

collection and control system contributing to venting of the gas to the atmosphere shall be closed within 1 hour; and

(f) Operate the control or treatment system at all times when the collected gas is routed to the system.

(g) If monitoring demonstrates that the operational requirements in paragraphs (b), (c), or (d) of this section are not met, corrective action shall be taken as specified in §60.755(a)(3) through (5) or §60.755(c) of this subpart. If corrective actions are taken as specified in §60.755, the monitored exceedance is not a violation of the operational requirements in this section.

[61 FR 9919, Mar. 12, 1996, as amended at 63 FR 32751, June 16, 1998]

EFFECTIVE DATE NOTE: At 63 FR 32751, June 16, 1998, §60.753 was amended by revising the introductory text of the section; by revising the second sentence of paragraph (d); and by revising the first sentence of paragraph (g), effective Aug. 17, 1998. For the convenience of the user, the superseded text is set forth as follows:

**§ 60.753 Operational standards for collection and control systems.**

Each owner or operator of an MSW landfill gas collection and control system used to comply with the provisions of §60.752(b)(2)(ii) of this subpart shall:

(d) \* \* \* To determine if this level is exceeded, the owner or operator shall conduct surface testing around the perimeter of the collection area along a pattern that traverses the landfill at 30 meter intervals and where visual observations indicate elevated concentrations of landfill gas, such as dis-

tressed vegetation and cracks or seeps in the cover. \* \* \*

\* \* \* \* \*

(g) If monitoring demonstrates that the operational requirement in paragraphs (b), (c), or (d) of this section are not met, corrective action shall be taken as specified in §60.752(a) (3) through (5) or §60.755(c) of this subpart. \* \* \*

**§ 60.754 Test methods and procedures.**

(a)(1) The landfill owner or operator shall calculate the NMOC emission rate using either the equation provided in paragraph (a)(1)(i) of this section or the equation provided in paragraph (a)(1)(ii) of this section. Both equations may be used if the actual year-to-year solid waste acceptance rate is known, as specified in paragraph (a)(1)(i), 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)(ii), for part of the life of the landfill. The values to be used in both equations are 0.05 per year for k, 170 cubic meters per megagram for L<sub>o</sub>, and 4,000 parts per million by volume as hexane for the C<sub>NMOC</sub>. For landfills located in geographical areas with a thirty year annual average precipitation of less than 25 inches, as measured at the nearest representative official meteorologic site, the k value to be used is 0.02 per year.

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

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

where,

- M<sub>NMOC</sub>=Total NMOC emission rate from the landfill, megagrams per year
- k=methane generation rate constant, year<sup>-1</sup>
- L<sub>o</sub>=methane generation potential, cubic meters per megagram solid waste
- M<sub>i</sub>=mass of solid waste in the i<sup>th</sup> section, megagrams
- t<sub>i</sub>=age of the i<sup>th</sup> section, years
- C<sub>NMOC</sub>=concentration of NMOC, parts per million by volume as hexane
- 3.6 × 10<sup>-9</sup>=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<sub>i</sub> if documentation of the nature and amount of such wastes is maintained

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

$$M_{NMOC} = 2 L_o R (e^{-k_c} - e^{-k t}) (C_{NMOC}) (3.6 \times 10^{-9})$$

where,

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

$L_0$ =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 50 megagrams per year.

(i) If the NMOC emission rate calculated in paragraph (a)(1) of this section is less than 50 megagrams per year, then the landfill owner shall submit an emission rate report as provided in §60.757(b)(1), and shall recalculate the NMOC mass emission rate annually as required under §60.752(b)(1).

(ii) If the calculated NMOC emission rate is equal to or greater than 50 megagrams per year, then the landfill owner shall either comply with §60.752(b)(2), or determine a site-specific NMOC concentration and recalculate the NMOC emission rate using the procedures provided in paragraph (a)(3) of this section.

(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 2 years. If the landfill is larger than 25 hectares in area, only 50 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 25C of appendix A of this part or Method 18 of appendix A of this part. If using Method 18 of appendix A of this part, the minimum list of compounds to be tested shall be those published in the most

recent Compilation of Air Pollutant Emission Factors (AP-42). If composite sampling is used, equal volumes shall be taken from each sample probe. 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 25C of appendix A of this part by six to convert from  $C_{\text{NMOC}}$  as carbon to  $C_{\text{NMOC}}$  as hexane.

(i) The landfill owner or operator shall recalculate the NMOC mass emission rate using the equations provided in paragraph (a)(1)(i) or (a)(1)(ii) of this section 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 section.

(ii) If the resulting mass emission rate calculated using the site-specific NMOC concentration is equal to or greater than 50 megagrams per year, then the landfill owner or operator shall either comply with §60.752(b)(2), 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 section.

(iii) If the resulting NMOC mass emission rate is less than 50 megagrams per year, the owner or operator shall submit a periodic estimate of the emission rate report as provided in §60.757(b)(1) and retest the site-specific NMOC concentration every 5 years using the methods specified in this section.

(4) *Tier 3.* The site-specific methane generation rate constant shall be determined using the procedures provided in Method 2E of appendix A of this part. The landfill owner or operator shall estimate the NMOC mass emission rate using equations in paragraph (a)(1)(i) or (a)(1)(ii) of this section and using a site-specific methane generation rate constant  $k$ , and the site-specific NMOC concentration as determined in paragraph (a)(3) of this section instead of the default values provided in paragraph (a)(1) of this section. The landfill owner or operator shall compare the resulting NMOC

mass emission rate to the standard of 50 megagrams per year.

(i) 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 50 megagrams per year, the owner or operator shall comply with § 60.752(b)(2).

