R_n = Annual quantity of CH_4 recovered from the nth anaerobic reactor or anaerobic sludge digester, as calculated in Equation II–4 of this section (metric tons CH_4).

DE_1 = Primary destruction device CH_4 destruction efficiency (lesser of manufacturer's specified destruction efficiency and 0.99). If the biogas is transported off-site for destruction, use DE = 1.

$f_{Dest—1}$ = Fraction of hours the primary destruction device was operating calculated as the annual hours when the destruction device was operating divided by the annual operating hours of the biogas recovery system. If the biogas is transported off-site for destruction, use f_{Dest} = 1.

DE_2 = Back-up destruction device CH_4 destruction efficiency (lesser of manufacturer's specified destruction efficiency and 0.99).

$f_{Dest—2}$ = Fraction of hours the back-up destruction device was operating calculated as the annual hours when the destruction device was operating divided by the annual operating hours of the biogas recovery system.

(e) Estimate the total mass of CH_4 emitted from all anaerobic processes from which biogas is not recovered (calculated in Eq. II–3) and all anaerobic processes from which some biogas is recovered (calculated in Equation II–6) using Equation II–7 of this section.

$$CH_4E_T = \sum_{n=1}^{j} CH_4E_n \qquad \text{(Eq. II-7)}$$

Where:

CH_4E_T = Annual mass CH_4 emitted from all anaerobic processes at the facility (metric tons).

n = Index for processes at the facility.

CH_4E_n = Annual mass of CH_4 emissions from process n (metric tons).

j = Total number of processes from which methane is emitted.

[75 FR 39767, July 12, 2010, as amended at 76 FR 73903, Nov. 29, 2011; 78 FR 71972, Nov. 29, 2013]

§ 98.354 Monitoring and QA/QC requirements.

(a) For calendar year 2011 monitoring, the facility may submit a request to the Administrator to use one or more best available monitoring methods as listed in § 98.3(d)(1)(i) through (iv). The request must be submitted no later than October 12, 2010 and must contain the information in § 98.3(d)(2)(ii). To obtain approval, the request must demonstrate to the Administrator's satisfaction that it is not reasonably feasible to acquire, install, and operate a required piece of monitoring equipment by January 1, 2011. The use of best available monitoring methods will not be approved beyond December 31, 2011.

(b) You must determine the concentration of organic material in wastewater treated anaerobically using analytical methods for COD or BOD_5 specified in 40 CFR 136.3 Table 1B. For the purpose of determining concentrations of wastewater influent to the anaerobic wastewater treatment process, samples may be diluted to the concentration range of the approved method, but the calculated concentration of the undiluted wastewater must be used for calculations and reporting required by this subpart.

(c) You must collect samples representing wastewater influent to the anaerobic wastewater treatment process, following all preliminary and primary treatment steps (*e.g.*, after grit removal, primary clarification, oil-water separation, dissolved air flotation, or similar solids and oil separation processes). You must collect and analyze samples for COD or BOD_5 concentration at least once each calendar week that the anaerobic wastewater treatment process is operating; if only one measurement is made each calendar week, there must be at least three days between measurements. You must collect a sample that represents the average COD or BOD_5 concentration of the waste stream over a 24-hour sampling period. You must collect a minimum of four sample aliquots per 24-hour period and composite the aliquots for analysis. Collect a flow-proportional composite sample (either constant time interval between samples with sample volume proportional to stream flow, or constant sample volume with time interval between samples proportional to stream flow). Follow sampling procedures and techniques presented in Chapter 5, Sampling, of the ''NPDES Compliance Inspection Manual,'' (incorporated by reference, *see* § 98.7) or Section 7.1.3, Sample Collection Methods, of the ''U.S.

EPA NPDES Permit Writers' Manual,'' (incorporated by reference, *see* § 98.7).

(d) You must measure the flowrate of wastewater entering anaerobic wastewater treatment process at least once each calendar week that the process is operating; if only one measurement is made each calendar week, there must be at least three days between measurements. You must measure the flowrate for the 24-hour period for which you collect samples analyzed for COD or BOD_5 concentration. The flow measurement location must correspond to the location used to collect samples analyzed for COD or BOD_5 concentration. You must measure the flowrate using one of the methods specified in paragraphs (d)(1) through (d)(5) of this section or as specified by the manufacturer.

(1) ASME MFC–3M–2004 Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi (incorporated by reference, *see* § 98.7).

(2) ASME MFC–5M–1985 (Reaffirmed 1994) Measurement of Liquid Flow in Closed Conduits Using Transit-Time Ultrasonic Flowmeters (incorporated by reference, *see* § 98.7).

(3) ASME MFC–16–2007 Measurement of Liquid Flow in Closed Conduits with Electromagnetic Flowmeters (incorporated by reference, *see* § 98.7).

(4) ASTM D1941–91 (Reapproved 2007) Standard Test Method for Open Channel Flow Measurement of Water with the Parshall Flume, approved June 15, 2007, (incorporated by reference, *see* § 98.7).

