ESC SPRING 2019 USER GROUP BIRMINGHAM MAY 6th & 7th, 2019

QAQC PLAN RECOMMENDATIONS FOR PART 60 ONLY SYSTEMS

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Special warning!! Check locally!!

BIRMINGHAM SPRING 2019 USER GROUP MAY 6TH - 7TH ESC

- Most of what I am going to be discussing today directs your attention to the EPA's practices and procedures, but..
- You need to be aware if your state's (or your local) air quality agency's regulations are different in any way.
- For example, when is opacity data valid?
  - PS-1 is silent on this topic. (Certification)
  - Procedure 3 is equally silent. (On going QA)
  - Some states believe opacity data becomes valid when the fans being operating – they are providing the motive force to push the particulates into the ambient environment. Without fans, elevated opacity readings indicate the presence of "fugitive dust".
  - Other states believe opacity data is valid at all times; even times when no fans are operating or no fuel is being combusted.

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Why are QAQC plans so important?

- First off, they are required by nearly every subpart within the P60 regulations. See slide 7.
- Second, the plan represents the commitment from a facility on how they are going to operate and maintain their monitoring systems.
- Third, it should reflect how the work force is organized, who is responsible for operating and maintaining these systems, how the data generated is validated, reviewed, processed, used, packaged and reported.
- The QAQC plans are the cornerstone to your compliance plans.

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Assuring good quality and accurate data requires careful planning and review

- Before certification
  - The various Performance Specifications found in Appendix B to Part 60 dictate the process or steps executed to complete the certification process for the CEM or COM systems.
  - Continuous Emission Monitoring systems (CEMs). (Ex. SO2, PM, NOx, etc.)
  - Continuous Opacity Monitoring systems (COMs). (Ex. Opacity systems).
  - Continuous Parameter Monitoring systems (CPMs) (Ex. Baghouse diff. press.)
- After certification
  - The Quality Assurance Procedures found in Appendix F to Part 60 dictate the process and steps needed to produce good quality and valid data for compliance demonstration purposes.

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QAQC plans - more

- The QA procedures consist of two distinct and equally important functions.
- One function is the assessment of the quality of the CEMS by estimating accuracy.
- The second function is the control and improvement of the quality of the CEMS data by implementing Quality Control policies and corrective action.

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QAQC plans - more

- These two functions form a control loop.
- When the assessment function indicates that the data quality is inadequate, the control effort must be increased until the data quality is acceptable.
- In order to provide uniformity in the assessment and reporting of data quality, this plan explicitly specifies the assessment methods for response drift and accuracy.
- The methods are based on the procedures included in the applicable Performance Specifications (PS's) in App. B of Part 60.

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Which regulations did we review?

- In nearly every regulation, they referenced the QA procedures of Appendix F to Part 60 or Appendix B of Part 75.

Subpart A – General Provisions §§60.1 – 60.19	**Subpart D – §§60.40 – 60.46 (PM, SO_2 and NO_x)**	**Subpart Da – §§60.40Da – 60.52Da (PM, SO_2, NO_x and CO)**	**Subpart Db – §§60.40b – 60.49b (PM, SO_2 and NO_x)**
Subpart GG – §§60.330 – 60.335 (SO_2 and NO_x)	**Subpart KKKK – §§60.4300 – 60.4420 (SO_2 and NO_x)**	**Subpart J – §§60.100 – 60.109 (PM, SO_2 and NO_x)**	**Subpart Ja – §§60.100a – 60.109a (PM, SO_2 and NO_x and CO)**

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What are Performance Specifications? They are found in Appendix B to P60.

- There are eighteen (18) procedures that outline how to certify various continuous opacity (COMS) and emission monitoring systems (CEMS).

Performance Specifications			
1- Opacity	2- SO_2 and NO_x	3 – O_2 and CO_2	4, 4A, 4B – CO and O_2
5 - TRS	6 – Continuous Emission Rate Monitoring System	7 – H_2S	8 & 8A - VOCs
9 – Gas Chromatograph	11- PM	12, 12A - Hg	15 – Extractive FTIR
16 – Predictive Emission Monitoring System	18 – Gaseous HCl		

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But what happens after certification? Appendix F takes over.

- There are the five (5) quality assurance procedures that outline the steps required to maintain the certification status and continue generating valid emissions data.
- These procedures form the foundation of your QAQC plan.
- These are found in Appendix F of Part 60.

