

3745-76-09 **Test methods and procedures.**

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules, and federal statutory provisions referenced in this rule, see the last paragraph of rule 3745-76-01 of the Administrative Code titled "Incorporation by reference."]

(A)

(1) The landfill owner or operator shall calculate the NMOC emission rate using either the equation provided in paragraph (A)(1)(a) of this rule or the equation provided in paragraph (A)(1)(b) of this rule. Both equations may be used if the actual year-to-year solid waste acceptance rate is known, as specified in paragraph (A)(1)(a) of this rule, for part of the life of the landfill and the actual year-to-year solid waste acceptance rate is unknown, as specified in paragraph (A)(1)(b) of this rule, for part of the life of the landfill. The values to be used in both equations are 0.05 per year for  $k$ , one hundred seventy cubic meters per megagram for  $L_o$ , and four thousand parts per million by volume as hexane for the  $C_{NMOC}$ . For landfills located in geographical areas with a thirty year annual average precipitation of less than twenty five inches, as measured at the nearest representative official meteorologic site, the  $k$  value to be used is 0.02 per year.

(a) The following equation shall be used if the actual year-to-year solid waste acceptance rate is known.

$$M_{NMOC} = \sum_{i=1}^n 2kL_oM_i(e^{-kt_i})(C_{NMOC})(3.6 \times 10^{-9})$$

Where,  $M_{NMOC}$  = total NMOC emission rate from the landfill, megagrams per year

$k$  = methane generation rate constant, year<sup>-1</sup>

$L_o$  = methane generation potential, cubic meters per megagram solid waste

$M_i$  = mass of solid waste in the  $i^{\text{th}}$  section, megagrams

$t_i$  = age of the  $i^{\text{th}}$  section, years

$C_{NMOC}$  = concentration of NMOC, parts per million by volume as hexane

$3.6 \times 10^{-9}$  = conversion factor

The mass of nondegradable solid waste may be subtracted from the total mass of solid waste in a particular section of the landfill when calculating

the value for  $M_i$  if documentation of the nature and amount of such wastes is maintained.

- (b) The following equation shall be used if the actual year-to-year solid waste acceptance rate is unknown.

$$M_{\text{NMOC}} = 2L_oR (e^{-kc} - e^{-kt}) (C_{\text{NMOC}}) (3.6 \times 10^{-9})$$

Where,

$M_{\text{NMOC}}$  = mass emission rate of NMOC, megagrams per year

$L_o$  = methane generation potential, cubic meters per megagram solid waste

$R$  = average annual acceptance rate, megagrams per year

$k$  = methane generation rate constant, year<sup>-1</sup>

$t$  = age of landfill, years

$C_{\text{NMOC}}$  = concentration of NMOC, parts per million by volume as hexane

$c$  = time since closure, years. For active landfill  $c = 0$  and  $e^{-kc} = 1$

$3.6 \times 10^{-9}$  = conversion factor

The mass of nondegradable solid waste may be subtracted from the average annual acceptance rate when calculating a value for  $R$ , if documentation of the nature and amount of such wastes is maintained.

- (2) Tier 1. The owner or operator shall compare the calculated NMOC mass emission rate to the standard of fifty megagrams per year.
- (a) If the NMOC emission rate calculated in paragraph (A)(1) of this rule is less than fifty megagrams per year, then the landfill owner shall submit an emission rate report as provided in paragraph (B)(1) of rule 3745-76-12 of the Administrative Code, and shall recalculate the NMOC mass emission rate annually as required under paragraph (B)(1) of rule 3745-76-07 of the Administrative Code.
- (b) If the calculated NMOC emission rate is equal to or greater than fifty megagrams per year, then the landfill owner shall either comply with paragraph (B)(2) of rule 3745-76-07 of the Administrative Code, or determine a site-specific NMOC concentration and recalculate the NMOC emission rate using the procedures provided in paragraph (A)(3) of this rule.