(ii) If the NMOC mass emission rate is less than 50 megagrams per year, then the owner or operator shall submit a periodic emission rate report as provided in § 60.757(b)(1) and shall recalculate the NMOC mass emission rate annually, as provided in § 60.757(b)(1) using the equations in paragraph (a)(1) of this section and using the site-specific methane generation rate constant and NMOC concentration obtained in paragraph (a)(3) of this section. 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 section if the method has been approved by the Administrator.

(b) After the installation of a collection and control system in compliance with § 60.755, the owner or operator shall calculate the NMOC emission rate for purposes of determining when the system can be removed as provided in § 60.752(b)(2)(v), 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 this part.

(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 this part. If using Method 18 of appendix A of this part, 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 this part 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 Administrator.

(c) When calculating emissions for PSD purposes, the owner or operator of each MSW landfill subject to the provisions of this subpart shall estimate the NMOC emission rate for comparison to the PSD major source and significance levels in §§ 51.166 or 52.21 of this chapter using AP-42 or other approved measurement procedures.

(d) For the performance test required in § 60.752(b)(2)(iii)(B), Method 25C or Method 18 of appendix A of this part shall be used to determine compliance with 98 weight-percent efficiency or the 20 ppmv outlet concentration level, unless another method to demonstrate compliance has been approved by the Administrator as provided by § 60.752(b)(2)(i)(B). If using Method 18 of appendix A of this part, 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:

$$\text{Control Efficiency} = \frac{(\text{NMOC}_{\text{in}} - \text{NMOC}_{\text{out}})}{(\text{NMOC}_{\text{in}})}$$

where,

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

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

[61 FR 9919, Mar. 12, 1996, as amended at 63 FR 32751, June 16, 1998]

EFFECTIVE DATE NOTE: At 63 FR 32751, June 16, 1998, §60.754 was amended by removing the phrase "if the documentation provisions of §60.758(d)(2) are followed", and inserting in its place "if documentation of the nature and amount of such wastes is maintained" in the last sentence of paragraphs (a)(1) (i) and (ii); by revising the last sentence of paragraph (a)(4)(ii); by removing the phrase "as provided in §60.752(b)(2)(i)(B)" from paragraphs (a)(5) and (b)(3); by removing the the words "Method 25" and inserting the word "Method 25C" in paragraph (d); and by revising paragraphs (a)(1) introductory text and paragraph (c), effective Aug. 17, 1998. For the convenience of the user, the superseded text is set forth as follows:

**§ 60.754 Test methods and procedures.**

(a)(1) The landfill owner or operator shall calculate the NMOC emission rate using either the equation provided in paragraph (a)(1)(i) of this section or the equation provided in paragraph (a)(1)(ii) of this section. The values to be used in both equations are 0.05 per year for k, 170 cubic meters per megagram for L<sub>o</sub>, and 4,000 parts per million by volume as hexane for the C<sub>NMOC</sub>.

\* \* \* \* \*

(4) \* \* \* (ii) \* \* \* The calculation of the methane generation rate constant is performed only once, and the value obtained is used in all subsequent annual NMOC emission rate calculations.

\* \* \* \* \*

(c) The owner or operator of each MSW landfill subject to the provisions of this subpart shall estimate the NMOC emission rate for comparison to the PSD major source and significance levels in §§51.166 or 52.21 of this chapter using AP-42 or other approved measurement procedures. If a collection system, which complies with the provisions in §60.752(b)(2) is already installed, the owner or operator shall estimate the NMOC emission rate using the procedures provided in paragraph (b) of this section.

\* \* \* \* \*

**§ 60.755 Compliance provisions.**

(a) Except as provided in §60.752(b)(2)(i)(B), the specified methods in paragraphs (a)(1) through (a)(6) of this section shall be used to determine whether the gas collection system is in compliance with §60.752(b)(2)(ii).

(1) For the purposes of calculating the maximum expected gas generation flow rate from the landfill to deter-

mine compliance with §60.752(b)(2)(ii)(A)(I), one of the following equations shall be used. The k and L<sub>o</sub> kinetic factors should be those published in the most recent Compilation of Air Pollutant Emission Factors (AP-42) or other site specific values demonstrated to be appropriate and approved by the Administrator. If k has been determined as specified in §60.754(a)(4), the value of k determined from the test shall be used. A value of no more than 15 years shall be used for the intended use period of the gas mover equipment. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

(i) For sites with unknown year-to-year solid waste acceptance rate:

$$Q_m = 2L_o R (e^{-kc} - e^{-kt})$$

where,

Q<sub>m</sub> = maximum expected gas generation flow rate, cubic meters per year

L<sub>o</sub> = 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 the landfill at equipment installation plus the time the owner or operator intends to use the gas mover equipment or active life of the landfill, whichever is less. If the equipment is installed after closure, t is the age of the landfill at installation, years

c = time since closure, years (for an active landfill c = 0 and e<sup>-kc</sup> = 1)

(ii) For sites with known year-to-year solid waste acceptance rate:

$$Q_M = \sum_{i=1}^n 2 k L_o M_i (e^{-kt_i})$$

where,

Q<sub>M</sub>=maximum expected gas generation flow rate, cubic meters per year

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

L<sub>o</sub>=methane generation potential, cubic meters per megagram solid waste

M<sub>i</sub>=mass of solid waste in the i<sup>th</sup> section, megagrams

t<sub>i</sub>=age of the i<sup>th</sup> section, years

(iii) If a collection and control system has been installed, actual flow data may be used to project the maximum expected gas generation flow rate instead of, or in conjunction with, the equations in paragraphs (a)(1) (i) and