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# Odorization: Code Compliance and Liability

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# Question 1

- ◆ What gas-in-air concentration corresponds to one-fifth of the lower explosive limit?
- ◆ It all depends on what you define as the LEL for your gas system.
  - State regulations – some states have more stringent odor levels – NY, MA, MD

## Question 2

- ◆ When using the Odorometer and the 2 BB's are floating in the rotameter tube, which BB do you use to take a reading and where on the BB do you take the reading?
- ◆ Read top BB and read at the bottom edge
  - Correspondingly, when do you push the button on the Odorator or DTEX to take an odor reading? When you first smell the gas, when it is strong, or at its detectable level?

## Question 3

- ◆ What does “Readily Detectable” mean?
- ◆ The odor of gas should be one that a spouse, family, or member of the general public would quickly recognize, prompting them to take appropriate action.

# Question 4

- ◆ Which pipelines must always be odorized?
- ◆ Distribution lines—
  - OPS Interpretation, Sept. 10, 1980
  - *Section 192.625(a) requires that gas in distribution lines have a natural odor or be odorized to the limit prescribed. Since service lines are distribution lines, they are subject to the odorization requirements of §192.625(a). The exception from odorization provided by §192.625(b) for some transmission lines does not affect the requirement to odorize gas in distribution lines connected to an unodorized transmission line.*

## Question 5

- ◆ What is the minimum allowable odorant injection rate for regulatory compliance?
- ◆ There is no injection rate specified in the code. The only requirement for injection rates is in 192.625(e)
  - Equipment for odorization must introduce the odorant without wide variations in the level of odorant.

# Bonus!!!

- ◆ So what is “wide variation”
- ◆ OPS interpretation October 31, 1973

*An acceptable range for variation of odorant concentration would be within a range no lower than a concentration which is readily detectable at one-fifth of the lower explosive limit by the typical person in Comment 1. The intent of the regulations is that the operator would not make variations in odorant concentration that could cause unwarranted public reaction. For the most part, each gas operator has determined the range of odorant concentration needed in its system for compliance with regulatory standards.*

# Why Odorize?

- ◆ Regulations – 49 CFR 192.625(a)
  - A combustible gas in a distribution line must contain a natural odorant or be odorized so that at a concentration in air of one-fifth of the lower explosive limit, the gas is readily detectable by a person with a normal sense of smell.



# Why Odorize?

- ◆ Liability

- Odorization of a gas system is done with a single purpose in mind: Provide the public with an effective warning device to alert them when there is a possible problem.

# No Exceptions!

- ◆ OPS Interpretation, Sept. 10, 1980

- *Section 192.625(a) requires that gas in distribution lines have a natural odor or be odorized to the limit prescribed. Since service lines are distribution lines, they are subject to the odorization requirements of §192.625(a). The exception from odorization provided by §192.625(b) for some transmission lines does not affect the requirement to odorize gas in distribution lines connected to an unodorized transmission line.*

# Complying with 49 CFR 192.625

- ◆ Readily detectable
- ◆ 1/5 LEL
- ◆ Class location
- ◆ Odorant selection
- ◆ Odorizers and injection rates
- ◆ Periodic sampling

# What is Readily Detectable?

- ♦ **Ready** - "in a ready manner: as **a** : without hesitating : **WILLINGLY** **b** : without much difficulty..."
- ♦ **Detectable** - "**1** : to discover the true character of **2** : to discover or determine the existence, presence, or fact of..."
- ♦ **Readily detectable odor** – *an odor that can be discovered, determined or whose existence can be identified in a ready manner, without hesitating or much difficulty.*

Merriam-Webster Dictionary, on-line edition

# What is Readily Detectable?

- ◆ The odor of gas should be one that a spouse, family, or member of the general public would quickly recognize, prompting them to take appropriate action.