- (3) Tier 2. The landfill owner or operator shall determine the NMOC concentration using the following sampling procedure. The landfill owner or operator shall install at least two sample probes per hectare of landfill surface that has retained waste for at least two years. If the landfill is larger than twenty five hectares in area, only fifty samples are required. The sample probes should be located to avoid known areas of nondegradable solid waste. The owner or operator shall collect and analyze one sample of landfill gas from each probe to determine the NMOC concentration using Method 25 or Method 25C of Appendix A of 40 CFR Part 60. Method 18 of Appendix A of 40 CFR Part 60 may be used to analyze the samples collected by the Method 25 or 25C sampling procedure. . If more than the required number of samples are taken, all samples shall be used in the analysis. The landfill owner or operator shall divide the NMOC concentration from Method 25 or Method 25C of Appendix A of 40 CFR part 60 by six to convert from  $C_{\text{NMOC}}$  as carbon to  $C_{\text{NMOC}}$  as hexane.
- (a) Taking composite samples from different probes into a single cylinder is allowed; however, equal sample volumes must be taken from each probe. For each composite, the sampling rate, collection times, beginning and ending cylinder vacuums, or alternative volume measurements must be recorded to verify that composite volumes are equal. Composite sample volumes should not be less than one liter, unless evidence can be provided to substantiate the accuracy of smaller volumes. The compositing shall be terminated before the cylinder approaches ambient pressure where measurement accuracy diminishes.
- (b) If using Method 18, the owner or operator must identify all compounds in the sample, and, at a minimum, test for those compounds published in the most recent "Compilation of Air Pollutant Emission Factors (AP-42)", minus carbon monoxide, hydrogen sulfide, and mercury. At a minimum, the instrument must be calibrated for each of the compounds on the list. The concentration of each Method 18 compound shall be converted to  $C_{\text{NMOC}}$  as hexane by multiplying it by the ratio of its carbon atoms divided by six.
- (c) If the landfill has an active or passive gas removal system in place, Method 25 or Method 25C samples may be collected from these systems instead of surface probes, provided the removal system can be shown to provide sampling as representative as the two sampling probe per hectare requirement. For active collection systems, samples may be collected from the common header pipe before the gas moving or condensate removal equipment. For these systems, a minimum of three samples must be collected from the header pipe.
- (d) The landfill owner or operator shall recalculate the NMOC mass emission rate using the equations provided in paragraph (A)(1)(a) or (A)(1)(b) of this rule and using the average NMOC concentration from the collected samples

instead of the default value in the equation provided in paragraph (A)(1) of this rule.

- (e) If the resulting mass emission rate calculated using the site-specific NMOC concentration is equal to or greater than fifty megagrams per year, then the landfill owner or operator shall either comply with paragraph (B)(2) of rule 3745-76-07 of the Administrative Code, or determine the site-specific methane generation rate constant and recalculate the NMOC emission rate using the site-specific methane generation rate using the procedure specified in paragraph (A)(4) of this rule.
  - (f) If the resulting NMOC mass emission rate is less than fifty megagrams per year, the owner or operator shall submit a periodic estimate of the emission rate report as provided in paragraph (B)(1) of rule 3745-76-12 of the Administrative Code and retest the site-specific NMOC concentration every five years using the methods specified in this rule.
- (4) Tier 3. The site-specific methane generation rate constant shall be determined using the procedures provided in Method 2E of Appendix A of 40 CFR Part 60. The landfill owner or operator shall estimate the NMOC mass emission rate using equations in paragraph (A)(1)(a) or (A)(1)(b) of this rule and using a site-specific methane generation rate constant  $k$ , and the site-specific NMOC concentration as determined in paragraph (A)(3) of this rule instead of the default values provided in paragraph (A)(1) of this rule. The landfill owner or operator shall compare the resulting NMOC mass emission rate to the standard of fifty megagrams per year.
- (a) If the NMOC mass emission rate as calculated using the site-specific methane generation rate and concentration of NMOC is equal to or greater than fifty megagrams per year, the owner or operator shall comply with paragraph (B)(2) of rule 3745-76-07 of the Administrative Code.
  - (b) If the NMOC mass emission rate is less than fifty megagrams per year, then the owner or operator shall submit a periodic emission rate report as provided in paragraph (B)(1) of rule 3745-76-12 of the Administrative Code and shall recalculate the NMOC mass emission rate annually, as provided in paragraph (B)(1) of rule 3745-76-12 of the Administrative Code using the equations in paragraph (A)(1) of this rule and using the site-specific methane generation rate constant and NMOC concentration obtained in paragraph (A)(3) of this rule. The calculation of the methane generation rate constant is performed only once, and the value obtained from this test shall be used in all subsequent annual NMOC emission rate calculations.
- (5) The owner or operator may use other methods to determine the NMOC concentration or a site-specific  $k$  as an alternative to the methods required in