(5) ASTM D5614–94 (Reapproved 2008) Standard Test Method for Open Channel Flow Measurement of Water with Broad-Crested Weirs, approved October 1, 2008, (incorporated by reference, *see* § 98.7).

(e) All wastewater flow measurement devices must be calibrated prior to the first year of reporting and recalibrated either biennially (every 2 years) or at the minimum frequency specified by the manufacturer. Wastewater flow measurement devices must be calibrated using the procedures specified by the device manufacturer.

(f) For each anaerobic process (such as anaerobic reactor, sludge digester, or lagoon) from which biogas is recovered, you must make the measurements or determinations specified in paragraphs (f)(1) through (f)(3) of this section.

(1) You must continuously measure the biogas flow rate as specified in paragraph (h) of this section and determine the cumulative volume of biogas recovered.

(2) You must determine the CH_4 concentration of the recovered biogas as specified in paragraph (g) of this section at a location near or representative of the location of the gas flow meter. You must determine CH_4 concentration either continuously or intermittently. If you determine the concentration intermittently, you must determine the concentration at least once each calendar week that the cumulative biogas flow measured as specified in paragraph (h) of this section is greater than zero, with at least three days between measurements.

(3) As specified in § 98.353(c) and paragraph (h) of this section, you must determine temperature, pressure, and moisture content as necessary to accurately determine the biogas flow rate and CH_4 concentration. You must determine temperature and pressure if the gas flow meter or gas composition monitor do not automatically correct for temperature or pressure. You must measure moisture content of the recovered biogas if the biogas flow rate is measured on a wet basis and the CH_4 concentration is measured on a dry basis. You must also measure the moisture content of the recovered biogas if the biogas flow rate is measured on a dry basis and the CH_4 concentration is measured on a wet basis.

(g) For each anaerobic process (such as an anaerobic reactor, sludge digester, or lagoon) from which biogas is recovered, operate, maintain, and calibrate a gas composition monitor capable of measuring the concentration of CH_4 in the recovered biogas using one of the methods specified in paragraphs (g)(1) through (g)(6) of this section or as specified by the manufacturer.

(1) Method 18 at 40 CFR part 60, appendix A–6.

(2) ASTM D1945–03, Standard Test Method for Analysis of Natural Gas by Gas Chromatography (incorporated by reference, *see* § 98.7).

(3) ASTM D1946–90 (Reapproved 2006), Standard Practice for Analysis of Reformed Gas by Gas Chromatography (incorporated by reference, *see* § 98.7).

(4) GPA Standard 2261–00, Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography (incorporated by reference, *see* § 98.7).

(5) ASTM UOP539–97 Refinery Gas Analysis by Gas Chromatography (incorporated by reference, *see* § 98.7).

(6) As an alternative to the gas chromatography methods provided in paragraphs (g)(1) through (g)(5) of this section, you may use total gaseous organic concentration analyzers and calculate the CH_4 concentration following the requirements in paragraphs (g)(6)(i) through (g)(6)(iii) of this section.

(i) Use Method 25A or 25B at 40 CFR part 60, appendix A–7 to determine total gaseous organic concentration. You must calibrate the instrument with CH_4 and determine the total gaseous organic concentration as carbon (or as CH_4; K=1 in Equation 25A–1 of Method 25A at 40 CFR part 60, appendix A–7).

(ii) Determine a non-methane organic carbon correction factor at the routine sampling location no less frequently than once a reporting year following the requirements in paragraphs (g)(6)(ii)(A) through (g)(6)(ii)(C) of this section.

(A) Take a minimum of three grab samples of the biogas with a minimum of 20 minutes between samples and determine the methane composition of the biogas using one of the methods specified in paragraphs (g)(1) through (g)(5) of this section.

(B) As soon as practical after each grab sample is collected and prior to the collection of a subsequent grab sample, determine the total gaseous organic concentration of the biogas using either Method 25A or 25B at 40 CFR part 60, appendix A–7 as specified in paragraph (g)(6)(i) of this section.

(C) Determine the arithmetic average methane concentration and the arithmetic average total gaseous organic concentration of the samples analyzed according to paragraphs (g)(6)(ii)(A) and (g)(6)(ii)(B) of this section, respectively, and calculate the non-methane organic carbon correction factor as the ratio of the average methane concentration to the average total gaseous organic concentration. If the ratio exceeds 1, use 1 for the non-methane organic carbon correction factor.

(iii) Calculate the CH_4 concentration as specified in Equation II–8 of this section.

$$C_{CH4} = f_{NMOC} \times C_{TGOC} \qquad \text{(Eq. II-8)}$$

Where:

C_{CH_4} = Methane (CH_4) concentration in the biogas (volume %) for use in Equation II–4 of this subpart.

f_{NMOC} = Non-methane organic carbon correction factor from the most recent determination of the non-methane organic carbon correction factor as specified in paragraph (g)(6)(ii) of this section (unitless).