Procedure Number	
1 - Gaseous CEMS (SO_2, NO_x, O_2 & CO_2)	2 – PM CEMS
3 - COMS	5 – Vapor Phase Hg CEMS and Sorbent Traps
6 – Gaseous HCl	

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Appendices to Part 60

- In general, the plan should not be excessively detailed, so that you don't restrict or limit your flexibility to address unexpected events or situations.
- Cover all the known activities – QA or maintenance related.
- Our goal is to have an auditor read the plan and understand that your know what you are doing, what the regulations require, that your are properly trained, and can handle the challenges that can present themselves.
- P60 Appendix B – Performance Specifications
  - Achieving certification of various continuous monitoring systems.
- P60 Appendix F – Quality Assurance Procedures
  - Maintaining the certification status of these monitoring systems to produce valid and quality assured data for the purpose of demonstrating compliance to the appropriate emission limits or standards
- The QAQC plans are primarily wrapped around the quality assurance procedures of Appendix F, but these procedures frequently reference back to the Performance Specifications procedures and the performance limits (cal drifts, Relative Accuracy, etc.) of Appendix B so it's important for people to understand these two appendices are interwoven.

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We reviewed the P60 regulations

- In nearly all cases, the regulations point towards:
  - Appendix F of Part 60 (Quality Assurance Procedures) or
  - Appendix B of Part 75 (Quality Assurance and Quality Control).
- From Appendix F, Procedures 1-3, 5 & 6, frequently directed the CEMS operator to follow the quality assurance procedures found in the Performance Specifications for each respective monitor.
- After reviewing these Quality Assurance procedures and the associated Performance Specifications, here are our recommendations for what should be contained in your QAQC plan.

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What topics to include in your plan?

- In general, the plan should not be excessively detailed, so that you don't restrict or limit your flexibility to address unexpected events or situations.
- Cover all the known activities – QA or maintenance related.
- Fairly detailed procedures for each of the QA activities are needed.
- Our goal is to have an auditor read the plan and understand that your know what you are doing, what the regulations require, that you're are properly trained, and can handle the challenges that can present themselves.
- Each of the QA procedures in Appendix F will list their respective quality control requirements.

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Special topics you should include in your plan?

- Frequently, permits or regulations are not perfectly clear in their expectations. Describe how you are going to handle them.
- You can define in your plan your approach to these type of topics or issues. Be up front and state your position and why.
- For example – a 30-day emission limit. What if the permit does not defined how this calculation is made.
- Is the 30-day average:
  - Average of the 30 most recent 1-day averages,
  - Or the average of all valid hours recorded over the last 30 days?
- Are these operating days or calendar days?

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Another special topic…

- Does your permit or regulation allow you to exclude data collected during certain operating conditions from the calculations of extended averages?
- For example – startup, shutdown or maintenance periods. You must record the emissions during these periods, but you exclude them from being included in your advanced calculations.
- Most emission limits are established for normal operating and steady state conditions.
- Be up front and state your position and why these periods should be excluded.

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What about diluent capping?

- Does your permit or the regulation mention or reference diluent capping?
- A *diluent gas means a major gaseous constitute in a gaseous pollutant mixture, which in the case of emissions from a fossil fuel-fired units are carbon dioxide (CO_2) and oxygen (O_2).*
- Diluent capping refers to capping of the diluent value under certain situations. Prior to lighting off of boiler, heater, or turbine, the measured O_2 levels are probably near 20.9% and CO_2 is near zero.
- When an emission sources starts operating (the first couple of hours) the O_2 levels are unusually high compared to normal conditions. When the measured O_2 level is >14%, the O_2 value used in emission rate calculations are capped at 14.0% O_2.
- The opposite is the case if the diluent parameter is CO_2. CO_2 level starts out near zero and if the level is <5.0% then the CO_2 value is capped at 5.0% CO_2.

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More about diluent capping…

- So if the regulation or permit does not forbid or exclude the use of diluent capping, using it will prevent recording artificially high emission rate values (lb./MMBtu) during startup and shutdown conditions.
- When configured correctly in the data controller, diluent capping will occur automatically in the emission rate calculation and the rate value will be flagged.
- The CO_2 or O_2 parameter will still record the actual measured value. Only the emission rate parameter, if properly configured, will use the capped value.

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What topics should you include in your plan?