paragraphs (A)(3) and (A)(4) of this rule if the method has been approved by the director.

- (B) After the installation of a collection and control system in compliance with rule 3745-76-10 of the Administrative Code, the owner or operator shall calculate the NMOC emission rate for purposes of determining when the system can be removed as provided in paragraph (B)(2)(e) of rule 3745-76-07 of the Administrative Code, using the following equation:

$$M_{\text{NMOC}} = 1.89 \times 10^{-3} Q_{\text{LFG}} C_{\text{NMOC}}$$

Where,

$M_{\text{NMOC}}$  = mass emission rate of NMOC, megagrams per year

$Q_{\text{LFG}}$  = flow rate of landfill gas, cubic meters per minute

$C_{\text{NMOC}}$  = NMOC concentration, parts per million by volume as hexane

- (1) The flow rate of landfill gas,  $Q_{\text{LFG}}$  shall be determined by measuring the total landfill gas flow rate at the common header pipe that leads to the control device using a gas flow measuring device calibrated according to the provisions of section 4 of Method 2E of Appendix A of 40 CFR Part 60.
  - (2) The average NMOC concentration,  $C_{\text{NMOC}}$ , shall be determined by collecting and analyzing landfill gas sampled from the common header pipe before the gas moving or condensate removal equipment using the procedures in Method 25C or Method 18 of Appendix A of 40 CFR Part 60. If using Method 18 of Appendix A of 40 CFR Part 60, the minimum list of compounds to be tested shall be those published in the most recent "Compilation of Air Pollutant Emission Factors (AP-42)". The sample location on the common header pipe shall be before any condensate removal or other gas refining units. The landfill owner or operator shall divide the NMOC concentration from Method 25C of Appendix A of 40 CFR Part 60 by six to convert from  $C_{\text{NMOC}}$  as carbon to  $C_{\text{NMOC}}$  as hexane.
  - (3) The owner or operator may use another method to determine landfill gas flow rate and NMOC concentration if the method has been approved by the director.
- (C) When calculating emissions for PSD purposes, the owner or operator of each MSW landfill subject to the provisions of this chapter shall estimate the NMOC emission rate for comparison to the major stationary source and significant levels in rule 3745-31-01 of the Administrative Code using AP-42 or other approved measurement procedures. If a collection system, which complies with the provisions in paragraph (B)(2) of rule 3745-76-07 of the Administrative Code is already installed, the owner

or operator shall estimate the NMOC emission rate using the procedures provided in paragraph (B) of this rule.

- (D) For the performance test required in paragraph (B)(2)(c)(ii) of rule 3745-76-07 of the Administrative Code, Method 25C or Method 18 of appendix A of 40 CFR Part 60 shall be used to determine compliance with ninety eight weight-per cent efficiency or the twenty parts per million volume outlet concentration level, unless another method to demonstrate compliance has been approved by the director as provided by paragraph (B)(2)(a)(ii) of rule 3745-76-07 of the Administrative Code. If using Method 18 of Appendix A of 40 CFR Part 60, the minimum list of compounds to be tested shall be those published in the most recent "Compilation of Air Pollutant Emission Factors (AP-42)". The following equation shall be used to calculate efficiency:

$$\text{Control efficiency} = (\text{NMOC}_{\text{IN}} - \text{NMOC}_{\text{OUT}}) / (\text{NMOC}_{\text{IN}})$$

Where,

$\text{NMOC}_{\text{IN}}$  = mass of NMOC entering control device

$\text{NMOC}_{\text{OUT}}$  = mass of NMOC exiting control device

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Certification

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