C_{TGOC} = Total gaseous organic carbon concentration measured using Method 25A or 25B at 40 CFR part 60, appendix A–7 during routine monitoring of the biogas (volume %).

(h) For each anaerobic process (such as an anaerobic reactor, sludge digester, or lagoon) from which biogas is recovered, install, operate, maintain, and calibrate a gas flow meter capable of continuously measuring the volumetric flow rate of the recovered biogas using one of the methods specified in paragraphs (h)(1) through (h)(8) of this section or as specified by the manufacturer. Recalibrate each gas flow meter either biennially (every 2 years) or at the minimum frequency specified by the manufacturer. Except as provided in § 98.353(c)(2)(iii), each gas flow meter must be capable of correcting for the temperature and pressure and, if necessary, moisture content.

(1) ASME MFC–3M–2004, Measurement of Fluid Flow in Pipes Using Orifice, Nozzle, and Venturi (incorporated by reference, *see* § 98.7).

(2) ASME MFC–4M–1986 (Reaffirmed 1997), Measurement of Gas Flow by Turbine Meters (incorporated by reference, *see* § 98.7).

(3) ASME MFC–6M–1998, Measurement of Fluid Flow in Pipes Using Vortex Flowmeters (incorporated by reference, *see* § 98.7).

(4) ASME MFC–7M–1987 (Reaffirmed 1992), Measurement of Gas Flow by Means of Critical Flow Venturi Nozzles (incorporated by reference, *see* § 98.7).

(5) ASME MFC–11M–2006 Measurement of Fluid Flow by Means of Coriolis Mass Flowmeters (incorporated by reference, see § 98.7). The mass flow must be corrected to volumetric flow based on the measured temperature, pressure, and biogas composition.

(6) ASME MFC–14M–2003 Measurement of Fluid Flow Using Small Bore Precision Orifice Meters (incorporated by reference, *see* § 98.7).

(7) ASME MFC–18M–2001 Measurement of Fluid Flow using Variable Area Meters (incorporated by reference, *see* § 98.7).

(8) Method 2A or 2D at 40 CFR part 60, appendix A–1.

(i) All temperature, pressure, and, moisture content monitors required as specified in paragraph (f) of this section must be calibrated using the procedures and frequencies where specified by the device manufacturer, if not specified use an industry accepted or industry standard practice.

(j) All equipment (temperature, pressure, and moisture content monitors and gas flow meters and gas composition monitors) must be maintained as specified by the manufacturer.

(k) If applicable, the owner or operator must document the procedures used to ensure the accuracy of measurements of COD or BOD_5 concentration, wastewater flow rate, biogas flow rate, biogas composition, temperature, pressure, and moisture content. These procedures include, but are not limited to, calibration of gas flow meters, and other measurement devices. The estimated accuracy of measurements made with these devices must also be recorded, and the technical basis for these estimates must be documented.

[75 FR 39767, July 12, 2010, as amended at 76 FR 73904, Nov. 29, 2011]

§ 98.355 Procedures for estimating missing data.

A complete record of all measured parameters used in the GHG emissions calculations is required. Therefore, whenever a quality-assured value of a required parameter is unavailable (*e.g.*, if a meter malfunctions during unit operation or if a required sample is not taken), a substitute data value for the missing parameter must be used in the calculations, according to the following requirements in paragraphs (a) through (c) of this section:

(a) For each missing weekly value of COD or BOD_5 or wastewater flow entering an anaerobic wastewater treatment process, the substitute data value must be the arithmetic average of the quality-assured values of those parameters for the week immediately preceding and the week immediately following the missing data incident.

(b) For each missing value of the CH_4 content or biogas flow rates, the substitute data value must be the arithmetic average of the quality-assured values of that parameter immediately preceding and immediately following the missing data incident.

(c) If, for a particular parameter, no quality-assured data are available prior to the missing data incident, the substitute data value must be the first quality-assured value obtained after the missing data period. If, for a particular parameter, the ''after'' value is not obtained by the end of the reporting year, you may use the last quality-assured value obtained ''before'' the missing data period for the missing data substitution. You must document and keep records of the procedures you use for all such estimates.

[75 FR 39767, July 12, 2010, as amended at 76 FR 73905, Nov. 29, 2011]

§ 98.356 Data reporting requirements.

In addition to the information required by § 98.3(c), each annual report must contain the following information for each wastewater treatment system.

(a) A description or diagram of the industrial wastewater treatment system, identifying the processes used to treat industrial wastewater and industrial wastewater treatment sludge. Indicate how the processes are related to each other and identify the anaerobic processes. Provide a unique identifier for each anaerobic process, indicate the average depth in meters of each anaerobic lagoon, and indicate whether biogas generated by each anaerobic process is recovered. The anaerobic processes must be identified as:

(1) Anaerobic reactor.

(2) Anaerobic deep lagoon (depth more than 2 meters).