# Normal Sense of Smell?

- ◆ Use a wide variety of testing personnel
- ◆ Testing or “qualifying” a sense of smell
- ◆ Sensonics “Smell Identification Test”
  - <http://www.smelltest.com>

# 1/5 of the LEL

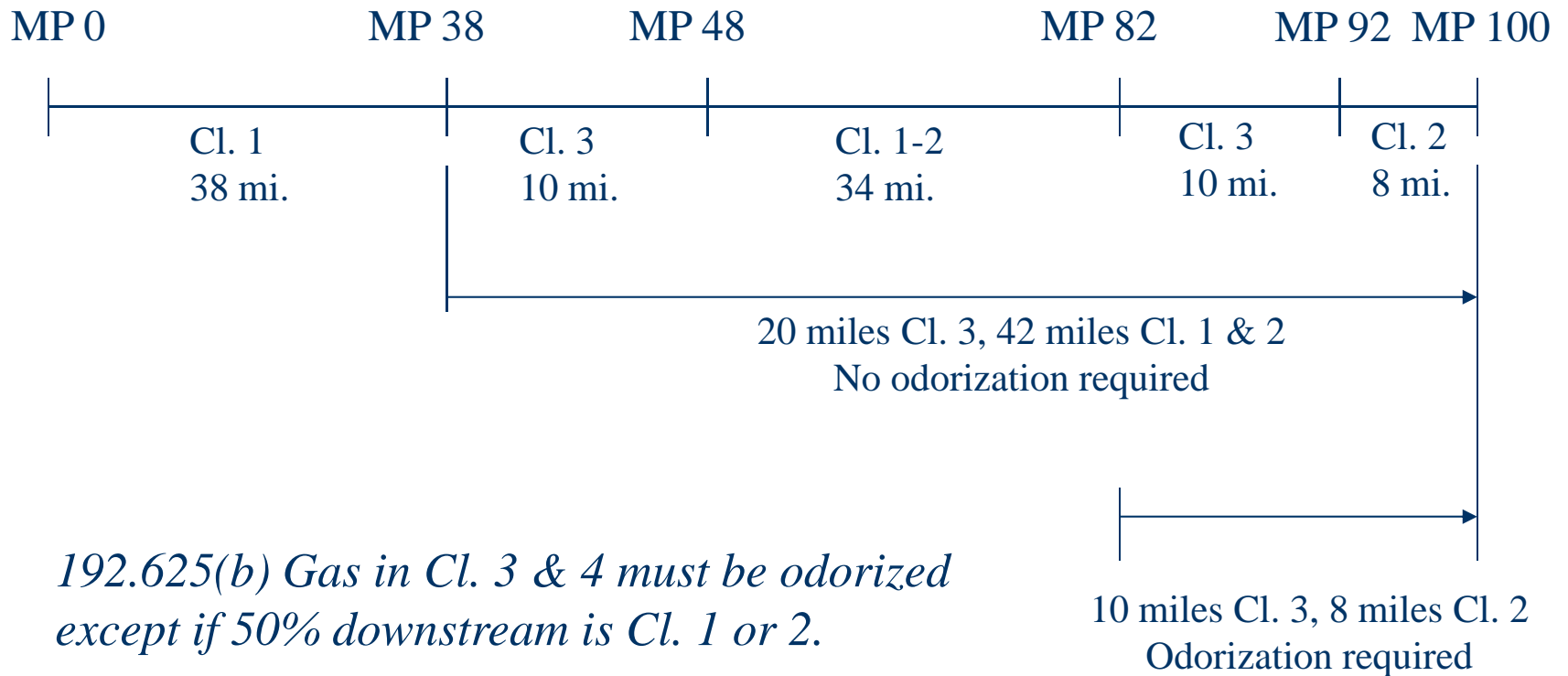
- ◆ Is  $1/5 = 1\%$  gas-in-air?
- ◆ State regulations
- ◆ Define it in the O&M Manual

# Is Low Odor an Non-compliance?

- ◆ The Eastern Region has discussed these Code Sections with Mr. DeLeon and as the result, we offer the following:
- ◆ 1. Concerning §192.625(a):
- ◆ A violation does not automatically exist if an operator, during random tests, finds an inadequate level of odorant in his distribution system (assuming the operator can demonstrate a history of adequate levels of odorant in his system). However, when an inadequate level is discovered, prompt action must be taken by the operator to insure that the level is increased to acceptable limits. The operator must be able to demonstrate that prompt action was taken.
- ◆ If for example, an unacceptable odorant level is discovered and the remedy involves increasing the injection rate of the odorizer servicing that particular area, then the operator must note that an adjustment was made (either to his test document sheet or at least some type of daily log), thus demonstrating that prompt action was taken.
- ◆ Obviously, some time must pass before the adjustment of the odorizer effects the area where insufficient odorant levels were discovered. Consequently, a follow-up test must be conducted by the operator in a timely manner to insure that the prompt action taken by the operator has sufficiently increased the level of odorant in the problem area.



