EPA 340/1-90-026c

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EPA

Inspector Training Series

# COURSE MODULE S380

# INSPECTION TECHNIQUES FOR FUGITIVE VOC EMISSION SOURCES

## SLIDE MANUAL

**Prepared by:**

Pacific Environmental Services, Inc.
3708 Mayfair Street
Suite 202
Durham, North Carolina 27707



**Prepared for:**

U.S. Environmental Protection Agency
Stationary Source Compliance Division
Office of Air Quality Planning and Standards
Washington, D.C. 20460

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## DISCLAIMER

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# LECTURE 1

# WELCOME AND INTRODUCTION

# INTRODUCTION

This manual is intended for use during the workshop. The manual contains "copies" of the slides that are presented during the workshop. The only slides not included are those of photographs. In their place are brief descriptions of the photographs. There are no slides for Lecture 1; thus, this manual starts with Lecture 2 slides.

Ample space is provided on each page for the student to take notes directly in this manual during the workshop. This will allow the student to use this manual rather than the Student's Manual for note-taking.

# LECTURE 2

# INTRODUCTION TO FUGITIVE EMISSION REGULATIONS

INTRODUCTION TO EQUIPMENT LEAK STANDARDS FOR VOC AND VHAP

SLIDE 2-1

WHAT ARE EQUIPMENT LEAK STANDARDS?

Federal and State Regulations Designed to Cause Sources to Reduce Emissions from Leaking Process Equipment

SLIDE 2-2

FEDERAL REGULATIONS

1. New Source Performance Standards (NSPS)

   - Apply to new VOC sources

2. National Emission Standards for Hazardous Air Pollutants (NESHAP)

   - Apply to new and existing hazardous air pollutant sources

STATE REGULATIONS

1. State Implementation Plans

   - Apply to existing VOC sources

SLIDE 2-3

WHY ARE EQUIPMENT LEAK STANDARDS NEEDED?

- VOC, $NO_x$, and sunlight produce ozone
- Ozone nonattainment is a serious problem
- Easier to control VOCs than $NO_x$ or sunlight
- VHAPs are hazardous to human health

SLIDE 2-4

ARE EQUIPMENT LEAKS REALLY SIGNIFICANT?

| Source Category | Nationwide Uncontrolled Emissions (tons/year) |
|---|---|
| Refineries | 53,900 |
| SOCMIs | 91,500 |
| Benzene | 8,700 |

SLIDE 2-5

ARE EQUIPMENT LEAKS REALLY SIGNIFICANT?

| Source Category | Nationwide Emissions (tons/year) Uncontrolled | After Control |
|---|---|---|
| Refineries | 53,900 | 19,800 |
| SOCMIs | 91,500 | 40,700 |
| Benzene | 8,700 | 2,750 |

SLIDE 2-6

WHAT SOURCE CATEGORIES ARE REGULATED?

| | |
|---|---|
| NSPS: | SOCMI<br>Petroleum refineries<br>Onshore natural gas processing plants |
| STATE: | SOCMI<br>Petroleum refineries<br>Natural gas processing plants<br>Polymer manufacturing plants |
| NESHAP: | Benzene<br>Vinyl Chloride |

SLIDE 2-7

WHAT EQUIPMENT IS REGULATED?

- Pumps
- Compressors
- Pressure relief devices
- Sampling connections
- Open ended valves or lines
- Process Valves
- Flanges and other connectors
- Product accumulator vessels
- Agitators
- Closed Vent Systems

SLIDE 2-8

TYPES OF STANDARDS

- Performance Standards

  - no detectable emissions

- Equipment Standards

  - equipment specifications
  - design specifications
  - operational specifications

- Work Practice Standards

  - leak detection and repair
  - evidence of potential leaks

SLIDE 2-9

SIMILARITIES IN STANDARDS

- Covered equipment
- Leak definition
- Sampling method for leak detection
- Repair/retest procedures
- Recordkeeping and reporting requirements

SLIDE 2-10

DIFFERENCES IN STANDARDS

- Exemptions
- Definition of light/heavy liquid
- Component Labeling
- Monitoring Frequency

SLIDE 2-11

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. Applicable source categories
4. Component Identification
5. Leak detection and repair standards
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. Test methods and procedures
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-12

MAJOR LECTURE TOPICS

1. ***Definitions***
2. Finding the regulations
3. Applicable source categories
4. Component Identification
5. Leak detection and repair standards
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. Test methods and procedures
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-13

DEFINITIONS

- Affected facility
- Process unit
- Equipment
- In VOC service
- In gas/vapor service
- In liquid service (light and heavy)
- Volatile hazardous air pollutant (VHAP)
- In VHAP service
- Connector
- Product accumulator vessel

SLIDE 2-14

MAJOR LECTURE TOPICS

1. Definitions
2. ***Finding the regulations***
3. Applicable source categories
4. *Component Identification*
5. Leak detection and repair standards
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. Test methods and procedures
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-15

NSPS REGULATIONS
40 CFR 60

| | | |
|---|---|---|
| Subpart VV | SOCMI | October 18, 1983 |
| Subpart GGG | Petroleum refineries | May 30, 1984 |
| Subpart KKK | Onshore natural gas processing plants | June 24, 1985 |

SLIDE 2-16

NESHAP REGULATIONS
40 CFR 61

| | | |
|---|---|---|
| Subpart J | Benzene | June 6, 1984 |
| Subpart F | Vinyl chloride | September 23, 1988 |
| Subpart V | National emission standard for equipment leaks (fugitive emission sources) | June 6, 1984 |

SLIDE 2-17

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. *Applicable source categories*
4. Component Identification
5. Leak detection and repair standards
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. Test methods and procedures
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-18

APPLICABILITY REQUIREMENTS - SOCMI

- "Retroactive" to January 5, 1981
- Industry that produces one or more chemicals listed in section 60.489
- Process stream contains 10% or more VOC
- Applies to process units
- Exemptions:
  - Design capacity <1,000 mg/yr (1,100 tons/yr)
  - Only heavy liquid chemicals produced from heavy liquid feed or raw materials
  - Beverge alcohol production
  - No equipment in VOC service
  - Equipment in vacuum service

SLIDE 2-19

APPLICABILITY REQUIREMENTS - PETROLEUM REFINERIES

- "Retroactive" to January 4, 1983
- Facilities subject to Subpart VV or KKK are excluded
- Applies to process units and compressors
- Alternative definition for light liquid (>10% evaporates at 150°C)
- Exemptions:
  - Equipment in vacuum service
  - Compressors in hydrogen service (>50% $H_2$)
  - Process units on Alaskan north slope

SLIDE 2-20

APPLICABILITY REQUIREMENTS - ONSHORE NATURAL GAS PROCESSING PLANTS

- "Retroactive" to January 20, 1984
- Facilities subject to subpart VV or GGG are excluded
- Applies to process units and compressors
- Alternative definitions for light liquid (> 10 percent evaporates at 150°C) and for heavy liquid (≤ 10 percent evaporates at 150°C)
- Exemptions:
  - Sampling connection systems
  - Nonfractionating plants with design capacity less than 10 million scfd
  - Process units on Alaskan north slope
  - Reciprocating compressors in wet gas service

SLIDE 2-21

APPLICABILITY REQUIREMENTS - BENZENE FACILITIES

- 10% or more benzene in process fluid
- Applies to individual pieces of equipment
- Exemptions:
  - Plant site designed to produce or use <1,000 Mg/yr (1,100 tons/yr) of benzene
  - process units having no equipment in benzene service
  - Coke by-product plants
  - Equipment in vacuum service

SLIDE 2-22

APPLICABILITY REQUIREMENTS VINYL CHLORIDE FACILITIES

- Applies to plants which produce:
  - Ethylene dichloride
  - Vinyl chloride
  - Polymers containing polymerized vinyl chloride
- Exemptions
  - R&D reactors <0.19$m^3$ (50 gal)

SLIDE 2-23A

APPLICABILITY REQUIREMENTS
VINYL CHLORIDE FACILITIES

- Exemptions (Cont.)
  - R&D reactors between 0.19 to 4.07$m^3$ (50 to 1,075 gal) have less stringent requirements
  - Equipment in vacuum service exempted
  - If process unit has <2% leaking valves, then:
    - -- Recordkeeping is different
    - -- Reporting is different
    - -- Equipment marking not required

SLIDE 2-23B

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. Applicable source categories
4. ***Component Identification***
5. Leak detection and repair standards
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. Test methods and procedures
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-24

COMPONENT IDENTIFICATION

- ID number
- Affected facility
- Component type
- Component location
- Fluid state
- Plus NESHAPS:

  Mark each component
  % VHAP

SLIDE 2-25

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. Applicable source categories
4. Component Identification
5. ***Leak detection and repair standards***
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. Test methods and procedures
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-26

LEAK DETECTION
AND REPAIR

Phase 1 - Detection of Leaks

Phase 2 - Repair of Leaks

SLIDE 2-27

LDAR PROGRAM

- Monitoring Interval
  - monthly/quarterly
- Leak Definition
  - 10,000 ppm
- Repair Interval
  - within 5 days first attempt
  - completed within 15 days
  - delay allowed under certain circumstances

SLIDE 2-28

FIRST ATTEMPT AT REPAIR

- Valves
  - tightening of bonnet bolts
  - replacement of bonnet bolts
  - tightening of packing gland nuts
  - injection of lubricant into lubricated packing

SLIDE 2-29

DELAY OF REPAIRS

- Infeasible without process unit shutdown
  - repair at next shutdown
- Isolated from process and does not remain in VOC or VHAP service
- Valves and pumps specific conditions

SLIDE 2-30

DELAY OF REPAIRS - VALVES

- Additional Condition
  - purged material emissions from immediate repair are greater than emissions from delay

    and

  - at repair, purged material is destroyed or recovered in control device
- Delay Beyond Next Shutdown
  - valve assembly replacement needed and
  - supplies depleted (but adequate prior to depletion)
  - only if next shutdown occurs within 6 months after first

SLIDE 2-31

DELAY OF REPAIRS - PUMPS

- Additional Condition
  - dual mechanical seal system with barrier fluid system; and
  - repaired within 6 months

