

Chapter 10

Inspecting Combustion Sources

Editor's Note:

Chapter 10 – Inspecting Combustion Sources – This section was written by Chuck Solt and is updated from material in the NOx Emissions course presented by Rutgers University until 2007

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Contents

Editor's Note:	i
General Notes.....	1
To Do List	2
CEMS Inspection.....	3
New Source Review Questions	3
Post Inspection.....	3
Permit Examples	4

General Notes

To state the obvious, the primary purpose of a site inspection is to determine whether a facility is operating in compliance with their permits and applicable regulations. So, before going out on an inspection visit it is essential to determine:

- What permits are applicable to the portion of the facility being inspected?
- What limits apply?
- What monitoring is required?
- What records are required?
- What certification/calibration is required?
- The visit will then determine compliance with the above items.

Many inspectors will say that adequate preparation will take more time than the inspection itself. Unless you're familiar with the facility, review the permits and the file before the visit.

- You may want to take:
 - To-do check list
 - Copy of applicable permits
 - Copy of any applicable NSPS section
 - Any significant documents from the file

Many operating conditions, limits, reporting etc. will be delineated in the permits, but, some requirements may not be listed in the permits. A source may be subject to Federal programs such as NSPS or HAPs regulations and must comply even if these requirements are not in the permit. States or local agencies may also have rules or regulations that may apply such as limits on the sulfur, ash or nitrogen contained in the fuel.

Permit limits should include BACT in PSD areas or LAER for non-attainment areas along with any operating conditions, reporting and record keeping, testing etc.

Inspection data is collected to verify compliance with all of the requirements, so knowledge of the requirements is essential to a successful inspection. Permit and regulatory requirements can vary dramatically from one air agency to the next, from one source type to the next, from one year to the next and even from one permit engineer to the next. Accordingly, the comments below are intended to be general or typical, and may not be appropriate or relevant in all cases.

If the permit requires a determination of the emission rate or cumulative emissions, the limits may be stated in a variety of units and/or averaging periods. It is often necessary to convert emission measurements in ppm to lb/Hr or g/BHp-Hr to determine compliance. In other cases emissions may be calculated from other parameters such as fuel flow measurements. It would be advisable to review how the determination will be made before going on the inspection visit.

Inspection data gathered might include:

- Emission rates
- Process data
- Control data
- Results from periodic emission tests
- CEMS records (if a CEMS is required)
- Other records that are required or relevant

To Do List

It is a good idea to generate a to-do-list before going to the site. It could consist of a variation of the following:

- General site walk-through
- Ask questions
- Review all required records
- Visit control room (large facilities)
- Visit CEMS shelter (if applicable)
- Walk around control equipment (maintaining proper safety)
- Address New Source Review questions (major maintenance, etc.)

CEMS Inspection

If there is a CEMS required, it will probably be the key item in determining compliance. There are several items that should be addressed if applicable:

- Records or reports for the most recent Cylinder Gas Audit and/or Relative Accuracy Test Audit (RATA). Check audit gasses used by the testing company for traceability to NIST, cylinder date, whether the gas concentration meets the levels required for zero and span and cylinder pressure (at least 100 psig). (40 CFR 60 Appendix F)
- Daily calibration procedure and results, including zero and span-gas range, frequency, where the span gas is introduced and do the daily records show drift or out-of-range? (40 CFR 60 Appendix B).
- Inspection of umbilical cord to determine if it is functional, not leaking and heated (if required).
- Review the certifications for the cylinder gases used by the CEMS to assure the cylinders are the correct range and not out of date.

New Source Review Questions

There are several reasons to request a review of the operating log and/or parameters. This will allow you to compare the design capacity of the unit with the current capacity.

You may also want to review recent unplanned or forced outages, frequency, duration, cause, how it was repaired and what components were replaced. Also, ask about any recent or future major projects.

Post Inspection

After the inspection you will need to review the data and other information collected to determine whether the operations are in compliance. This determination should include consideration of the emissions limits and the record keeping/reporting requirements.

Last, prepare a report of the inspection and any Notice of Violations.

Permit Examples

As mentioned above, the permit is the basis for determining compliance. Therefore it is important to understand the permit limits and conditions. Below are some examples of conditions found in some actual permits that illustrate the complexity in determining the intent and enforceable requirements of the permits.

Permit Example A

This permit covers 2 stations with 2 compressor sets each. There are other combustion processes at the site, covered by separate permits. The example only addresses the compressor engine permits.

Condition UU

The emergency shutdown and relief vents shall only be used to vent natural gas during emergencies or when it is necessary to vent natural gas for the purpose of performing scheduled maintenance and/or repairs.

How will you determine compliance with this condition? Also, it is interesting to notice that the relief vents have nothing to do with the emission source covered by the permit.

Condition VV

The combustion engine shall be equipped with a fuel flow meter. The total volume of natural gas combusted in the internal combustion engine shall not exceed 149.26 MM standard cubic feet (scf) per year, based upon a 12 month rolling average calculated on the first day of each month, nor shall it exceed 25.23 m for the first calendar quarter, 48.84 MMscf for the second calendar quarter, 49.38 MMscf for the third calendar quarter, and 25.81 MMscf for the calendar fourth quarter, based upon a monthly rolling average calculated on the first day of each month of each year.