# Odorizing Transmission Lines



# Odorizing Transmission Lines

## ◆ Other exemptions

- Lines transporting unodorized gas to certain facilities before May 5, 1975
- Lateral lines to distribution centers with 50% of the line in Class 1 or 2 locations
- Hydrogen used for feedstock in manufacturing

# NPRM, Misc. Updates

FR Volume 76, Number 229 (Tuesday, November 29, 2011)

- ◆ (b) \* \* \*
- ◆ (3) In the case of a lateral line which transports gas to a distribution center, at least 50 percent of the length of that line is in a Class 1 or Class 2 location as measured between the distribution center and the first upstream connection to the transmission line;

*Figure 1. Hypothetical lateral system (not to scale).*

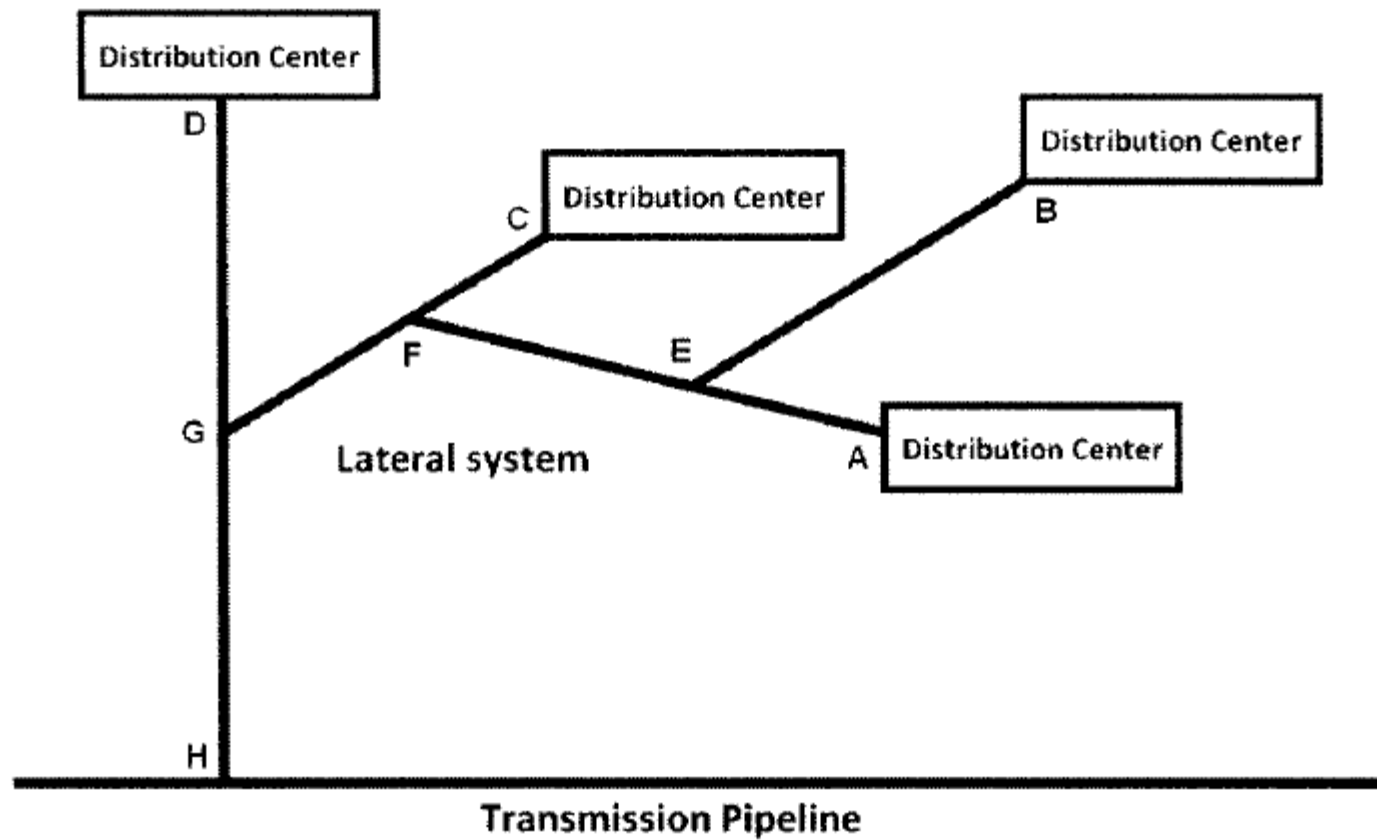
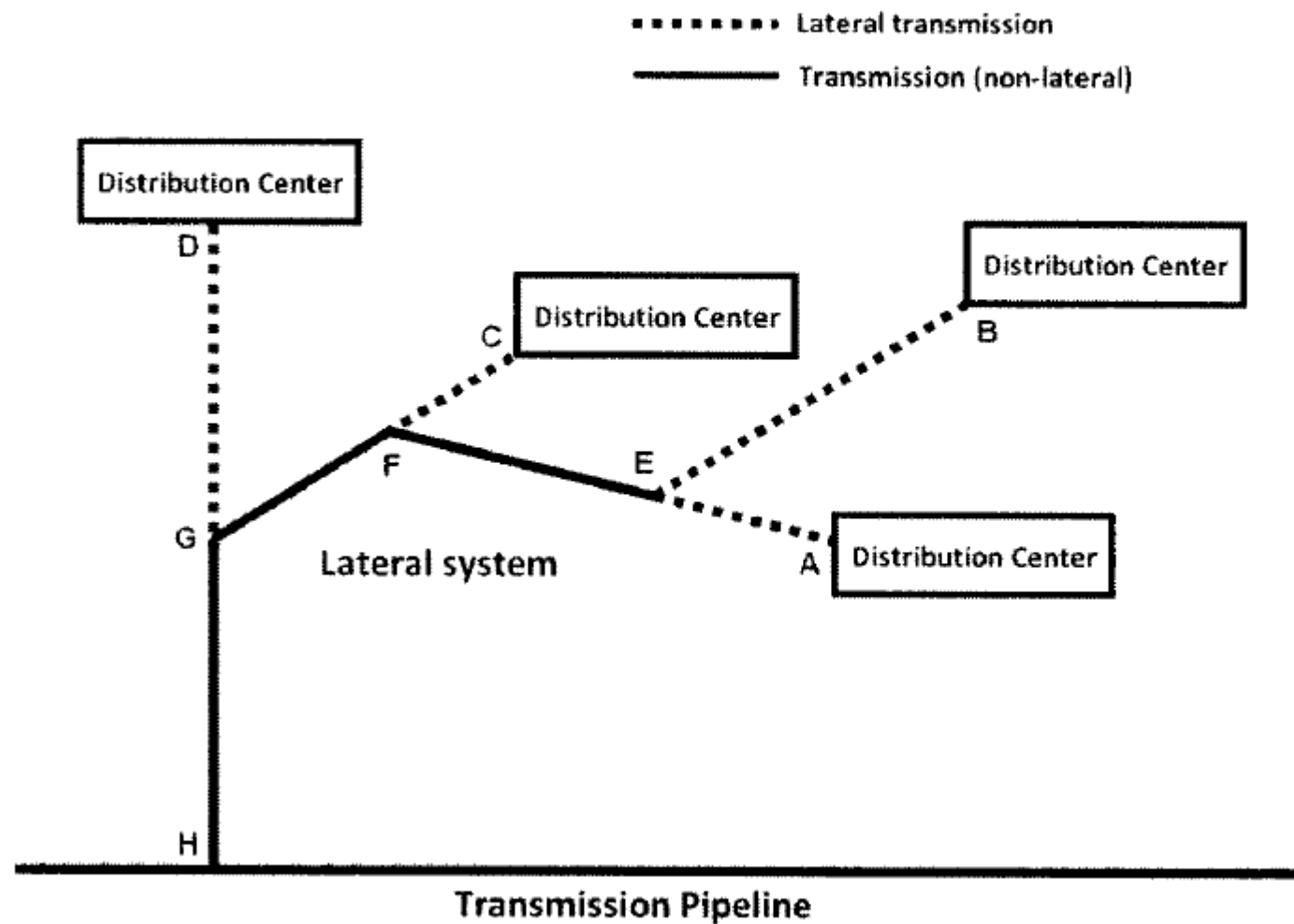


Figure 2: Identification of laterals for purposes of § 192.625(b)(3) (not to scale).