SLIDE 2-32

LDAR:
EQUIPMENT COVERED

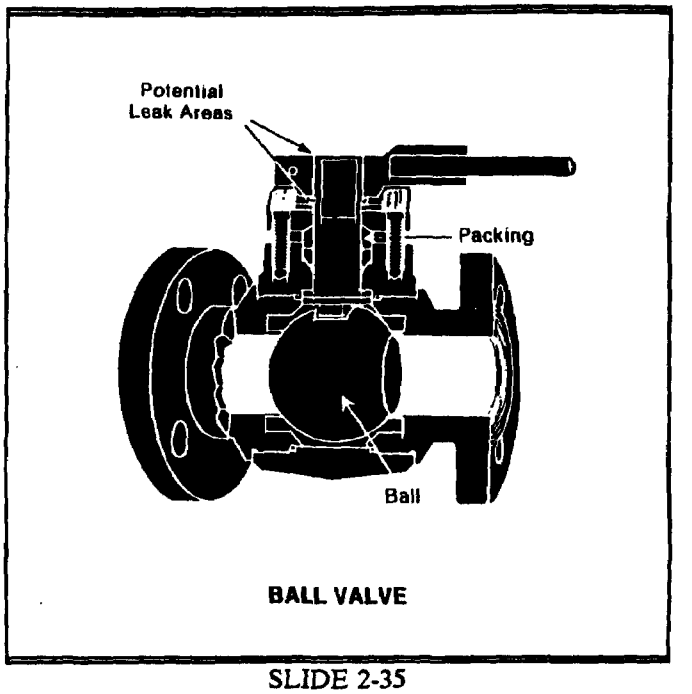
- Valves
  - in gas/vapor, in light liquid VOC, in VHAP service
  - difficult-to-monitor
  - unsafe-to-monitor
- Pumps
  - in light liquid service
- Other Equipment
  - flanges and other connectors
  - PRDs in liquid service
  - pumps and valves in heavy liquid service

SLIDE 2-33

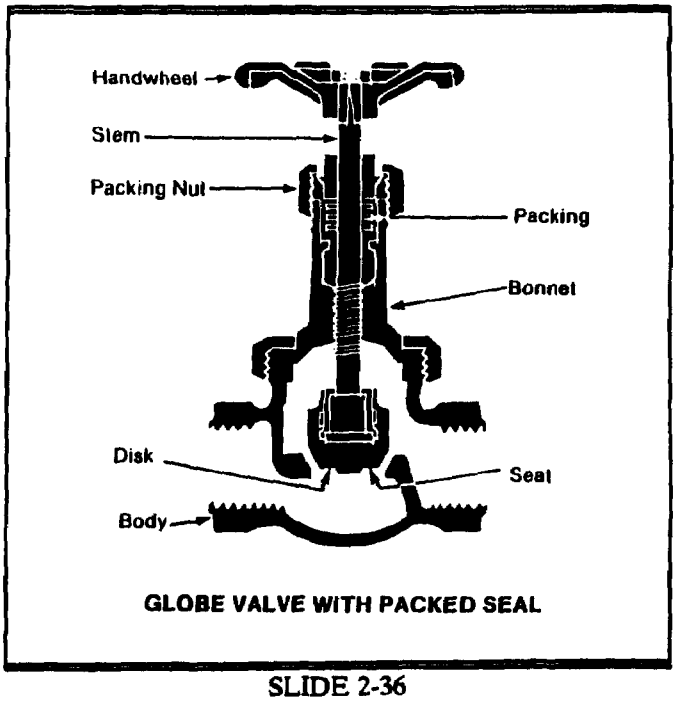
LEAK DETECTION:
VALVES

| Type of Value | Leak Detected | Monitoring Frequency |
|---|---|---|
| *In gas/ vapor or light liquid service or in VHAP service* | *> 10,000* | *monthly/ quarterly* |
| Difficult-to-monitor | > 10,000 | annually (minimum) |
| Unsafe-to-monitor | > 10,000 | when safe to monitor |

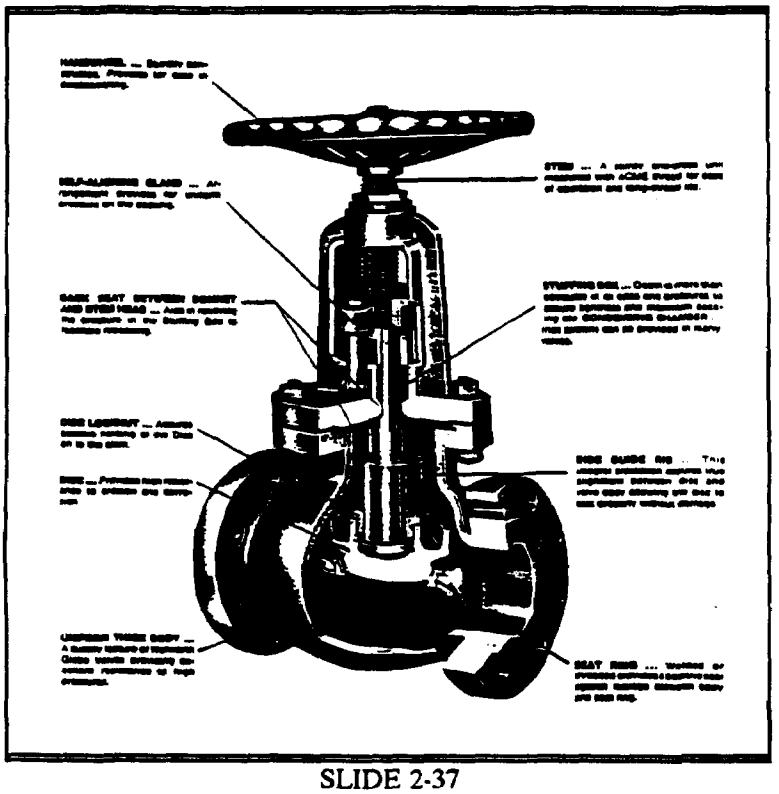
SLIDE 2-34




SLIDE 2-35




SLIDE 2-36



SLIDE 2-37

LEAK DETECTION:
VALVES

Alternate Standards

- not more than 2 percent leaking valves
- skip period LDAR

SLIDE 2-38

ALTERNATIVE STANDARDS FOR VALVE LEAK DETECTION PROGRAMS

Alternative 1: Not more than 2% leaking valves

- Notify administrator 90 days before implementing alternative
- M-21 test initially, annually, and when requested by administrator
- All valves monitored within one week
- Leakers must be repaired within 15 days, with first attempt at repair within 5 days
- >2% leaking valves is a violation

SLIDE 2-39

ALTERNATIVE STANDARDS FOR VALVE LEAK DETECTION PROGRAMS

Alternative 2: Skip period leak detection and repair

- Option 1: After consecutive quarters with <= 2% leaks; skip to semiannual monitoring
- Option 2: After 5 consecutive quarters with <= 2% leaks; skip to annual monitoring

  - If >2% leaking valves, revert back to monthly monitoring, but this is not a violation

SLIDE 2-40

LEAK DETECTION:
VALVES

| Type of Value | Leak Detected | Monitoring Frequency |
|---|---|---|
| In gas/ vapor or light liquid service or in VHAP service | > 10,000 | monthly/ quarterly |
| ***Difficult- to-monitor*** | ***> 10,000*** | ***annually (minimum)*** |
| Unsafe-to-monitor | > 10,000 | when safe to monitor |

SLIDE 2-41

LEAK DETECTION:
VALVES

| Type of Value | Leak Detected | Monitoring Frequency |
|---|---|---|
| In gas/ vapor or light liquid service or in VHAP service | > 10,000 | monthly/ quarterly |
| Difficult-to-monitor | > 10,000 | annually (minimum) |
| ***Unsafe-to-monitor*** | ***> 10,000*** | ***when safe to monitor*** |

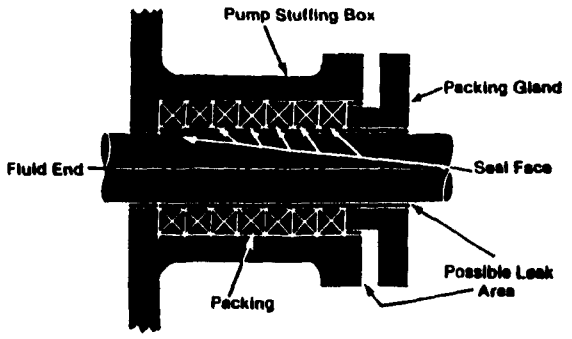
SLIDE 2-42

## LEAK DETECTION: PUMPS

| Leak Detected | Monitoring Frequency |
|---|---|
| > 10,000 ppm by Method 21 | Monthly |
| visual indication | Weekly* |

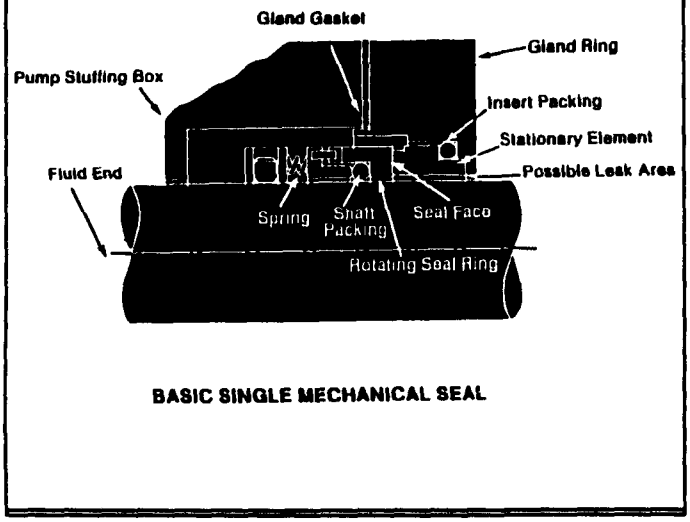
* Unmanned plant sites to be visually inspected as often as practicable and at least monthly.

