**Landfills: Regulations, Design/Operation, Emissions, and Inspection**

**Course #491**

**Draft Agenda**

**Internet Course**

**Dates: November 11-15, 2021**

**Course Instructor:**

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**Kevin Mattison; B.S.**

Topics Dealing with Landfill History and Regulations

**Day 1 Times below are Central Time (CT)**

**8:30 AM** Introduction to the course and materials

**8:40 AM** Background of Landfills

a. History of Landfills/Garbage

b. What is a Municipal Solid Waste (MSW)?

c. Municipal Solid Waste Landfill Types and Operations

d. What is MSW Landfill Gas (LFG) Constituents?

**10:00 AM** Regulations Associated with MSW Landfills

* 1. Introduction
  2. 40 CFR63 Subpart AAA National Emission Standards for Hazardous Air Pollutants; Municipal Solid Waste Landfills, Residual Risk
  3. 40 CFR60, Subpart Cc: Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills
  4. MSW 40CFR60, Subpart WWW: MSW Landfill
  5. 40 CFR Part 60 Subpart XXX
  6. 40 CFR part 60 Subpart Cf
  7. GHGRP Subpart HH

**11:45** **AM** Overview of Landfill Operations, Landfill Types and Liners

**12:00 PM** Bioreactor Landfills & Video

**12:45 PM ADJOURN**

**Day 2**

**8:30 AM** Landfill Gas Constituents, Design and Operation

1. Landfill Gas Collection Systems and Timelines
2. Evaluating Existing Gas Collection Systems and Well Operation
3. Landfill Gas Control Systems/Odor Migration Techniques
4. Surface Scans
5. Landfill Wells: Low Methane Generation and “Hot” Wells
6. Siloxanes Formaldehyde and PFOS’s

Topics Dealing with Monitoring Landfill Gas Emissions Utilizing Federal Reference Methods (FRMs)

**Day 2**

**9:30** A**M** Federal Reference Method 18

* 1. Introduction
  2. FRM 18 and Determining Landfill Gas Emissions
     1. Tier 1: Calculate NMOC Emission Rate Using Default Values
     2. Tier 2: Determine NMOC Emission Rate Using FRM 18, 25 or 25C
     3. Tier 3: Determination of Methane Generating Rate Constant Using FRM 2E
  3. FRM 18 Overview
  4. FRM 18 Techniques
     1. Canister Sampling
     2. Solid Adsorbent Sampling
     3. Flexible Tedlar Bag Sampling
     4. Direct GC Sampling
  5. FRM 18 Applicability to MSWs

**10:30 AM** Federal Reference Method 21**(Agency Checklist)**

* 1. Introduction
  2. Equipment Specifications
     1. VOC Response
     2. Measurement Range
     3. Scale Resolution
     4. Flow Rate Requirements
     5. Intrinsically Safe
     6. Sample Probe Construction
  3. Performance Specification
     1. Response Factor Determination
     2. Calibration Precision Test

Response Time Test

**11:00 AM** Federal Reference Methods 2E, 3A, and 3C

a. Introduction and Applicability

b. Principle of Methodology

c. Placement of Gas Extraction Wells

d. Gas Flow Rate Testing

e. Determination of Gas Constituents for O2 and CO2

* 1. Performance Specifications Associated with FRM 2E, 3A, and 3C

**11:30 AM** Federal Reference Method 25/25A/25C

a. Introduction and Applicability

b. Principle and Sampling System

c. Pilot Probe

d. Weaknesses/Strengths of FRM 25/25A/25C to LFG Monitoring

**12:45 PM Adjourn**

Topics Dealing with Landfill Design/Operation/Control Devices and Vapor Migration

**Day 3**

**8:30 AM** Landfill Gas Collection System Review

**9:30 AM** Landfill Gas Emission Model LandGEM and Other Empirical Gas Generation Models for Predicting Emissions and examples

**10:00** A**M** Gas Migration/Vapor Intrusion

1. Screening-Level Vapor Migration Modeling
2. Determining the Extent of Methane Migration
3. Mitigation Strategies for Subsurface Vapor Migration
4. Indoor Vapor Intrusion from Contaminated Groundwater

**11:00 AM** Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned

Facilities and Examples EPA-600/R-05/123 a,b,c

Landfill Gas Controls and Odors associated with Landfills

**11:30 AM** Landfill Gas Control Systems and Their Operations

a. Open or Candlestick Flares

b. Enclosed Flares

c. Carbon Adsorption Systems

d. Biofiltration Systems

e. Turbines and Internal Combustion (IC) Engines and Gas Treatment

f. Sulfur removal equipment

**12:45 PM** Adjourn

**Day 4**

**8:30 PM** Odors, Emissions and Complaints Associated with Landfills

a. Landfill Odors, Complaints, and Odor Controls

b. ATSDR Landfill Primer and Organization

Stack Testing of Landfill Control Devices and Permit Conditions

a. Typically Sampled Pollutants

b. Parameters Measured During Source Testing

c. Sampling other POPCs

**9:00** A**M** Inspection of MSW Landfills

* 1. Agency Inspection Program **(Agency Checklist)**
     1. Level 1: Regulatory Reports Review
     2. Level 2: Site Inspection and Walkthrough
     3. Level 3: Perimeter, Surface and Wellheads Monitoring
     4. GPS Mapping of Landfills

**9:30 AM** Use of the FLIR Camera for Monitoring Landfill Gases

**10:00 AM** Use of a Federal Reference Method (FRM) 21 Analyzer for Landfill Surface

Monitoring for Agency Compliance

**10:30 AM** Elkin Earth Works Well Gas and Surface Scan Analyzers (Invited)

**11:30 AM Virtual Tour of a Landfill and Disposal Facility with Discussions**

**12:45 PM Adjourn and Post-test Instructions**

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