REGULATION 6.45 Standards of Performance for Existing Solid Waste Landfills

Air Pollution Control District of Jefferson County
Jefferson County, Kentucky

Relates To: KRS Chapter 77 Air Pollution Control
Pursuant To: KRS Chapter 77 Air Pollution Control
Necessity and Function: KRS 77.180 provides that the Air Pollution Control Board may make and enforce all needful orders, rules, and regulations necessary or proper to accomplish the purposes of KRS Chapter 77. This regulation provides for the control of volatile organic compound emissions from existing solid waste landfills.

SECTION 1 Applicability

This regulation applies to each existing solid waste landfill located in Jefferson County, Kentucky that commenced operation before the effective date of this regulation and is still in operation.

SECTION 2 Definitions

Terms used in this regulation not defined herein shall have the meaning given them in Regulation 1.02.

2.1 "Affected facility" means each solid waste landfill for which construction, modification, or reconstruction commenced before the effective date of this regulation.

2.2 "Commercial solid waste" means all types of solid waste generated by stores, offices, restaurants, warehouses, and other nonmanufacturing activities, excluding household and industrial wastes. Commercial solid waste includes waste from medical facilities, schools, and other institutions that is not medical waste.

2.3 "Contained landfill" means a solid waste site or facility which accepts for disposal solid waste including residential, commercial, institutional, industrial, municipal solid waste, shredded tires, household hazardous waste, limited quantity generator hazardous waste and spill cleanup residues that are not hazardous waste.

2.4 "Controlled landfill" means any landfill at which collection and control systems are required as a result of the nonmethane organic compound emission rate. The landfill is considered controlled at the time a collection and control system is installed, tested, and operated in compliance with Section 3.

2.5 "Design capacity" means the maximum amount of waste landfill can accept, as specified in the Division of Waste Management permit.

2.6 "Hazardous waste" means any discarded material or material intended to be discarded or substance or combination of such substance intended to be discarded, in any form which, because of its quantity, concentration or physical, chemical or infectious characteristics, may cause, or significantly contribute to, an increase in mortality or an increase in serious

irreversible or incapacitating reversible illness or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

2.7 "Household solid waste" means any solid waste including garbage and trash generated by single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, and recreational areas such as picnic areas, parks, and campgrounds.

2.8 "Industrial waste" means a liquid, gaseous, or solid waste substance resulting from a process of industry, manufacture, trade, or business, or from the development, processing, or recovery of a natural resource.

2.9 "Landfill" means an area of land or an excavation in which wastes are placed for permanent disposal, and which is not a land application unit, surface impoundment, injection well, or waste pile.

2.10 "NMOC" means nonmethane organic compound.

2.11 "Sludge" means any solid, semi-solid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, or air pollution control facility, exclusive of the treated effluent from a wastewater treatment plant.

2.12 "Solid waste" means any garbage, refuse, sludge and other discarded material, including solid, liquid, semi-solid or contained gaseous material resulting from industrial, commercial, mining (excluding coal mining waste, coal mining by products, refuse and overburden), agricultural operations, and from community activities, but does not include, but not limited to the following materials, sand, soil, rock, gravel, or bridge debris extracted as a part of a public road construction project funded wholly or in part with state funds, recovered material, special waste as designated by KRS 224.50-760, solid or dissolved material in domestic sewage, manure, crops, crop residue, or a combination thereof which is placed on the soil for return to the soil as fertilizers or soil conditioners, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880), or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923).

2.13 "Solid waste landfill" (SWL) means an entire disposal facility in a contiguous geographical space where household waste is placed in or on land. A SWL may also receive commercial waste, sludges, and industrial solid waste. Portions of any SWL may be separated by access roads. A SWL may be publicly or privately owned.

2.14 "Solid waste landfill emissions" means any gas derived through a natural process from the decomposition of organic waste deposited in a SWL site or from the evolution of volatile organics species in the waste.

SECTION 3 Standards for Air Emissions

3.1 Each owner or operator subject to this regulation shall calculate a NMOC emission rate for the landfill using the procedures in Appendix A or B.

3.1.1 If the calculated NMOC emission rate is less than 150 Mg/yr (167 tpy), the owner or operator shall:

3.1.1.1 Submit an annual emission report to the District, and

3.1.1.2 Recalculate the NMOC emission rate semi-annually until such time as the NMOC emission rate is equal to or greater than 150 Mg/yr (167 tpy) and a collection and control system is installed, or the landfill is closed.

3.1.2 If the calculated NMOC emission rate is equal to or greater than 150 Mg/yr (167 tpy), the owner or operator shall install a collection and control system in compliance with the following:

3.1.2.1 The owner/operator shall submit to the District, within 180 days, a permit application to install a collection and control system containing the following:

3.1.2.1.1 A collection and control system design plan,

3.1.2.1.2 A compliance plan to install a collection and control system by no later than May 1, 1996, and

3.1.2.1.3 A design for a collection system that shall effectively capture the gas that is generated within the landfill. The collection system shall:

3.1.2.1.3.1 Be designed to handle the maximum expected gas flowrate over the lifetime of the gas control or treatment system from the entire area of the landfill that warrants control over the lifetime of the system,

3.1.2.1.3.2 Collect gas from each area, cell, or group of cells in the landfill in which refuse has been placed for a period of two years or more, and

3.1.2.1.3.3 Collects gas at a sufficient extraction rate that when controlled pursuant to section 3.1.2.2 the NMOC emission rate shall not exceed 150 Mg/yr (167 tpy) for the landfill.

