been an issue for all source testing companies across the board.
If you can avoid using this method, that would be best. For reference, about 60% of source tests that we see using this method are invalid for isokinetic sampling being outside the required ranges. In the methodology under qualifications, EPA even says that this is a complex test method.
There is usually language and permitting method 5 to be used in lieu of 201A.
The downside to this is that all particulate matter that is collected is considered PM 2.5.
If that language does not exist in your permit, feel free to ask your compliance inspector if a different method may be used prior to submitting a testing protocol to NDEP.
I'll pause for questions again.
No questions.
OK.
On the process side of source testing and the EPA wants to ensure representative data is collected, we recommend 80% of the permit limit as a baseline for your operational throughput.
If NDEP is concerned that throughput is not representative of normal operating conditions, we will be asking for the last year’s worth of operating data for that emission unit.
If the emissions are near the permitted limit, but throughput is low, NDEP reserves the right to limit throughput for that unit via compliance order.
Most source testers are very good at making sure to collect throughput and fuel consumption for their reports.
However, if they do not ask you or facility representatives, rest assured that NDEP will be asking you for that information.
EPA reference method 1A refers to stack diameters that are less than 12 inches in diameter.
There is an alternative to the pre and post-test velocity traverses that have historically been an issue on retorts and other small diameter, low flow stacks.
A secondary set of ports can be installed.
Sampling is conducted out of the first set of ports, while the second set of ports is used for temperature and velocity measurements.
The difference between these two options is flexibility and flow.
In the single set of port scenario, if flow deviates by more than 10% between runs, that test is invalid.
Simultaneous flow and particulate sampling: Flow deviations are moot point because everything is being sampled at once.
This all boils down to isokinetic testing.
Testing from manlifts is not allowed.
Having a probe moving in the stack causes either over or under sampling of the gas stream as the lift moves around, it adds variability to an already complicated process.
The photo below was taken in the field, BAPC field photo, here.
The wider bottom portion tightens to the existing stack ports.
The Threaded segment attaches to the sampling probe, thereby eliminating movement of the probe itself.
So the testers can still be on the main lift, but the probe may not be supported in any way by the lift.
Scaffolding or rail attachments are a common solution to the manlift testing concern that we see all the time. An inherent concern what testing is open ports causing flow disturbances and turbulent conditions in the stack.
Everything I've covered so far regarding EPA testing methods is getting accurate representative emission information.
This information is only as good as the conditions allow.
I've personally seen a wind event during testing caused and validation because of reference method 1A flow deviations. Covering ports that are not used with either the blind flange that was there before the testing started or rags is imperative.
Invalidations and failures happen, unfortunately.
Invalidations are caused by deviations in testing methodology or operating conditions not being representative.
A failure is synonymous with exceeding a permitted emission limit. NDEP tries to review the source test report within 60 days of receiving the report.
However, failure of a tested pollutant needs to be reported to NDEP within 24 hours of identification from the facility through an excess emissions report, typically a 15 day report also identifies the source of control, failure and potential solutions to remedy this problem.
If a failure is self-reported, it is in your best interest to schedule a retest as soon as feasible, after identifying the problem.
Retesting of the emission unit will be required within 60 days of NDEP sending an invalidation letter.
Enforcement actions may be pursued, but that's not a topic I'll be covering in this presentation.
I will say that getting ahead of the required retest timeframe shows the agency that a problem is being addressed not because we found the problem, but because the facility wants to be in compliance with the air quality operating permit.
I'd like to finish this presentation by saying a source testing is a bit of an art form.
It's where EPA methodology meets reality. Limiting as many variables as possible leads to accurate data, which is what we as an agency and you as stakeholders both want.
Here are the references for the figures and images used throughout the presentation, as well as the NDP source testing guideline link. I covered the most common concerns and frequent issues we see in the field, but if there is another source testing related question you have now is the time to ask.
Thank you.
So not hearing any additional questions.
First, I'd like to thank Jens again for putting this source testing webinar on.
I just uploaded a few links to the chat that I would ask you all to look at.
The first one is the registration link for the next upcoming webinar that will be handled by Shannon Miller.
It is what to expect during an inspection and as we are in the middle of inspection season, this could be a very valuable webinar.
Next, the next link is the YouTube link for the how to read your air quality operating permit webinar and there is a survey for that one that's still open for the next two weeks in the video description, and I ask that if you have either participated in that webinar or if you watch the video that you provide your input.
It's a six question survey and three of them are optional, so we hope that you participate in that.
And then the last link is a survey for this webinar that we also ask you to fill out.
Again, it's six questions, three of which are optional.
We really appreciate everyone's participation today.
Again, this webinar is being recorded and will be posted to the DCNR YouTube channel and the NDEP Air Home page.
The presentation and transcript will also be added to the download permit forms page on our website and I think that is all that I have.
Thank you again for participating.