SLIDE 2-43




SIMPLE PACKED SEAL

SLIDE 2-44




**BASIC SINGLE MECHANICAL SEAL**

SLIDE 2-45

LEAK DETECTION:
FLANGES AND OTHER CONNECTORS, PRDS IN LIQUID SERVICE, PUMPS AND VALVES IN HEAVY LIQUID SERVICE

- Evidence of a potential leak
  - visual
  - audible
  - olfactory
  - other
- Monitor (Method 21) within 5 days
  - > 10,000 ppm

SLIDE 2-46

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. Applicable source categories
4. Component Identification
5. Leak detection and repair standards
6. ***Equipment and performance standards***
7. Equivalent means of emission limitations
8. Test methods and procedures
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-47

EQUIPMENT AND PERFORMANCE STANDARDS

- Pumps
- Compressors
- Valves
- PRDs
- Sampling Connections
- Open-End Valves or Lines
- Flanges and other connectors
- Closed vent system and control devices
- Product accumulator vessels
- Agitators

SLIDE 2-48

STANDARDS FOR PUMPS
IN LIGHT LIQUID SERVICE (NSPS)
OR IN VHAP SERVICE (NESHAP)

- LDAR
- Dual mechanical seal system that includes a barrier fluid system
- "no detectable emissions"
- closed vent system to control device

SLIDE 2-49

PUMPS:
Dual Mechanical Seal Systems
with Barrier Fluid System

1. Dual Mechanical Seal System
   - Barrier fluid pressure pump > stuffing box pressure; or
   - Barrier fluid degassing reservoir is connected by a closed vent system to a control device; or
   - Barrier fluid is purged into a process stream with zero VOC (or VHAP) emissions to the atmosphere

SLIDE 2-50

PUMPS:
Dual Mechanical Seal Systems
with Barrier Fluid System
(continued)

2. Barrier fluid system is in heavy liquid service (NSPS only) or is not in VOC (or VHAP) service

3. Weekly visual inspection for indications of liquids dripping from pump seals

SLIDE 2-51

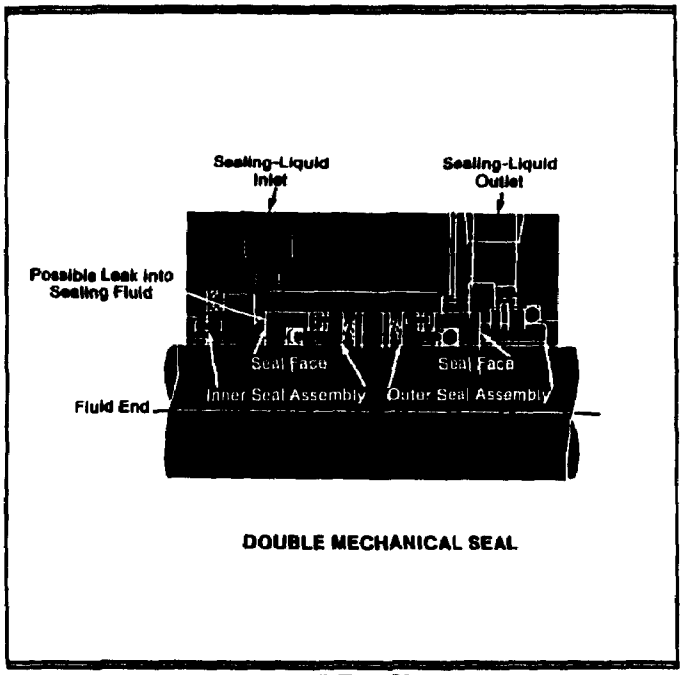
PUMPS:
Dual Mechanical Seal Systems
with Barrier Fluid System
(concluded)

4. Sensor to detect failure of seal system and/or barrier fluid system

   - checked daily or audible alarm
   - owner-determined criterion of failure indicator
   - not applicable at unmanned plant sites

5. Repair of detected leaks

SLIDE 2-52



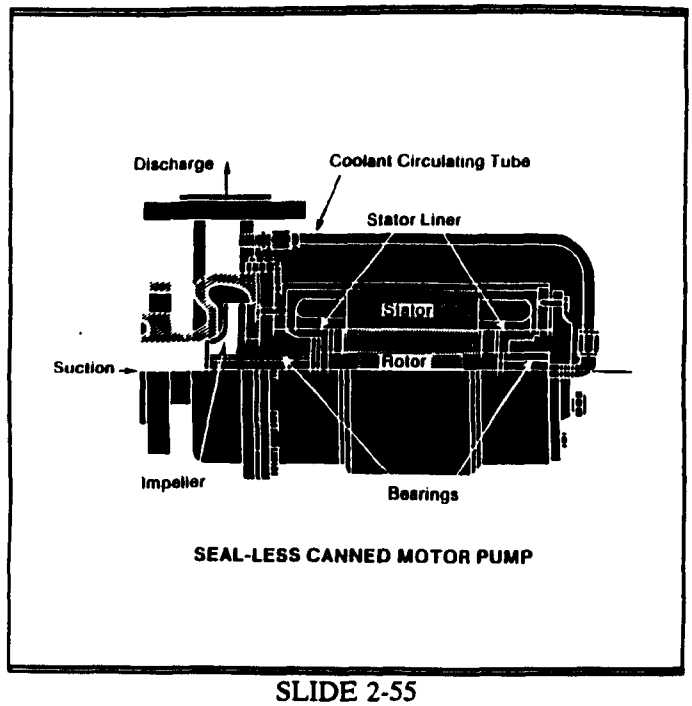

DOUBLE MECHANICAL SEAL

SLIDE 2-53

PUMPS:
No Detectable Emissions

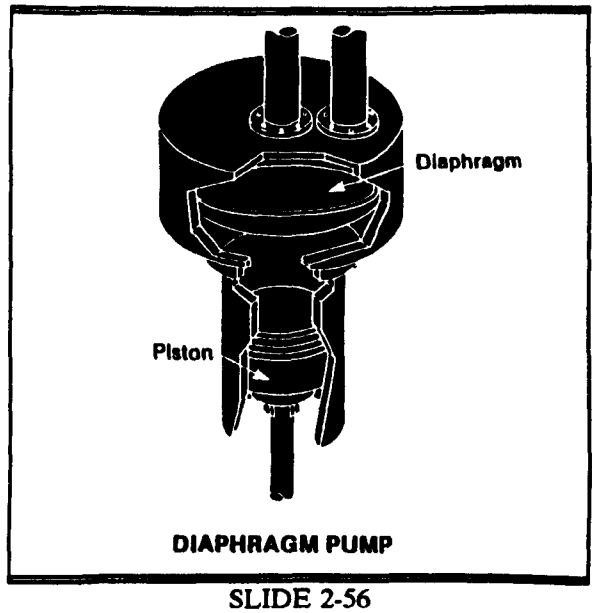
- Instrument reading of < 500 ppm
- No externally actuated shaft penetrating pump housing
- Test for compliance:
  - initially
  - annually
  - as requested by Administrator

SLIDE 2-54



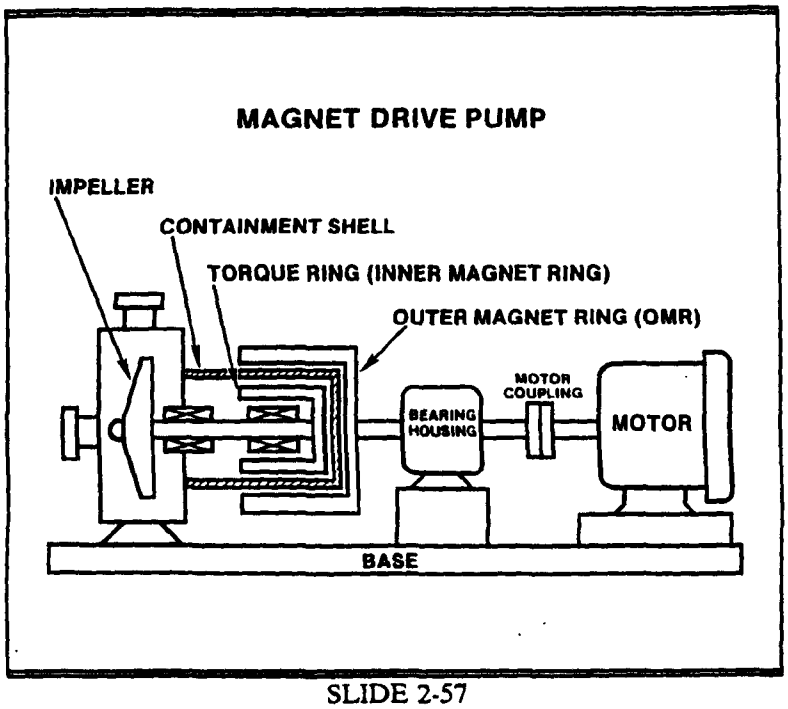

**SEAL-LESS CANNED MOTOR PUMP**

SLIDE 2-55




**DIAPHRAGM PUMP**

SLIDE 2-56




SLIDE 2-57

PUMPS:
Closed Vent Systems to Control Device

- Equipped with a closed vent system capable of capturing and transporting any leakage to a control device
- Closed vent system and control device must meet requirements of §60.482-10 (or §61.242-11).

SLIDE 2-58

STANDARDS FOR COMPRESSORS
(NSPS and NESHAP)

- Seal system that includes a barrier fluid system
- closed vent system to control device
- "no detectable emissions"

SLIDE 2-59

COMPRESSORS:
Seal System with Barrier Fluid System

1. Compressor Seal System
   - Barrier fluid pressure > compressor stuffing pressure; or
   - Barrier fluid system connected by a closed vent system to a control device; or
   - Barrier fluid purged into a process stream with zero VOC (or VHAP) emissions to the atmosphere

SLIDE 2-60

COMPRESSORS:
Barrier Fluid System
(concluded)

2. Barrier fluid system is in heavy liquid service (NSPS only) or is not in VOC (or VHAP) service

3. Sensor to detect failure of seal system and/or barrier fluid system

   - checked daily or audible alarm
   - owner-determined criterion of failure indicator
   - not applicable at unmanned plant sites

4. Repair of detected leaks

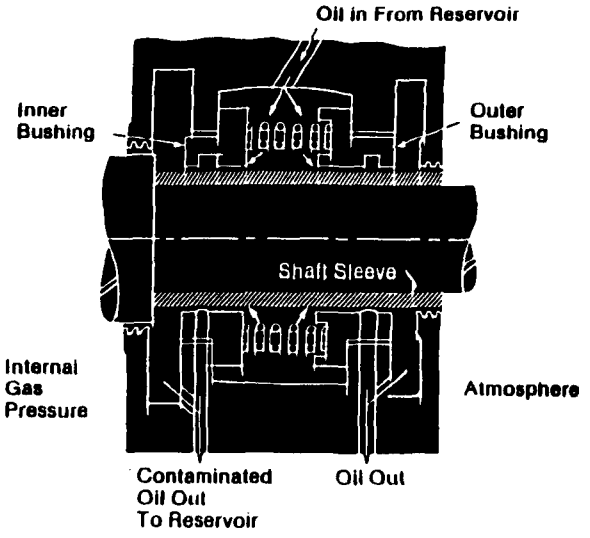
SLIDE 2-61

COMPRESSORS:
Closed Vent Systems to Control Device

- Equipped with a closed vent system capable of capturing and transporting any leakage to a control device

- Closed vent system and control device must meet requirements of §60.482-10 (or §61.242-11)

SLIDE 2-62




LIQUID-FILM COMPRESSOR SHAFT SEAL

SLIDE 2-63

COMPRESSORS:
"No Detectable Emissions"

- Instrument reading of < 500 ppm
- Test for compliance:
  - initially
  - annually
  - as requested by Administrator