- This plan needs to be reflective of how you do business at your plant. Do you "do everything yourselves", or do you use outside parties, to maintain the equipment or conduct the RATAs.
- Even thought it's not required, include a brief outline of how the people involved in the CEMS are organized. Use job titles, not names.
- Don't be afraid to include a definition section. Clarifying the terms found in the plan is important. Some CEM systems introduce new terms, for example "Absolute Correlation Audit" or "Response Correlation Audit". Remember an auditor needs to understand what you are doing.

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New terms should be clarified in definitions:

- For example, in PS-2 for PM CEM systems, the term "reference standard" is used.
- This term is applied to those devices which simulate various concentrations of particulate matter, and are similar to but are different from gas cylinders. Think of Neural Density filters used for COMS.
- These devices should be described.
- Your plan should also include what steps you take to maintain or assure their accuracy (are they returned to the OEM for recertification, like Neural Density filters for COMS).

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Topics for your plan?

- Include a brief outline of how the monitoring systems operate.
  - What kind of sample probe is used? Extractive, in situ….
  - What kind of monitors are used? (Example, SO_2, NOx, Hg, etc.)
  - Do you use a data controller or a PLC?
  - What software application do you use for processing the data generated.
  - What are the criteria for creating and validating an hourly average (or 6-minute opacity average). Are you following 60.13 (h)?
  - Do you use backup or redundant backup monitors?

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Which topics to include in your plan?

- Go back to the QA procedures from Appendix F.
- Depending on which monitors you are operating will dictate the required quality control and assurance activities that need to be reflected in your plan.

Procedure Number	
1 - Gaseous CEMS (SO_2, NO_x, O_2 & CO_2)	2 – PM CEMS
3 - COMS	5 – Vapor Phase Hg CEMS and sorbent traps
6 – Gaseous HCl	

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Topics for your plan?

- Include a brief outline of how the monitoring systems operate.
  - What kind of support systems are include in your overall monitoring system. For example, a Hg sorbent trap system. It includes:
    - The sorbent traps themselves. Outline their before and after QA checks.
    - You are also operating a Part 75 certified stack flow monitoring system, which provides a flow rate signal to the sampling system for the Hg traps. The operating requirements for this flow system, and it's associated quality assurance checks, should be included in your QA plan.
    - If you are calculating Hg lb./TBtu, then you are also operating a diluent (O_2/CO_2) monitor which has been certified and operates according to P75.
  - Don't forget to include these support systems and the unique way you are operating them different than P75 (i.e. no missing data).

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More topics for your plan?

- Which regulations impact the emission sources at your plant. See the list of P60 Subparts provided earlier (slide 7).
  - Review your operating permits (SOP or Title V permits).
  - Do you have a consent decree to content with?
  - How does this plan and it's associated procedures fit into the plant's overall training program? Does the plant have an organized training program? These training programs show your plant's intent and it's commitment to it's compliance plan.

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An optional approach for our procedures:

- How about a keeping "Procedure Users' Manual" separate from the actual QAQC plan itself?
- Some facilities incorporate their detailed operating procedures in the overall QAQC plan. Using this concept, if these plans were updated or revised to reflect new practices or shortcuts, then the whole QA plan need to be submitted to the local agency for their review and approval.
- Using a separate "User's Manual" wouldn't necessarily trigger resubmitting the updates to the local agencies, if they were updated.

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QA Topics for your plan? Daily activities.

- Describe the quality assurance activities conducted on your systems.
  - Daily calibration, interference or other checks
  - Are they automatically or manually triggered?
  - Are there alarms setup to announce a failure of the check?
  - Are the results of these checks reviewed in a timely manner (within a couple of hours)?
  - What are the pass/fail criteria? When is an adjustment required? Frequently, the QA procedures directs you to the limits defined in the respective Performance Spec.

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More QA topics for your daily checks?

- When the quality assurance activities are conducted on your systems, do they require?
  - Is the unit required to be in service, operating or combusting a fuel?
  - §60.13 (d)(1) requires, "calibration drift checks at least once each operating day". But it does not require the unit to actually be operating.
  - When does an out of control (OOC) period begin and what causes it to end?
  - During the OOC period, the data is invalid and downtime is occurring. Your procedure should address how the OOC period is identified and flagged as downtime. And how it is reported.

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More QA topics for your daily checks?