3.1.2.2 The collected gas shall be routed to:

3.1.2.2.1 An open flare designed and operated in accordance with 40 CFR Section 60.18,

3.1.2.2.2 A control system designed and operated within the parameters demonstrated in the performance test to reduce NMOCs by 98% by weight,

3.1.2.2.3 An enclosed combustor. Reduction of the outlet NMOC concentration to 20 ppmvd as hexane at 3% oxygen is required. The ppmvd shall be established by Method 25, or

3.1.2.2.4 A treatment system that processes the collected gas for subsequent sale or use.

3.1.2.3 The collection and control device may be capped or removed provided the following conditions are met:

3.1.2.3.1 The landfill must no longer be accepting waste and be permanently closed. A copy of the closure report submitted to the Division of Waste Management must be submitted to the District, and

3.1.2.3.2 The collection and control system must have been in continuous operation a minimum of 15 years, and the calculated NMOC emission rate must be less than 150 Mg/yr (167 tpy) on three successive test dates. The test dates must be no closer than three months apart, and no longer than six months apart.

3.1.3 The following methods shall be used to determine whether or not the gas collection system is in compliance:

3.1.3.1 Calculate the maximum expected gas generation flowrate from the landfill using the procedures in Appendix C, and

3.1.3.2 Determine whether the control device is operating according to the parameters established in 40 CFR Section 60.18 (for open flares), or for other control devices the parameters established in the performance test, to reduce NMOCs by 98% by weight (see Section 4), or

3.1.3.3 The owner or operator seeking to demonstrate compliance with a device other than open or enclosed flare, boiler, gas turbine, incinerator or internal combustion engine shall provide the District information proving continuous achievement of these standards.

SECTION 4 Monitoring and Reporting Requirements

4.1 The owner or operator shall install a sampling port at, each well and measure and record the gauge pressure in the gas collection header on a monthly basis.

4.2 The owner or operator using an enclosed combustion device shall install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment:

4.2.1 A temperature monitoring device equipped with a continuous recorder having an accuracy of $\pm$1% of the temperature being measured expressed in degrees Celsius or $\pm$ 0.5^{o}C, whichever is greater, and

4.2.2 A flow indicator and recorder that records at 15 minute intervals the gas flow to the control device.

4.3 The owner or operator using an open flare shall install, calibrate, maintain, and operate according to manufacturer's specifications the following equipment:

4.3.1 A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light to indicate the continuous presence of a flame, and

4.3.2 A flow indicator and recorder that records at 15 minute intervals the gas flow to the flare.

4.4 The owner or operator using a device other an open flare or a closed combustion device shall provide to the District information describing the operation of the control device and its parameters that indicate proper performance.

SECTION 5 Compliance Timetable

All existing landfills shall be in compliance with this regulation no later than May 1, 1996.

Adopted v1/2-2-94; effective 2-2-94.

	Date Submitted	Date Approved	Federal Register
Original Reg:	06/30/97	09/13/99	64 FR 49404
1st Revision:	07/20/99	10/23/01	66 FR 53658

Appendix A to Regulation 6.45

NMOC EMISSION RATE CALCULATIONS

The owner or operator shall estimate the NMOC emission rate using the following equations:

1. If the actual year-to-year acceptance rate is known:

$$Q_t = \sum_{I=1}^{n} 2\ k\ L_g\ M_t\ (e^{-kti})\ (C_{NMOC})\ (3.595\ 10^{-9})$$

where:

Q_t = Total NMOC emission rate from the landfill, Mg/yr.
k = landfill gas generation constant, 1/yr.
L_g = methane generation potential, m^3/Mg.
M_t = mass of refuse in the i^{th} section, Mg.
t_i = age of the i^{th} section, yrs.
C_{NMOC} = concentration of NMOC, ppmv as hexane.
$3.595\ 10^{-9}$ = conversion factor.

The total NMOC emission rate is the sum of each NMOC emission rate for each yearly mass.

2. If the actual year-by-year refuse acceptance rate is unknown:

$$M_{NMOC} = 2\ L_g\ R\ (1-e^{-kt})\ (C_{NMOC})\ (3.595\ 10^{-9})$$

where:

M_{NMOC} = mass emission rate of NMOC, Mg/yr.
L_g = refuse methane generation potential, m^3/Mg.
R = average annual acceptance rate, Mg/yr.
k = methane generation rate constant, 1/yr.
t = age of landfill, yrs.
C_{NMOC} = concentration of NMOC, ppmv as hexane.

$3.595\ 10^{-9}$= conversion factor.

In the absence of site-specific data, the values for k, L_g, and C_{NMOC} are 0.02/yr, 230 m^3/Mg, and 8000 ppmv as hexane, respectively.