SLIDE 2-64

STANDARDS FOR PRESSURE RELIEF DEVICES (PRDs) IN GAS/VAPOR SERVICE

- "no detectable emissions"
- closed vent system to control device

SLIDE 2-65

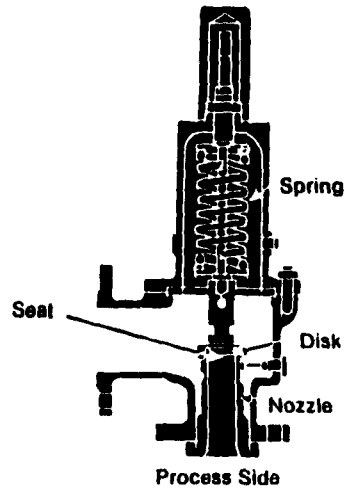
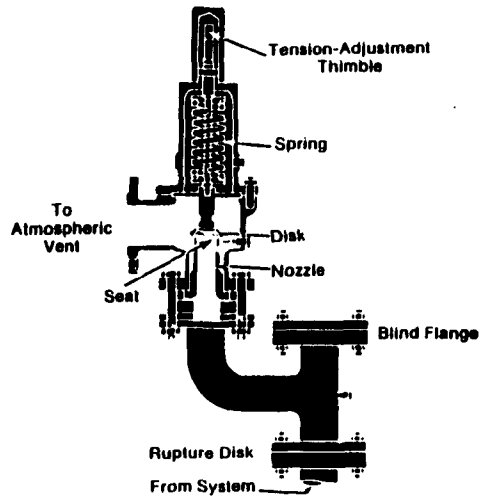



DIAGRAM OF A SPRING-LOADED RELIEF VALVE

SLIDE 2-66




**RUPTURE DISK INSTALLATION UPSTREAM OF A RELIEF VALVE**

SLIDE 2-67

PRDs:
"No Detectable Emissions"

- Instrument reading of < 500 ppm, except during pressure releases
- Return to "no detectable emissions" within 5 days after each pressure release

SLIDE 2-68

PRDs:
Closed Vent System To
Control Device

- Equipped with a closed vent system capable of capturing and transporting any leakage to a control device.
- Closed vent system and control device must meet requirements of §60.482-10 (or §61.242-11).

SLIDE 2-69

STANDARDS FOR
SAMPLING CONNECTIONS

- Closed purge system or closed vent system
  - return purge directly to process line with zero emissions; or
  - collect and recycle with zero emissions; or
  - capture and transport all purged fluid to compliant control device
- in-situ sampling connections are exempt

SLIDE 2-70

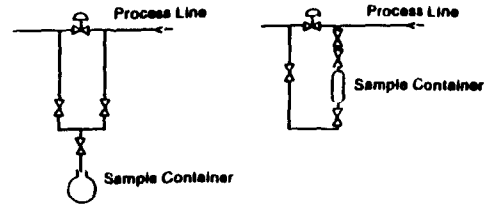



DIAGRAM OF TWO CLOSED-LOOP SAMPLING SYSTEMS

SLIDE 2-71

STANDARDS FOR OPEN-ENDED VALVES OR LINES

- Caps, blind flange, plug, or second valve
- Seal open end at all times except during operations requiring flow through valve or line

SLIDE 2-72

STANDARDS FOR OPEN-ENDED VALVES OR LINES: (concluded)

- Second valve
  - valve on process fluid end is to be closed before second valve is closed
- Double block-and-bleed system
  - bleed valve or line may remain open during operations requiring venting the line between the block valves
  - closed at all other times

SLIDE 2-73

STANDARDS FOR VALVES IN GAS/VAPOR OR LIGHT LIQUID SERVICE

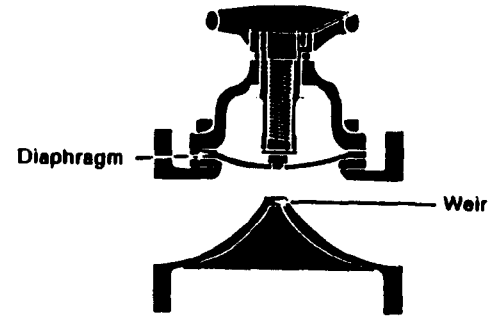
- LDAR
  - alternative standards
  - "unsafe-to-monitor"
  - "difficult-to-monitor"
- "no detectable emissions"

SLIDE 2-74

STANDARDS FOR VALVES:
No Detectable Emissions

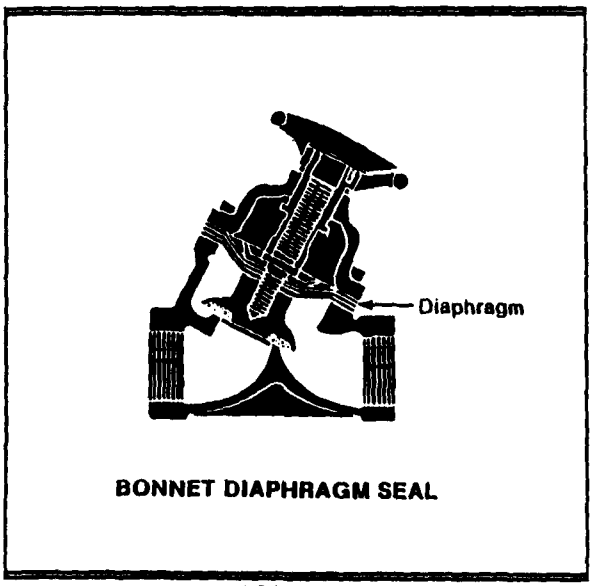
- Instrument reading < 500 ppm
- No external actuating mechanism in contact with process fluid
- Test for compliance
  - initially
  - annually
  - as requested by Administrator

SLIDE 2-75

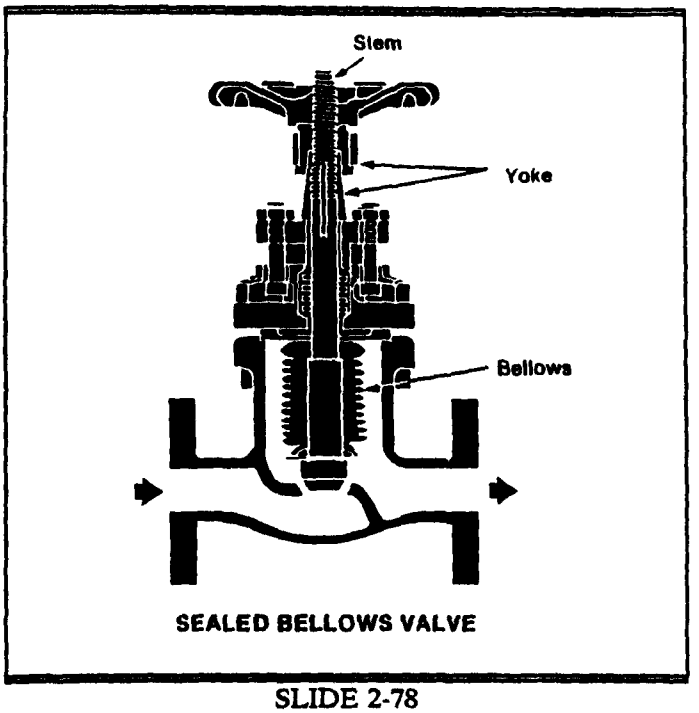



WEIR DIAPHRAGM SEAL

SLIDE 2-76




SLIDE 2-77




SLIDE 2-78

STANDARDS FOR PRODUCT ACCUMULATOR VESSELS (NESHAP only)

- Closed vent system capable of capturing and transporting any leakage from the vessel to a compliant control device

SLIDE 2-79

STANDARDS FOR AGITATORS

- Double mechanical seals
  - maintain pressure between seals so that any leak is into the agitated vessel; or
  - duct any vinyl chloride between seals to control device (< 10 ppm of vinyl chloride in exhaust); or
  - equivalent

SLIDE 2-80

STANDARDS FOR CLOSED VENT SYSTEMS AND CONTROL DEVICES

Closed Vent Systems

- no detectable emissions
  - < 500 ppm
  - visual inspections
- monitoring
  - initially
  - annually
  - as requested by Administrator
- repair of leaks (> 500 ppm or visual)
- operated at all times when emissions may be vented to them

SLIDE 2-81

STANDARDS FOR CLOSED VENT SYSTEMS AND CONTROL DEVICES (concluded)

CONTROL DEVICES

- Monitor parameters to ensure proper operation and maintenance
  - determined by plant owner/operator
- Operate at all times when emissions may be vented to them

SLIDE 2-82

STANDARDS FOR CLOSED VENT SYSTEMS AND CONTROL DEVICES (continued)

CONTROL DEVICES (continued)

- Vapor recovery devices: ≥ 95 percent efficiency
- Enclosed combustion devices: ≥ 95 percent efficiency
  - NSPS: ≥ 0.75 residence time
    ≥ 816°C temperature
  - NESHAP: ≥ 0.5 residence time
    ≥ 760°C temperature

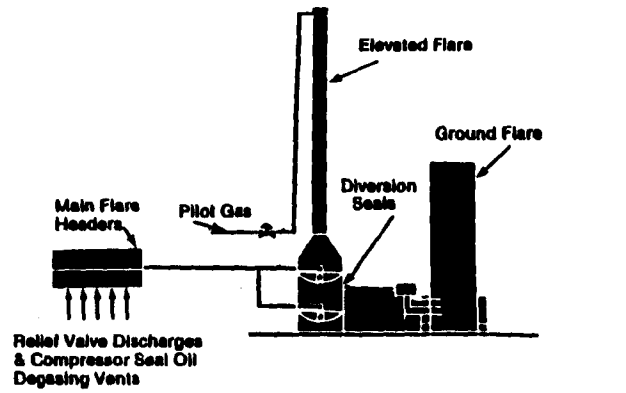
SLIDE 2-83

STANDARDS FOR CLOSED VENT SYSTEMS AND CONTROL DEVICES (continued)

CONTROL DEVICES (concluded)

- Flares
  - no visible emissions
  - operated with flame present at all times
  - heat content
  - exit velocity
  - steam-assisted, air-assisted, nonassisted
  - Comply with Section 60.18

SLIDE 2-84




SIMPLIFIED CLOSED-VENT SYSTEM WITH DUAL FLARES

SLIDE 2-85

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. Applicable source categories
4. Component Identification
5. Leak detection and repair standards
6. Equipment and performance standards
7. ***Equivalent means of emission limitations***
8. Test methods and procedures
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-86

EQUIVALENT MEANS OF EMISSION LIMITATION

- Petition administrator
- Demonstrate equivalence
  - Test data
  - Demonstrate emissions reduction achieved
  - Emission reductions ≥ achieved by EPA standard
  - Federal register notice - public hearing
  - Determination published in Federal Register

SLIDE 2-87

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. Applicable source categories
4. Component Identification
5. Leak detection and repair standards
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. ***Test methods and procedures***
9. Recordkeeping requirements
10. Reporting requirements

SLIDE 2-88

TEST METHODS AND PROCEDURES

- Monitoring
  - Method 21
- In VOC service presumption
  - unless demonstrated otherwise by owner or operator
  - ASTM methods or engineering judgement
    - -- D-2267 for VHAP
    - -- E-260, -168, 169 for VOC
- In light liquid service conditions
- Representative samples
- Flares (refer to 60.18 for general provisions)
  - Reference Method 22 for VE
  - Presence of flare pilot flame
  - Heat content
  - Velocity