The condition limits the fuel consumption based on a 12 month rolling average. This should not be a problem to determine, report or evaluate. It also limits the quarterly fuel consumption for calendar quarters, “based upon a monthly rolling average”. How do you calculate a monthly rolling average that’s applicable for specific three month periods and is only calculated on the first day of each month? In this case it would be wise to consult with the permit writer before the site visit

Condition WW

Gaseous emissions from each engine, exhaust outlet shall be limited to the following concentrations and rates:

NOx*	41	ppmvd
(As NO2)	0.5	g/bHP-Hr
CO*	269.0	ppmvd
	2.00	g/bHP-Hr
TNMHEHC*	59.0	ppmvd
	0.25	g/bHP-Hr

Notice that the permit states the limits in 2 different sets of units. Which one is used to determine compliance? You may find the conversion from one set of units to the other to be quite complex. But there is another problem. g/BHP-Hr is an output based limit (based on horsepower, not fuel consumption). Therefore it is a function of engine efficiency. These units are compressor sets and there is no means of measuring output power, and accordingly no means of determining efficiency, so there is no accurate way to convert from ppmvd to g/BHP-Hr.

Condition XX

Values stated [where?] are those, which represent an average of data as, provided by the source performance tests. The pollutant concentrations and mass emission rates shall be averaged over a two (2) hour period unless otherwise specified in the applicable test procedure. Pollutant concentration limits are corrected to 15% oxygen. All values are calculated on a dry basis.

This condition clearly needs some clarification.

Condition YY

The APCO may amend the emission concentrations and/or rate limits to reflect the conditions demonstrated during the source performance tests.

For a new source there may justification for some flexibility to get the permit to match the capability of the source, but this is entirely too vague. It is assumed that the APCO will be acting on the recommendation of the inspector. What does Condition YY mean? Will you ask to raise the limits if it fails the test? Will you ask to lower the limits to match the test results? Will you ask to change the test conditions?

Condition ZZ

The facility-wide emissions of Oxides of Nitrogen, from all emissions units located at the site, shall not exceed 29.23 tons per year. Compliance with this requirement shall be based upon a 12-month rolling average, calculated monthly.

The reason for this condition was to comply with the offset requirements in the NSR for non-attainment areas. The facility now has 11 permits, most of which have different renewal dates and this statement is in each one. The

inspector would have to inspect all units at the facility each time any unit needed inspection to determine compliance with this condition.

At this facility, Continuous Compliance with the NOx limits is calculated from the fuel consumption and an emission factors. There were no conditions in the permit to provides assurance of engine maintenance (which will affect efficiency which is a component of compliance) or proper inspection and maintenance of the catalyst in the SCR to assure catalyst activity.

Permit Example B

This permit is for one 65 KW reciprocating engine driven generator fueled by bio-gas from a dairy manure digester. There is no other combustion equipment at the site. The engine is not equipped with any exhaust treatment system.

Condition XX

THE EMISSIONS FROM THE IC ENGINE SHALL NOT EXCEED THE FOLLOWING LIMITS:

POLLUTANT	EMISSION FACTOR (A) G/HP-HR	MAXIMUM ALLOWABLE EMISSIONS (B)	
		LB/DAY	LB/QUARTER
ROC	0	0	0
NOX	2 OR 358.3 LB/MMCF	9.73	896
SOX	362.5 LB/MMCF	9.9	911
PM10	7.6 LB/MMCF	0.2	19
CO	5	24.3	2,239

(A) THE EMISSION FACTOR FOR NOX AND CO IS BASED ON MANUFACTURER’S DATA. THE EMISSION TABLES 1.4-1 ~ 1.4-2, EMISSION FACTORS FOR CRITERIA POLLUTANTS FROM NATURAL GAS FACTOR FOR SOx IS BASED ON 1950 PPM SOx. EMISSION FACTOR FOR PM10 ARE FROM AP-42, COMBUSTION, PG 1.4-5 ~ 1.4-6 (2/98).
 (B) EMISSIONS BASED ON 92 HP, 1132 CF/HR OF DIGESTER GAS USAGE, 24 HOURS/DAY AND 92 DAYS/QUARTER OF OPERATION.

Since the lb/Quarter is greater than the daily limit times 91.25 days, it is impossible to exceed the quarterly limit without exceeding the daily limit on a quarterly average basis, so the quarterly limit is of no significance except for the NOx. The ROC limit of 0 is problematic – you end up having to assume it means “not detectable” by some test method. Although the notes do not indicate the basis for the ROC limit, AP42 Table 3.2-2 shows this engine would

emit 0.118 lb/MMBtu which, based on natural gas and 38% efficiency, would be 0.36 g/BHp-Hr or 517 lb/day. Since it is 0, and not 0.0, does that imply that the limit is < 0.50 lb/day? If so, the quarterly limit is:

$$0.5/91.25 = 0.0055 \text{ lb/day average}$$

This interpretation means that the pounds per quarter is the same as the pounds per day or 91 times more stringent than the daily. When questioned, the engineer indicated that there was no test required.