

EMISSIONS FROM BIOGAS-FUELED DISTRIBUTED GENERATION UNITS

Part 4: How do operators of engine-generation sets meet applicable emission regulations?

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Biogas-fueled stationary spark ignition internal combustion engines (SI ICE) depending on engine type, maximum generating power, and manufacturing date, must be compliant with emission standards and if applicable maintain these standard over the life of the SI ICE^[1].

ENGINES VOLUNTARILY CERTIFIED TO MEET EMISSIONS STANDARDS BY THE MANUFACTURER

Due to the irregular composition of biogas voluntary certification of biogas-fueled engines by manufacturers is not typical. If the engine is certified, operators must:

- Operate and maintain the engine according to the manufacturer's recommendations.
- Keep records of conducted maintenance.
- If the operator deviates from manufacturer recommendations, compliance must be demonstrated as if the engine was not certified.

UNCERTIFIED ENGINES

Engines 25 – 500 HP

If the engine is not certified and is 25 – 500 HP in size, operators must:

- Have a maintenance plan and keep records of conducted maintenance.
- Maintain and operate the engine in a manner that minimizes air pollution.
- Conduct an initial performance test.

Engines > 500 HP

If the engine is not certified and is > 500 HP in size, in addition to the requirements for engines 25 – 500 HP, operators must also:

- Conduct subsequent performance testing every 8,760 hours of operation or 3 years, whichever comes first.

PERFORMANCE TESTING RESULTS

Performance test must be conducted within 10% of peak or highest achievable load and not during periods of engine startup, shutdown or malfunction. Replication is required with three separate test runs of engine emissions conducted for each performance test. Each test run must last at least 1 hour. Three air pollutant categories must be tested for: nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOC). Pollutant concentrations must be converted, using Equation 1, into units of mass per unit output emissions for reporting.

$$ER = \frac{C_{\text{measured}} \times k \times Q \times t}{HP \cdot \text{hr}}$$

where ER = emission rate (g/HP·hr); C_{measured} = measured concentration in parts per million by volume (ppmv); k = conversion constant, conversion rate for ppmv to g/m³ at 20°C, for NO_x (measured by EPA method 7)^[2] use 1.912 × 10⁻³, for CO (measured by EPA method 10)^[3] use 1.164 × 10⁻³, for VOC (measured as propane via flame ionization by EPA method 25A)^[4] use 1.833 × 10⁻³; Q = stack volumetric flow rate (m³/h); t = time of test run (h); HP-hr = horsepower-hour of the engine. Exhaust moisture content and oxygen content levels (measured by EPA methods 4^[5] and 3B^[6], respectively) should also be accounted for. Two other VOC detection methods are acceptable; EPA method 18 which uses gas

chromatography^[7] and EPA method 320 which uses Fourier transform infrared spectroscopy^[8]. Care must be taken to exclude the measurement of formaldehyde (EPA method 25A does not account for formaldehyde). If these methods are used, measured VOC emissions can be corrected for differences in methodology (see 40 CFR 60 JJJJ for complete details)^[1].

NOTIFICATION, REPORTING AND RECORD KEEPING REQUIREMENTS

To fulfill notification, reporting and record keeping requirements, operators must:

- Keep all submitted compliance notifications and supporting documents.
- Keep engine maintenance records.
- If certified, keep documentation from manufacturer that engine is certified.

- If not certified, submit performance test results demonstrating that the engine meets standards within 60 days of completing the test, and keep a copy of the submitted report/ test results.
- For engines > 500 HP as required by 40 CFR 60.7(a)(1)^[9], and within 30 days of commenced operation, submit an initial notification with name and address of operator, address of SI ICE, engine information (make, model, engine family, serial number, model year, max. engine power, engine displacement), emission control equipment and fuel used.
- According to the EPA, a hard copy of the notifications and performance test results should be submitted to the EPA Regional Office. To contact the EPA Region 2 office, which serves New York, see their webpage: <https://www.epa.gov/aboutepa/forms/contact-epa-region-2>

FACT SHEET SERIES Emissions from biogas-fueled distributed generation sources

Part 1: What are the potential emissions from engine-generation sets?
 Part 2: What are the current emission regulations for New York State?
 Part 3: Greenhouse gas reduction and other benefits of biogas upgrading.
 Part 4: How do operators of engine-generation sets meet applicable emission regulations?

AUTHORS

Jason P. Oliver, PhD
Curt Gooch, PE

jpo53@cornell.edu
cag26@cornell.edu

(607) 227-7943
 (607) 225-2088

REFERENCES

[1] Code of Federal Regulations (CFR). 2016. Title 40: Protection of Environment, Part 60: Standards of performance for new stationary sources. Subpart JJJJ—Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. http://www.ecfr.gov/cgi-bin/text-idx?node=sp40.7.60.jjjj#_top [2] U.S. Environmental Protection Agency (EPA). 2016. Method 7 - Determination of nitrogen oxide emissions from stationary sources. <http://www3.epa.gov/ttnemc01/promgate/m-07.pdf> [3] EPA. 2016. Method 10 - Determination of carbon monoxide emissions from stationary sources (instrumental analyzer procedure) <http://www3.epa.gov/ttn/emc/promgate/method10r06.pdf> [4] EPA. 2016. Method 25A - Determination of total gaseous organic concentration using a flame ionization analyzer. <http://www3.epa.gov/ttn/emc/promgate/m-25a.pdf> [5] EPA. 2014. Method 4 - Determination of moisture content in stack gases. <https://www3.epa.gov/ttnemc01/promgate/m-04.pdf> [6] EPA. 2014. Method 3B - Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air <https://www3.epa.gov/ttnemc01/promgate/m-03b.pdf> [7] EPA. 2016. Method 18 - Measurement of gaseous organic compound emissions by gas chromatography. <http://www3.epa.gov/ttn/emc/promgate/m-18.pdf> [8] EPA. 2016. Method 320 - Measurement of vapor phase organic and inorganic emissions by extractive Fourier transform infrared (FTIR) spectroscopy. <http://www3.epa.gov/ttnemc01/promgate/m-320.pdf> [9] Code of Federal Regulations (CFR). 2016. Title 40: Protection of Environment, Part 60: Standards of performance for new stationary sources. Subpart A. General Provisions §60.7 Notification and record keeping. http://www.ecfr.gov/cgi-bin/text-idx?SID=d9cb283ace65e198e4be03b9eab12bb6&mc=true&node=se40.7.60_17&rgn=div8