3. Once the NMOC calculation is done, compare the calculated NMOC mass emission rate to the standard of 150 Mg/yr (167 tpy).

3.1 If the calculated NMOC emission rate is less than the standard, then the owner or operator shall submit an emission rate report, and shall recalculate the NMOC mass emission rate quarterly.

3.2 If the calculated NMOC emission rate is greater than or equal to the standard, then the owner or operator shall either install controls, or determine a site-specific NMOC concentration using the following sampling procedure:

3.2.1 The owner or operator shall install a minimum of five sample probes. The owner or operator shall collect and analyze landfill gas from each sample probe for NMOC concentration using EPA Method 25C. The owner or operator shall recalculate the NMOC mass emission rate using the average NMOC concentration from the collected samples.

3.2.1.1 If the mass emission rate is equal to or greater than the standard, then the owner or operator shall install controls.

3.2.1.2 If the mass emission rate is less than the standard, then the owner or operator shall demonstrate that the NMOC mass emission rate is below the standard with 80% confidence.

80% confidence shall be determined by the following equation:

$$n = (t_{.20})^2 s^2 / D^2$$

where:

n = number of samples required to demonstrate 80% confidence.

$t_{.20}$ = student-t value for a two-tailed confidence interval with a 20% probability and for a degree of freedom equal to the initial number of samples less than one. (for a minimum of five initial samples, the degree of freedom is four, and the corresponding t value is 1.533).

s = standard deviation of the initial set of samples, ppmv.

$$D = \frac{\text{NMOC mass emission rate cutoff - } M_{NMOC}}{2\ L_g\ R\ (e^{-kc} - e^{-kt})(3.595\ 10^{-9})}$$

where:

C = years since closure (0 for active landfills)

The other variables are as defined previously.

4. The owner or operator shall then recalculate the mass emission rate using Method 1 or 2 with the "n" number of samples from 3.2.1 to determine new average NMOC concentration.

4.1 If the new mass emission rate is equal to or greater than the standard, then the owner or operator shall install controls.

4.2 If the new mass emission rate is less than the standard, then the owner or operator shall submit an annual or 5-year estimate of the emission rate, and shall update site-specific NMOC concentration using Method 25C procedures every 5 years.

4.3 The owner or operator shall estimate the NMOC mass emission rate using a site-specific landfill gas generation rate constant - k. The gas generation constant and the mass emission rate shall be determined using the procedures in EPA Method 2E.

5. Next, compare the new mass emission rate to the standard.

5.1 If the NMOC emission rate is equal to or greater than the standard, then the owner or operator shall install controls.

5.2 If the NMOC emission rate is less than the standard, then the owner or operator shall submit an annual emission rate report and shall recalculate the NMOC mass emission rate annually using the site-specific landfill gas generation rate constant. The gas generation rate constant calculation is performed only once, and the value obtained is used in all subsequent annual NMOC emission rate calculations.

APPENDIX B TO REGULATION 6.45

NMOC EMISSION RATE CALCULATION IF CONTROLS ARE REQUIRED

After the installation of a collection and control system in compliance with section 3.1.2, the owner or operator shall estimate the NMOC emission rate using the following equation:

$$M_{NMOC}=1.89\ 10^{-3}\ V_{LFG}\ C_{NMOC}$$

where:

M_{NMOC} = mass emission rate of NMOC, Mg/yr.

V_{LFG} = flowrate of landfill gas, m3/min.

C_{NMOC} = NMOC concentration, ppmv as hexane.

V_{LFG} shall be obtained by measuring the total landfill gas flowrate using an orifice meter as described in Method 2E at the common header pipe that leads to the control device.

C_{NMOC} shall be determined by collecting and analyzing landfill gas sampled from the common header pipe using EPA Method 25C.

APPENDIX C TO REGULATION 6.45

COMPLIANCE CALCULATIONS

The equation for maximum expected gas generation flowrate.

$$Q^m = 2\ L^e\ R\ (1\text{-}e^{\text{-}kt})$$

where:

Q_m = maximum expected gas generation flow rate, m^3/yr.

L_g = refuse methane generation potential, m^3/Mg refuse.

R = average annual acceptance rate, Mg/yr.

k = methane generation rate constant, 1/yr.

t = age of the landfill plus the gas mover equipment life or active life of the landfill, whichever is less, in years.

The value of 230 m^3/Mg shall be used for Lg. A value of .02 $years^{-1}$ shall be used unless a Method 2E has been performed for the value of k. A value of 15 years shall be used for the gas mover equipment life. The active life of the landfill is the age of the landfill plus the estimated number of years until closure.

For the purpose of calculating the area of influence of the gas collection system, Method 2E shall be used.

For the purpose of demonstrating whether the gas collection system flowrate is sufficient to determine compliance, measure gauge pressure in the gas collection header. If a positive pressure exists, the gas flow collection system shall be increased until a negative pressure is measured.

If the gauge pressure at a wellhead is positive, open the valve to restore negative pressure. If negative pressure can not be achieved, then an additional well shall be added.