SLIDE 2-89

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. Applicable source categories
4. Component Identification
5. Leak detection and repair standards
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. Test methods and procedures
9. ***Recordkeeping requirements***
10. Reporting requirements

SLIDE 2-90

RECORDKEEPING REQUIREMENTS

- Equipment
  - list IDs
  - compliance test
  - unsafe-to-monitor valves
  - difficult-to-monitor valves
- No detectable emissions designation
- In vacuum service
- Not in VOC (or VHAP) service
- LDAR results
  - monitoring
  - repair
- Closed Vent Systems
- Control Devices

SLIDE 2-91

MAJOR LECTURE TOPICS

1. Definitions
2. Finding the regulations
3. Applicable source categories
4. Component Identification
5. Leak detection and repair standards
6. Equipment and performance standards
7. Equivalent means of emission limitations
8. Test methods and procedures
9. Recordkeeping requirements
10. ***Reporting requirements***

SLIDE 2-92

REPORTING REQUIREMENTS

- NSPS
  - Notification of Construction
  - Initial Semi-annual report
  - Semi-annual reports
- NESHAP
  - Initial Statement
  - Semi-annual report
  - Vinyl chloride - no report if < 2 percent of the valves leak

SLIDE 2-93

# LECTURE 3

# PORTABLE VOC ANALYZER CHARACTERISTICS

PERFORMANCE SPECIFICATIONS
FOR METHOD 21

- Must respond to organic compounds being processed (detectors include catalytic oxidation, flame ionization, infrared adsorption, photoionization)
- Intrinsically safe for operation in explosive atmospheres
- Must measure concentration specified in the regulation
- Must have nominal flow rate of 0.1-3.0 liter/min
- Scale must be readable to ± 2.5 percent of defined leak concentration

SLIDE 3-1

PERFORMANCE CRITRIA FOR METHOD 21

- Response time of 30 seconds or less
- Calibration precision must be less than or equal to 10 percent of the calibration gas value
- Instrument subjected to response time and calibration precision tests prior to being placed in service
- Calibration precision repeated every 6 months or if modification or replacement of the instrument detector is required
- Response time retested after modifications to sample pumping system or flow configuration

SLIDE 3-2

COMMON TYPES OF PORTABLE VOC ANALYZERS

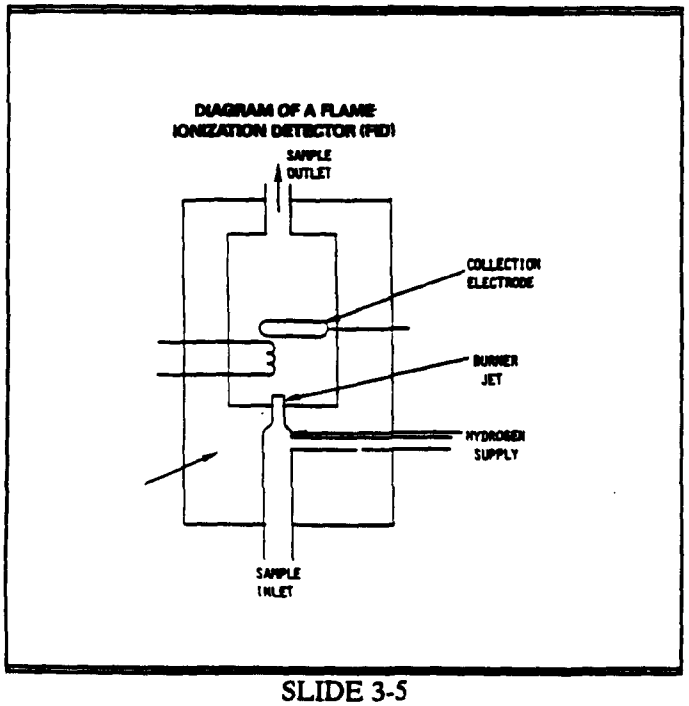
- Flame ionization detectors
- Photoionization detectors
- Catalytic combustion analyzers
- Infrared analyzers

SLIDE 3-3

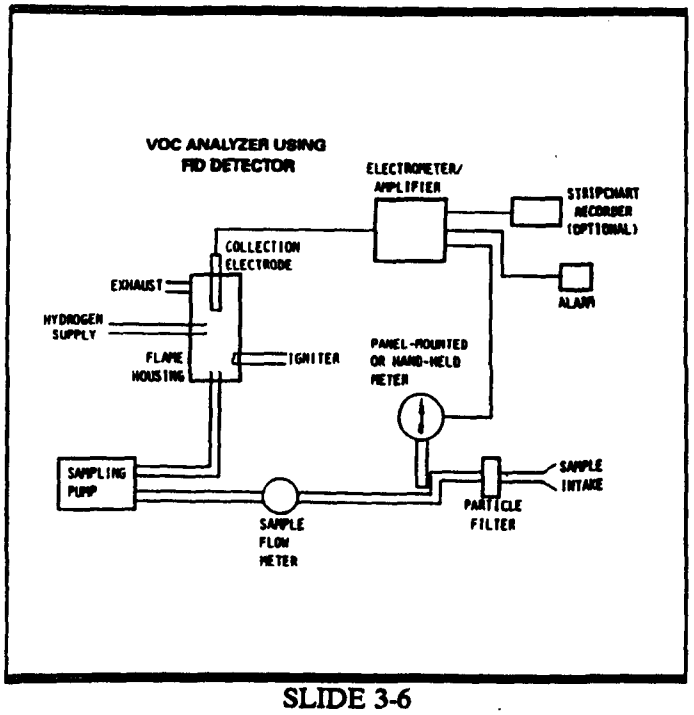
FLAME IONIZATION DETECTOR OPERATING PRINCIPLES

- Sample gas is drawn in continuously
- The sample gas is mixed with hydrogen
- The organic vapor is burned in a hydrogen flame using the oxygen present in the sample gas
- Positive ions are generated during combustion and collected on an electrode in the burner chamber
- The current is amplified and displayed

SLIDE 3-4




SLIDE 3-5




SLIDE 3-6

FLAME IONIZATION DETECTOR
INSTRUMENT CHARACTERISTICS

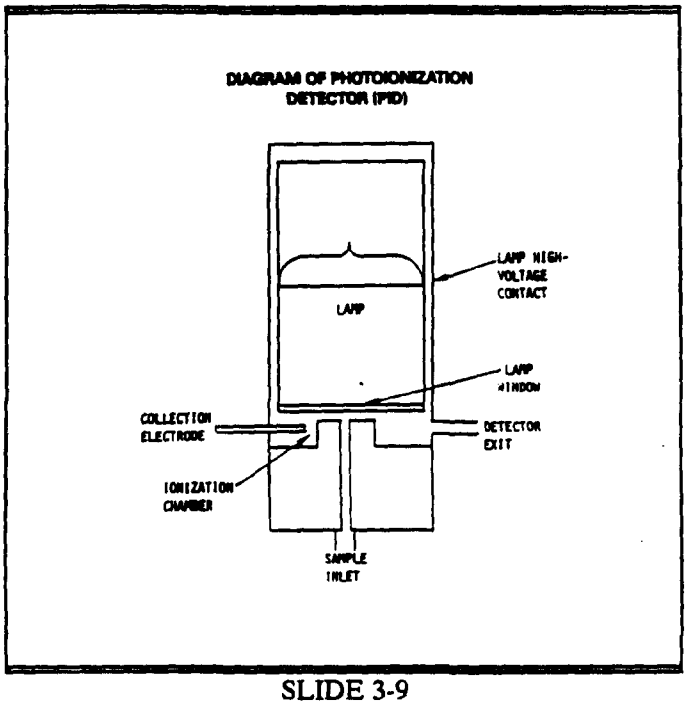
- Sensitive to sample gas flow rate changes
- Sample gas organic vapor "destroyed"
- Sensitive to air infiltration prior to the burner

SLIDE 3-7

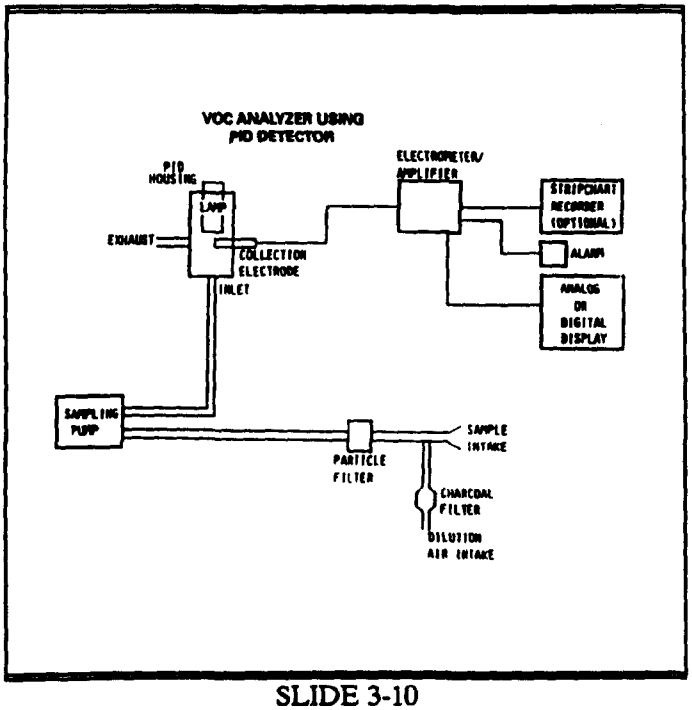
PHOTOIONIZATION ANALYZER
OPERATING PRINCIPLES

- Sample gas is drawn in continuously
- Organic vapor is ionized by absorption or ultraviolet radiation
- Positive ions are collected
- Current is amplified and measured

SLIDE 3-8




SLIDE 3-9




SLIDE 3-10

PHOTOIONIZATION ANALYZER
INSTRUMENT CHARACTERISTICS

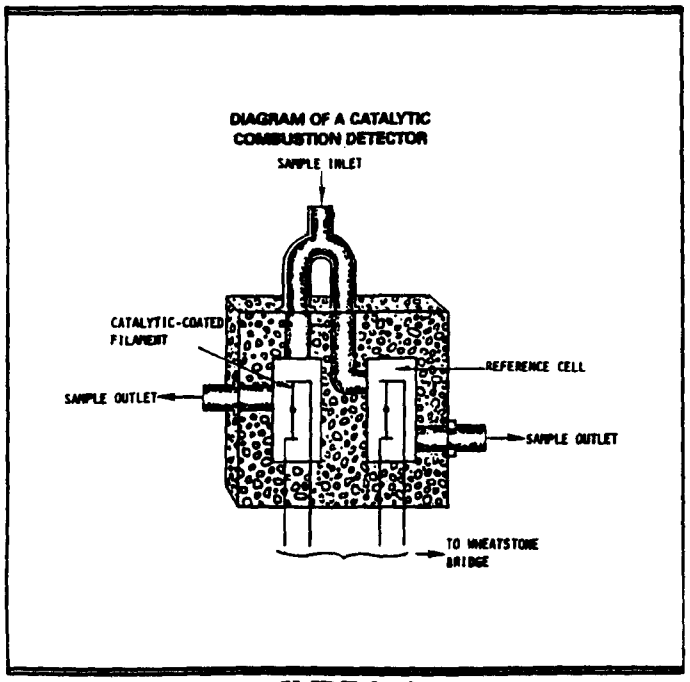
- Insensitive to sample gas flow rate changes
- Sample gas organic vapor not "destroyed"
- Sensitive to air infiltration prior to the detector