- When the quality assurance activities are conducted on your systems, do they require?
  - What is the status of your data if a daily calibration is missed during that operating day? Some people feel that invalid data begins with the first hour of the following day and end when a successful calibration is recorded.
  - Other people might say that all the data for the day without a valid calibration record should be invalidated.
  - What is your plant's position on this topic? It should be called out in your plan.

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More QA topics for your daily checks?

- How do you process the data for your system when:
  - Either the zero or high level cal drift exceeds 2X the applicable drift limit for the 5th consecutive day, or
  - When either the zero or high level cal drift results exceeds 4X the applicable drift limit during any check.
  - How far backwards in time is data invalidated? Isn't this invalidated data also considered as "downtime"?
  - Does your procedure spell out how to handle derived parameters which are calculated from your measured parameters?
  - What is your plant's position on this topic? It should be called out in your plan.

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QA topics for your quarterly checks?

- Cylinder Gas Audits (CGA), RATAs or RRA (Relative Response Audit) are the required quarterly checks.
- These checks must be separated by two months,
- CGAs can be performed for no more than three consecutive calendar quarters. The RATA is performed in the 4th calendar quarter.
- Use Certified Reference Materials [CRMs] or Protocol 1 gases
  - Use cylinders of know concentration at two levels:
    - 20-30% of span (5 to 8% for CO_2 and 4 to 6% for O_2)
    - 50-60% of span (10-14% for $CO_2$and 8 to 12% for O_2)

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More QA topics for your quarterly checks?

- For the CGAs, challenge the CEMS three times at each concentration; use the average response to calculate the overall accuracy.
- RATAs are normally required at full or >90% of full load (steam flow or MWs)
- Even though it is not called out or mentioned, CGAs should be performed when the unit is in service.
- The operating conditions when performing these checks should be explained in the plan.

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Criteria for excessive audit inaccuracy

- For RATAs, the relative accuracy required is defined in the respective Performance Specification for that monitor or system (usually about 20%)
- For CGAs, ± 15% of the average audit value, or ± 5 ppm, whichever is greater.
- RRA (Relative Response Audit), ± 15% of the average audit value, or ± 7.5% of the applicable standard, whichever is greater.
- List these limits and show example calculations and where the formulas came from.

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Show and explain more about calculations

- Derived parameters, are those that are calculated from measured parameters. For example, lb./MMBtu or lb./hr.
- Show example calculations and where the formula came from.
- Explain how extended averages are calculated (examples, 3-hour, 24-hour, 30 day, etc.).
- For example, is a 30-day average based on:
  - 30 daily averages or,
  - On all valid hourly averages from the most recent 30 day period?
- Are there cases when hourly data is excluded and not used? Explain why.
- In most cases, your regulation or permit will specify the calculation method for these extended averages. If it is silent, the plan is a good place to explain the method you have chosen.

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More topics for your plan!

- Does your plan layout a schedule for routine or preventive maintenance activities?
- Are they based on recommendations from the OEM or the CEM system supplier or integrator. Include that resource.
- Are these activities handled internally or by an outside party?
- Does your plan have a list of spare parts and where they are kept?
- Does your plan discuss, in general terms, training provided for the CEM operators on the equipment and data system.

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Still more topics…

- If your data system is configured with remote alarms, like in the control room or on DCS screens, explain this in general terms in your plan.
- Do the operators know what to do when any of the alarms come up and who to notify?
- Have the operators received training on what their role is as it relates to the CEM systems? Are their training records documenting these activities.
- These topics show your plant's intend to do a good job and fulfill it's compliance obligations.

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Excessive inaccuracies? What….

- In Procedure 1 (CEMS) section 5.2 says "whenever excessive inaccuracies occur for two consecutive quarters, the source owner or operator must revise the current written procedures or modify or replace the CEMS to correct the deficiency causing the excessive inaccuracies."
- Do you know what "excess inaccuracies" means? I would suggest these are any failed quarter audits, either CGAs or RATAs.

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Finishing the plan – finally!

- Record Retention should be addressed. Nearly every regulation requires many types of records to be retained for not less than five (5) years. Be sure this is addressed in the plan.
- How often is the plan itself reviewed and updated?
  - Typically when new pollution controls or monitoring systems are introduced or replaced.
  - When the Operating Permit is renewed or revised.
  - When any major operating change occurs.

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We are sure there are topics we've overlooked. What questions do you have?

You can always contact me at jkonings@envirosys.com or at 512-250-7915.

Thanks for coming!

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