SLIDE 3-11

CATALYTIC COMBUSTION
ANALYZER OPERATION
PRINCIPLES

- The sample gas stream is drawn in continuously
- The organic vapor is oxidized as it passes over a catalyst coated wire
- The change in electrical resistance of the coated wire is sensed and a current signal is generated

SLIDE 3-12




SLIDE 3-13

## CATALYTIC COMBUSTION ANALYZER INSTRUMENT CHARACTERISTICS

- Sensitive to sample gas flow rate changes
- Sample gas organic vapor "destroyed"
- Sensitive to air infiltration prior to the detector cell

SLIDE 3-14

DEFINITION

$$\text{Response factor} = \frac{\text{Actual concentration}}{\text{Instrument indicated concentration}}$$

SLIDE 3-15

RESPONSE FACTOR, EXAMPLE 1

| | |
|---|---|
| Actual concentration | = 10,000 ppm |
| Instrument gauge reading | = 5,000 ppm |
| Response factor | = 2 |

SLIDE 3-16

RESPONSE FACTOR, EXAMPLE 2

| | |
|---|---|
| Actual concentration | = 1,000 ppm |
| Instrument gauge reading | = 3,000 ppm |
| Response factor | = 0.33 |

SLIDE 3-17

RESPONSE FACTOR, EXAMPLE 3

| | |
|---|---|
| Actual concentration | = 100,000 ppm |
| Instrument gauge reading | = 10,000 ppm |
| Response factor | = 10 |

SLIDE 3-18

TYPICAL RESPONSE FACTOR RANGE

0.1 TO 40

The lower the response factor, the more sensitive the instrument for that compound

SLIDE 3-19

SOURCE OF RESPONSE FACTOR

- Instrument specific tests
- Published tables

SLIDE 3-20

RESPONSE FACTORS VARY WITH ACTUAL CONCENTRATION

SLIDE 3-21

EXAMPLE 1: RESPONSE FACTOR VARIATION FOR OVA-108 FID: XYLENES

| Compound | Actual Concentration (PPM) | Instrument Response Factor |
|---|---|---|
| para-Xylene | 50 | 3.49 |
| | 500 | 3.70 |
| | 7,700 | 2.27 |
| meta-Xylene | 200 | 1.04 |
| | 1,500 | 0.60 |
| | 3,000 | 0.42 |
| ortho-Xylene | 200 | 0.89 |
| | 1,500 | 0.86 |
| | 3,000 | 0.39 |

SLIDE 3-22

EXAMPLE 2: RESPONSE FACTOR VARIATION FOR OVA-108 FID: PARAFFINIC COMPOUNDS

| Compound | Actual Concentration (PPM) | Instrument Response Factor |
|---|---|---|
| Ethane | 1,000 | 1.04 |
| | 3,000 | 1.16 |
| | 4,500 | 0.57 |
| Propane | 1,000 | 0.84 |
| | 2,000 | 3.12 |
| | 4,000 | 0.59 |
| Pentane | 200 | 1.33 |
| | 1,500 | 0.94 |
| | 5,000 | 0.48 |

SLIDE 3-23

EXAMPLE 2: RESPONSE FACTOR VARIATION FOR OVA-108 FID: PARAFFINIC COMPOUNDS (CONT.)

| Compound | Actual Concentration (PPM) | Instrument Response Factor |
|---|---|---|
| N-hexane | 150 | 0.48 |
| | 550 | 0.57 |
| | 1,500 | 0.57 |
| | 3,200 | 0.63 |
| | 8,000 | 0.69 |
| Heptane | 200 | 1.00 |
| | 1,500 | 0.67 |
| | 4,000 | 0.32 |
| Decane | 200 | 10.77 |
| | 300 | 0.83 |
| | 400 | 1.61 |

SLIDE 3-24

EXAMPLE 3: RESPONSE FACTOR VARIATION FOR OVA-108 FID: AROMATIC COMPOUNDS

| Compound | Actual Concentration (PPM) | Instrument Response Factor |
|---|---|---|
| Benzene | 50 | 0.88 |
| | 2,000 | 0.32 |
| | 2,800 | 0.28 |
| | 5,000 | 0.51 |
| Toluene | 200 | 0.67 |
| | 1,500 | 0.49 |
| | 3,000 | 0.39 |
| Ethylbenzene | 50 | 0.52 |
| | 1,500 | 0.83 |
| | 8,000 | 1.23 |

SLIDE 3-25

EXAMPLE 4: RESPONSE FACTOR VARIATION FOR OVA-108 FID: CHLOROTOLUENES

| Compound | Actual Concentration (PPM) | Instrument Response Factor |
|---|---|---|
| Meta-chlorotoluene | 200 | 0.61 |
| | 1,500 | 0.53 |
| | 3,100 | 0.50 |
| Ortho-chlorotoluene | 200 | 0.85 |
| | 1,500 | 0.63 |
| | 3,100 | 0.63 |
| Para-chlorotoluene | 200 | 0.75 |
| | 1,500 | 0.55 |
| | 3,200 | 0.51 |

SLIDE 3-26

RESPONSE FACTORS VARY
INSTRUMENT-TO-INSTRUMENT

SLIDE 3-27

EXAMPLE 1: INSTRUMENT-TO-INSTRUMENT VARIATIONS FOR OVA-108 FID: CYCLOHEXANOL

| Compound | Actual Concentration (ppm) | Response Factor at 10,000 ppm | |
|---|---|---|---|
| | | Instrument 1 | Instrument 2 |
| Cyclohexanol | 200 | 1.98 | 2.21 |
| | 700 | 1.67 | 1.71 |
| | 1,200 | 1.21 | 1.41 |

SLIDE 3-28

EXAMPLE 2: INSTRUMENT-TO-INSTRUMENT VARIATIONS FOR CATALYTIC COMBUSTION ANALYZER: XYLENES

| Compound | Actual Concentration (ppm) | Response Factor at 10,000 ppm | |
|---|---|---|---|
| | | Instrument 1 | Instrument 2 |
| para-Xylene | 50 | 2.50 | 1.51 |
| | 500 | 9.43 | 3.98 |
| | 7,700 | 7.83 | 4.00 |
| meta-Xylene | 200 | 3.53 | 1.70 |
| | 1,500 | 9.44 | 2.01 |
| | 3,000 | 12.84 | 1.64 |
| | 4,500 | 15.01 | 1.53 |
| | 7,000 | 37.86 | 1.73 |

SLIDE 3-29

EXAMPLE 3: INSTRUMENT-TO-INSTRUMENT VARIATIONS FOR CATALYTIC COMBUSTION ANALYZER: ETHYLBENZENE

| Compound | Actual Concentration (ppm) | Response Factor at 10,000 ppm | | |
|---|---|---|---|---|
| | | Instrument | | |
| | | 1 | 2 | 3 |
| Ethylbenzene | 50 | 1.93 | 1.16 | N.D. |
| | 500 | 10.50 | 2.62 | N.D. |
| | 4,000 | 32.62 | 4.11 | 1.32 |
| | 8,000 | 27.09 | 3.05 | 1.14 |

SLIDE 3-30

RESPONSE FACTORS:

Used to select appropriate instruments for specific application,

but

not used to calculate actual concentration during Method 21 leak screening tests.

SLIDE 3-31

# LECTURE 4

# PORTABLE VOC ANALYZER CHECKOUT AND CALIBRATION

INITIAL INSTRUMENT CHECKS
ARE NOT REQUIRED BY
METHOD 21.

SLIDE 4-1

PURPOSE OF INITIAL INSTRUMENT CHECKS

Ensure that the instrument is working properly before leaving the inspection site

SLIDE 4-2

INITIAL CHECKS - FLAME IONIZATION DETECTORS

- *Check hydrogen supply - refuel if necessary*
- Confirm presence of exhaust port flame arrestor
- Check battery status
- Warm-up instrument electronics
- Check amplifier settings
- Check prefilter and probe conditions
- Leak check probe
- Measure sample gas flow rate at probe inlet

SLIDE 4-3

INITIAL CHECKS - PHOTOIONIZATION ANALYZER

- Check battery status
- Check probe condition
- Check for obvious deposits on optical window
- Confirm detector response
- Measure sample gas flow rate at probe inlet

SLIDE 4-4

INITIAL CHECKS -
CATALYTIC COMBUSTION
ANALYZER

- Check battery status
- Check prefilter and probe conditions
- Leak check probe
- Confirm detector response
- Measure sample gas flow rate at probe inlet

SLIDE 4-5

PURPOSE OF CALIBRATION

- Ensure compliance with Method 21
- Adjust instrument as necessary
- Identify any malfunctioning instruments

SLIDE 4-6

CALIBRATION REQUIREMENTS

- Instruments should be calibrated daily
- Calibrant gas should be methane or hexane
- Calibrant gas concentration should be close to leak definition concentration
- A calibration precision test is required monthly
- Blended gas calibration mixtures should have a known concentration with an accuracy of plus or minus 2%

SLIDE 4-7

CALIBRATION LOCATION

- Location is not specified by Method 21
- Calibration at agency shop or laboratory prior to leaving for inspection site eliminates hazards involved with shipping compressed calibration gases

SLIDE 4-8

INSTRUMENT RESPONSE TIME

- Instrument must reach 90% of calibration gas concentration within 30 seconds
- An average of three separate tests are used to determine conformance
- Tests must be repeated whenever sample flow rate changes are made
- Records must be kept
- Response time is usually tested in conjunction with a daily calibration procedure

SLIDE 4-9

CALIBRATION PRECISION

- Calculation
  Value = (observed/actual) x 100
- Algebraically averaged values must be within 10% of actual concentration
- Test is done monthly
- Records must be kept
- Usually done in conjunction with a daily calibration procedure

SLIDE 4-10

INHALATION HAZARDS

- Leakage of toxic calibration gases
- Emissions of toxic combustion products from flame ionization detectors and catalytic combustion analyzers

SLIDE 4-11

GAS CYLINDER RELATED PROBLEMS

- Unsecured compressed gas cylinders could become dangerous projectiles if the main valve is damaged
- Leakage of hydrogen (for FIDs) could create an explosion hazard in an area served with standard electrical wiring

SLIDE 4-12

REQUIRED LABORATORY FACILITIES

- Operational ventilation hoods free from chemicals or general contamination
- Secure cylinder mounts and facilities for receiving and shipping cylinders

SLIDE 4-13

INSTRUMENT MAINTENANCE AND TESTING

- Sample gas flow rates should be determined daily using soap bubble flow meters and rotameters
- Photoionization detectors should be disassembled and cleaned regularly
- Catalytic combustion analyzers must be removed from instrument cases for adjustment of zero scales
- All types of units must be partially disassembled when excessive quantities of vapor and/or droplets have entered the unit

SLIDE 4-14

REQUIRED LABORATORY FACILITIES

- Bench space for maintaining instruments and charging batteries
- Storage space for instrument supplies and accessories
- Shelf and file space for storing instrument operating manuals and maintenance notebooks

SLIDE 4-15

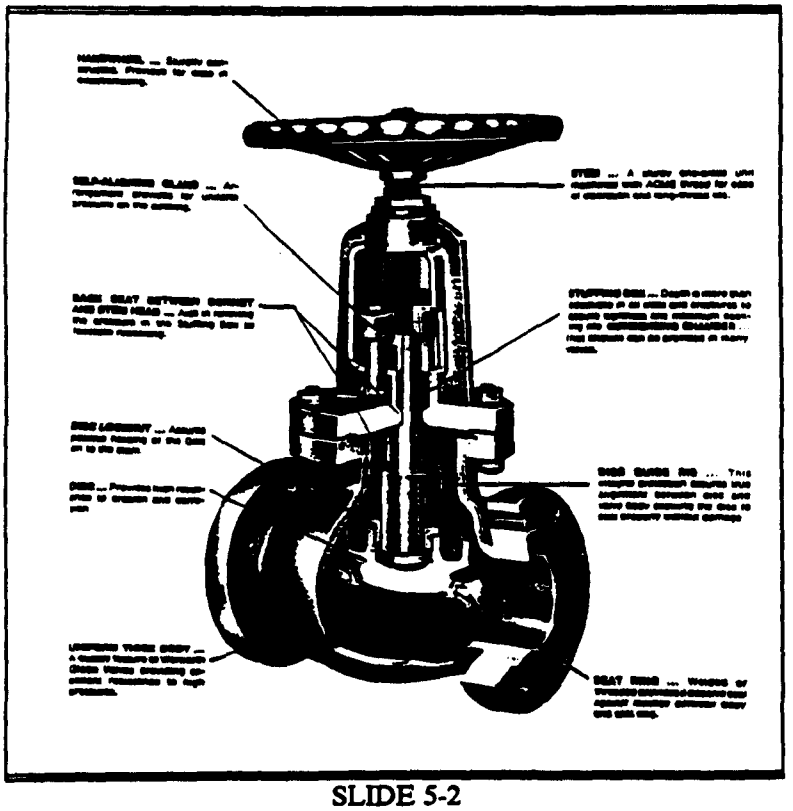
# LECTURE 5

# LEAK MONITORING PROCEDURES, PROBLEMS, AND ERRORS

METHOD 21 MONITORING REQUIREMENTS

- Probe at surface of component
- Move along interface periphery while observing readout
- If increase occurs, sample until maximum reading occurs
- record results

SLIDE 5-1



SLIDE 5-2

THIS SLIDE IS A PHOTOGRAPH OF AN INSPECTOR MONITORING A VALVE FOR LEAKS - NO HARD COPY AVAILABLE

SLIDE 5-3

THIS SLIDE IS A PHOTOGRAPH OF AN INSPECTOR MONITORING A VALVE FOR LEAKS - NO HARD COPY AVAILABLE

SLIDE 5-4

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SLIDE 5-5

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SLIDE 5-6

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SLIDE 5-7

THIS SLIDE IS A PHOTOGRAPH OF AN INSPECTOR MONITORING A PUMP FOR LEAKS - NO HARD COPY AVAILABLE

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SLIDE 5-10

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SLIDE 5-11

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SLIDE 5-12

PORTABLE VOC ANALYZER PROBE EMISSION PLUME "CAPTURE"

- Sampling is done under weak negative pressure
- Air is drawn into the probe from all directions, not just the direction from the VOC leak
- Even one probe diameter away from the probe inlet, there is almost no air movement toward the probe

SLIDE 5-13

PROBE ORIENTATION

- Due to poor capture capability, the probe must be as close as possible to the leak site
- Due to poor capture capability, the probe should be oriented directly into the plume to take advantage of the flow characteristics of the positive pressure leak

SLIDE 5-14

SAMPLE GAS FLOW SENSITIVITY

- Due to inherent poor capture capability, all instruments are sensitive to sample gas flow rates
- As flow rates decreases, the ability to draw in the emission plume decreases

SLIDE 5-15

FUGITIVE VOC LEAK CHARACTERISTICS

- Concentrations range from approximately 10,000 ppm to 1,000,000 ppm
- Mass emission rates from a single leak site can be significant
- The leaking VOC gas stream can be hot and contain compounds which condense at ambient temperatures

SLIDE 5-16

EFFECTS OF "EXCESSIVE" VOC INTAKE FLAME IONIZATION INSTRUMENTS

- Flame-out at sample gas concentrations above 70,000 to 100,000 ppm
- Blinding of flame arrestor leading into mixer/burner
- Sustained high observed readings due to condensation and revolatilization in sample lines

SLIDE 5-17

EFFECTS OF "EXCESSIVE" VOC INTAKE CATALYTIC COMBUSTION ANALYZERS

- Volatilization of catalyst on detector wire
- Sustained high observed readings due to condensation and revolatilization in sample lines

SLIDE 5-18

EFFECTS OF "EXCESSIVE" VOC INTAKE PHOTOIONIZATION ANALYZERS AND INFRARED ANALYZERS

- Condensation of organic materials on the optical surface
- Sustained high observed readings due to condensation and revolatilization in sample lines

SLIDE 5-19

PROCEDURE FOR MINIMIZING RISK OF "EXCESSIVE" VOC INTAKE

Withdraw probe immediately when the gauge spikes to the maximum reading

SLIDE 5-20

OTHER IMPORTANT MONITORING CONSIDERATIONS

- Use a plastic tubing extension on the probe to avoid metal contact with rotating shafts
- Use a fiberglass wool prefilter to protect against droplet intake

SLIDE 5-21

WEATHER LIMITATIONS

- Minimize field activities during rain to protect against water droplet intake
- Avoid standing layers of water around horizontal valves after a storm
- Have a spare battery ready for use during cold weather

SLIDE 5-22

SAFETY LIMITS TO FIELD MONITORING

- Do not attempt to monitor sources more than 6 feet above safe platforms
- Do not monitor sources adjacent to hot surfaces or adjacent to partially exposed rotating equipment
- Wear respiratory protection whenever necessary
- Use only intrinsically safe instruments and instrument recorders
- Check safety features of instruments before beginning field activities

SLIDE 5-23

# LECTURE 6

# NSPS AND NESHAP EQUIPMENT LEAK RECORDS AND REPORTS

NSPS REPORTING

- Notification of construction within 30 days of commencement
- Semi-annual report

SLIDE 6-1

NSPS INITIAL SEMI-ANNUAL REPORT

- Submission deadline: 6 months after the initial startup date
- Process unit ID
- Number of valves
- Number of pumps
- Number of compressors

SLIDE 6-2

NSPS SEMI-ANNUAL REPORT

- Process unit ID
- For each month, the number of valves, compressors, and pumps:
  - had detected leaks
  - were not repaired (explain any delay of repairs and why process shutdown infeasible)
- Dates of process shutdowns during the period
- Revisions to initial statement

SLIDE 6-3

OTHER NSPS REPORTING ASPECTS

- Alternate standards for valves - 90 day notification required
- Report all performance test results in accordance with Section 60.8 and notify Administrator at least 30 days before initial performance tests
- EPA may delegate enforcement authority to a State agency to receive semi-annual reports

SLIDE 6-4

NESHAP REPORTING

- Initial statement
- Semi-annual report
- Vinyl chloride does not have to report if < 2 percent leaking valves

SLIDE 6-5

INITIAL BENZENE STATEMENT REPORT

- Submission deadline
  - Existing plants - 9/4/84
  - New plants - submit with application for approval of construction
- Statement that standards, testing, recordkeeping, and reporting are being implemented
- Process unit IDs
- Equipment IDs, equipment type, percent VHAP, state of VHAP fluid, and method of compliance

SLIDE 6-6

BENZENE SEMI-ANNUAL REPORT

- Process unit ID
- For each month, the number of valves, compressors, and pumps that:
  - were detected leaking
  - were not repaired (explain any delay of repairs and why process shutdown infeasible)
- Dates of process shutdowns during period
- Revisions to initial statement
- Results of all performance tests to determine compliance with:
  - no detectable emissions (pumps, valves, compressors, PRD gas/vapor and C-V systems)
  - alternatives for valves (2 percent annual leakage and skip periods)

SLIDE 6-7

OTHER BENZENE REPORTING ASPECTS

- First semi-annual report to include a schedule for semi-annual reporting
- Alternative standards for valves - 90 day notification required
- Application for approval of construction/modification not required if:
  - new source complies with standards
  - new source is not part of the construction of a process unit
  - all information is submitted in next semi-annual report

SLIDE 6-8

FUGITIVE VOC (LEAKS) RECORDKEEPING REQUIREMENTS

SLIDE 6-9

RECORDS FOR EQUIPMENT

- List - IDs of all equipment (except welded fittings)
- No detectable emissions designation
  - List of IDs of applicable pumps, compressors, and valves, and signature of owner/operator
- List of IDs of applicable pressure relief devices in gas/vapor service
- For each compliance test:
  - date
  - background reading
  - maximum reading of equipment
- List of IDs of equipment in vacuum service

SLIDE 6-10

RECORDS FOR CLOSED-VENT SYSTEMS AND CONTROL DEVICES

- Detailed schematics
- Design specifications
- Piping and instrumentation diagrams
- Dates and description of changes
- Description and rational of monitoring parameter(s)
- Non-operational periods
- Periods of no flame in pilot light for flares
- Dates of start-up/shut-downs

SLIDE 6-11

RECORDS FOR PUMPS
AND COMPRESSORS

- Dual mechanical seal and barrier fluid sensor
  - design criterion
  - explanation
  - any changes (and reasons)

SLIDE 6-12

RECORDS FOR VALVES

- Unsafe
  - IDs
  - reason
  - monitoring plan
- Difficult to monitor
  - IDs
  - reason
  - monitoring schedule

SLIDE 6-13

RECORDS FOR SKIP PERIODS
VALVES

- Schedule of monitoring
- Percent of leaking valves per period

SLIDE 6-14

RECORDS FOR EXEMPTIONS

- Log of:
  - analysis of design capacity of process unit
  - analysis of feed or raw materials
- Information and data to demonstrate that a piece of equipment is not in VOC service

SLIDE 6-15

RECORDKEEPING REQUIREMENTS FOR COMPLIANCE MONITORING RESULTS BY M-21

- Monthly (10,000 ppm):
  - pumps
  - valves
- Annual (no detectable emissions, 500 ppm):
  - pumps
  - compressors
  - valves
  - closed-vent systems

SLIDE 6-16

RECORDKEEPING REQUIREMENTS FOR COMPLIANCE MONITORING RESULTS BY M-21 (CONT.)

- Other:
  - pressure relief devices gas/vapor within 5 days of a release (500 ppm)
  - pressure relief devices, liquid flanges, and other connections within 5 days of a potential leak (10,000 ppm)
- Leaks:
  - after each repair attempt
  - closed-vent systems

SLIDE 6-17

MARKING OF LEAKS

- Weatherproof and visible ID
- *Must remain until repaired* (valves - must remain for 2 monthly monitoring periods)

SLIDE 6-18

RECORD OF LEAKS

- Maintain records for 2 years
- ID of:
  - leaking equipment
  - instrument
  - operator
- Dates of:
  - leak detected
  - each repair attempt
  - expected repair completion
  - process unit shutdowns while unrepaired
  - successful repair
- Maximum instrument reading after each repair attempt "above 10,000"
- Signature of owner/operator/designate decision - delay repair to process shutdown

SLIDE 6-19

RECORD OF LEAKS

Unit/Area Name: ___Survey Date:___

| Comp. ID No. | Comp. Type | Leak Tag No. |
|---|---|---|
| | | |

| Date | | | Initial CONC (ppm) | Recheck CONC (ppm) |
|---|---|---|---|---|
| Initial Discovery | Re-paired | Monitor Recheck | | |
| | | | | |

| Repair Delay Explanation | Expected Repair Date |
|---|---|
| | |

SLIDE 6-20

SUMMARY OF REPORTING AND RECORDKEEPING

| Component | Reports | Records |
|---|---|---|
| Valves, Pumps, Compressors | # of leaks, and those not repaired | test/repair data |
| Alternative Valves | percent leaking | performance test data |
| No detectable emissions (including designated valves, pumps, compressors, and pressure relief devices in gas/vapor service) | performance/monitoring test results | performance/monitoring test data |
| Pressure relief devices in liquid service, flanges and other connectors | NONE | test/repair data |
| Seal/Barrier Fluid System (for pumps, compressors) | NONE | design information and failure sensor criteria |
| Closed vent systems and control devices | performance test results | schematics, design parameters, diagrams, monitoring information, periods of non-compliance, startups and shutdowns |

SLIDES 6-21 & 6-22

# LECTURE 7

# IMPLEMENTATION DECISIONS AND GUIDANCE

IMPLEMENTATION DECISIONS
AND GUIDANCE

SLIDE 7-1

EPA POLICY MEMORANDA

- Enforcement Guideline S-28
- Sewers
- Oil/water separators
- Storage terminals
- Use of benzene versus purchase of benzene
- Welded fittings
- Bypasses of control devices
- Product accumulator
- Determination of "in benzene or vinyl chloride service"
- Insulated valves
- Plant site

SLIDE 7-2

RECORDKEEPING/REPORTING FOR ENFORCEMENT

- Data for records different than data for reports
  - Pumps, compressors, and valves. Record all test/repair data, but report only the number that leaked.
  - PRD liq, flanges, and other connectors: record test/repair data but no reporting
  - C-V SYS: record periods of noncompliance, but report only the annual performance tests
  - Alternative skip period valves: record percent leaking, but report only the number found leaking
- No mechanism for recording or reporting leaks/repairs of sampling connections and open-ended lines and valves
- No schedule for visual emissions determinations from flares

SLIDE 7-3

PLANT OPERATOR DETERMINATIONS

- Plant does the initial determination as to "in benzene or vinyl chloride service"
- Plant sets criterion for "leaks" at pumps and compressors with dual mechanical seals with barrier fluids
- Plant sets monitoring system of proper operating conditions for control devices

SLIDE 7-4

# LECTURE 8

# INSPECTION TECHNIQUES

OBSERVATION/INSPECTION
OF
MONITORING RECORDS
AND PROCEDURES

SLIDE 8-1

SUGGESTED INSPECTION STEPS

- Pre-inspection records search
  - Check applicability
  - Reporting status
- Initial inspection
  - Check records
  - Equipment survey
  - Plant procedures
- Post-inspection data sorting
- Additional inspections

SLIDE 8-2

PRE-INSPECTION RECORDS SEARCH
CHECK APPLICABILITY

- Review initial reports and/or waiver request
- Cross-check with other air, wastewater (NPDES), hazardous waste (RCRA), and toxic substances (TSCA) permits

SLIDE 8-3

PRE-INSPECTION RECORDS SEARCH
REPORTING STATUS

- Review all reports submitted and compare to the applicability determination
- Highlight questions areas and data to be checked against plant records
- Does facility seem to be in compliance? If not, why not?
- List questions to be asked and items to be checked during inspection

SLIDE 8-4

INITIAL INSPECTION CHECK RECORDS

- Compare with data from reports
- Are records complete per regulations?
- Verify unsafe and difficult to monitor determinations listed
- Check process unit determinations

SLIDE 8-5

CHECKING REPORTS AND ON-SITE RECORDS

- Pumps, compressors, and valves
  - Compare test/repair data in records to the numbers reported in last several reports
  - Compare cumulative totals of leaks and repairs from records and reports
- C-V SYS and control devices
  - Check records for excessive periods of noncompliance

SLIDE 8-6

CHECKING REPORTS AND ON-SITE RECORDS

- No detectable emissions equipment
  - Compare test data in records to reported results
- Alternative valves
  - Check % leaking in records to reported result
- Exemptions
  - Check records to determine if exemptions are still applicable

SLIDE 8-7

INITIAL INSPECTION EQUIPMENT SURVEY

- Review ID system
- Spot-check product accumulators, sampling connectors, open-ended lines and valves, etc., for correct equipment usage per regulations

SLIDE 8-8

INITIAL INSPECTION
PLANT PROCEDURES

- Monitoring
- Repairs
- Tracking system for scheduling monitoring and repairing as per regulations
- System for recording and reporting their inter-connected data
- Criterion for failure of dual mechanical seals with barrier fluids
- Monitoring of operation of control devices

SLIDE 8-9

POST-INSPECTION DATA SORTING

- Review applicability determination for completeness
- Review process units and equipment listings
- Compare reports to field inspection notes/copies of records
- Is recordkeeping system adequate to track monitoring, leaks, and repairs?
- Are monitoring staff, equipment, and procedures adequate?
- List items to be checked during next inspection

SLIDE 8-10

ADDITIONAL INSPECTIONS

- Review file and past inspection report
- Spot check for leaks (either visually or with OVA equipment) - select recently repaired equipment
- Review records
- Spot check a different area of plant by generally walk-through in an effort to eventually cover the entire affected facility
- Spot check a different type of equipment during each inspection
- Spot check a different portion of the records during each inspection

SLIDE 8-11

# LECTURE 9

# INSPECTION SAFETY

SELECTING AND USING VOC ANALYZERS

- Only instruments which are rated intrinsically safe for Class I, Division I and Division 2 areas should be used.
- Instrument recorders must meet the same requirements as the instrument itself.
- Intrinsically safe instruments will have a clearly marked seal.

SLIDE 9-1

SELECTING AND USING VOC ANALYZERS: CHARACTERISTICS OF INTRINSICALLY SAFE UNITS

- Encased battery packs
- Encapsulated amplifiers
- Specially designed electrical circuitry
- Flame arrestors (Flame ionization instruments)

SLIDE 9-2

SELECTING AND USING VOC ANALYZERS

Before using an instrument, it is necessary to confirm that the protective features have not been disabled by unauthorized repair.

SLIDE 9-3

SELECTING AND USING VOC ANALYZERS

- Do not attempt to screen equipment more than 6 feet above secure platforms.
- Do not attempt to hold the analyzers while climbing ladders. Both hands must be free.
- Avoid unprotected rotating equipment which could snag loose support straps of the instrument.
- Avoid work in close proximity to hot equipment or around slippery surfaces.

SLIDE 9-4

BASIC REASONS FOR INHALATION RISKS

- The instrument probes are very short.
- The VOC emission plume concentrations are very high.
- It is necessary to position the probe in line with the emission plume in order to achieve satisfactory capture.
- There can be several fugitive VOC leak sites around the equipment being checked.

SLIDE 9-5

INHALATION HAZARDS

- Many of the fugitive VOC compounds have very poor warning properties. The odor, taste, and irritations are well above the permissible exposure limits.
- Many of the fugitive VOC compounds have serious physiological effects.

SLIDE 9-6

MINIMIZING INHALATION HAZARDS

- Do not enter areas with poor natural ventilation.
- Do not stand directly above the portable analyzer probe.
- Leave the instrument on while walking through the facility to detect any intermittent fumigation from VOC leaks in the general area.
- Wear respirator protection approved by plant and agency safety officials.

SLIDE 9-7

LIMITATIONS OF RESPIRATORS

- Organic cartridges and canisters are not equally effective for all types of organic compounds. Consult published tables of relative breakthrough times.
- Organic vapor air purifying respirators become less effective when the air temperature and/or the relative humidity increases.
- Both cartridges and canisters for organic vapor suffer breakthrough quickly.

SLIDE 9-8

LIMITATIONS OF RESPIRATORS

- Many organic compounds emitted as fugitive leaks are skin absorbable. Respirators do not provide any protection against these materials.
- Decontamination of respirator face pieces sprayed by liquids may be incomplete and thereby create a future hazard.

SLIDE 9-9

GENERAL SAFETY POLICIES

The inspector should obtain all necessary personal protection equipment prior to leaving for the inspection site. Equipment should not be borrowed from the plant.

SLIDE 9-10

GENERAL SAFETY POLICIES

Inspectors should not work alone. A plant representative should accompany the inspector at all times.

SLIDE 9-11

GENERAL SAFETY POLICIES

Inspectors should take regularly scheduled breaks and drink fluids to reduce the risk of heat stress.

SLIDE 9-12

GENERAL SAFETY POLICIES

Inspectors must comply with all DOT regulations if taking compressed calibration gas cylinders to the inspection site.

SLIDE 9-13

GENERAL SAFETY POLICIES

Inspectors must be aware of and conform to all applicable plant and agency safety policies.

SLIDE 9-14