# Class Location Change

## ◆OPS interpretation, February 6, 1979

*This is in response to your recent letter asking how much time is permitted under Part 192 to make system changes (in particular odorization) necessitated by class location changes.*

*While §192.613(a) requires an operator to make necessary changes, no time period for compliance is specified. However, a similar provision under §192.611(c) requires confirmation or revision of MAOP within 18 months after a change in class location. In view of this similarity, it appears that an 18-month compliance period is appropriate to apply under §192.613(a). In a previous interpretation, we have stated that the 18-month period begins to run upon completion of a structure which results in a new class location (see May 12, 1978 memo to DMT-213.)*

# Class Location Change

- ◆ §192.611 Change in class location: ...
- ◆ Section (d) now reads
  - (d) Confirmation or revision of the maximum allowable operating pressure that is required as a result of a study under §192.609 must be completed within 24 months of the change in class location...
  - Effective Date July 14, 2004. per Amendment 192-94.

# What is Wide Variation

## ◆OPS interpretation October 31, 1973

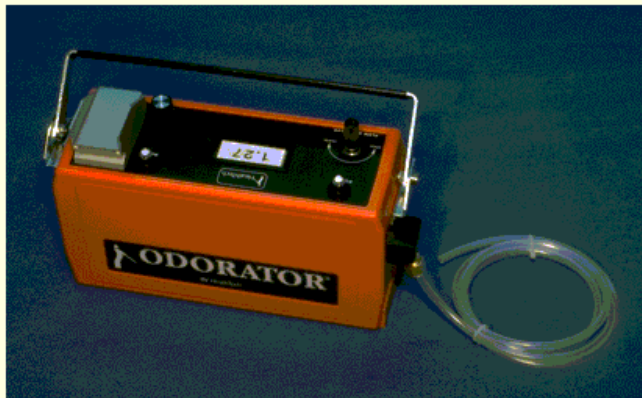
*An acceptable range for variation of odorant concentration would be within a range no lower than a concentration which is readily detectable at one-fifth of the lower explosive limit by the typical person in Comment 1. The intent of the regulations is that the operator would not make variations in odorant concentration that could cause unwarranted public reaction. For the most part, each gas operator has determined the range of odorant concentration needed in its system for compliance with regulatory standards.*



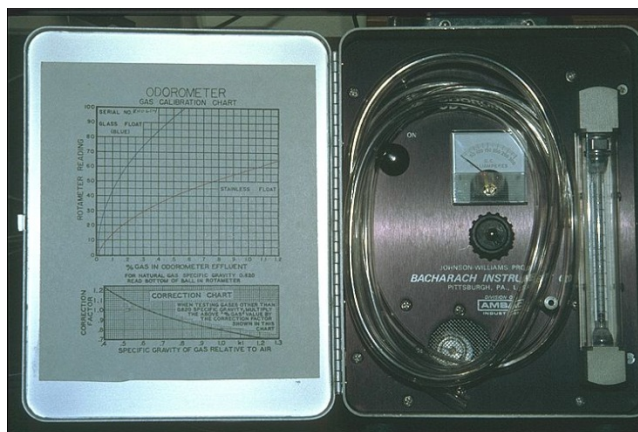
# 192.625(f) Periodic Sampling

- ♦ (f) To assure the proper concentration of odorant in accordance with this section, each operator must conduct periodic sampling of combustible gases using an instrument capable of determining the percentage of gas in air at which the odor becomes readily detectable. Operators of master meter systems may comply with this requirement by—
  - (1) Receiving written verification from their gas source that the gas has the proper concentration of odorant; and
  - (2) Conducting periodic "sniff" tests at the extremities of the system to confirm that the gas contains odorant.
- ♦ Amdt. 192-93, 68 FR 53895, Sept. 15, 2003

# Odor Concentration Meters



Heath Odorator



Bacharach Odorometer



YZ DTex

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File View DTEX Help



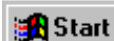
Test Records

Test Log (Total: 274, Displayed: 274)

#	Date	Time	Location	TDL	RDL	Operator	Comments
00001	02/03/98	09:00:00	EMERSON ELEMENTARY	0.18	0.37	HENRY HODGE	
00002	02/05/98	09:00:00	EMERSON ELEMENTARY	0.28	0.37	JOHN MCGOVERN	
00003	02/15/98	09:00:00	QUALIFICATION TEST	0.31	0.49	HENRY HODGE	
00004	02/16/98	09:00:00	ALBERTSONS SUPRMKT	0.30	0.48	JOSEPH GARCIA	
00005	02/17/98	09:00:00	EMERSON ELEMENTARY	0.12	0.28	HENRY HODGE	
00006	02/19/98	09:00:00	EMERSON ELEMENTARY	0.31	0.43	JOHN MCGOVERN	
00007	02/22/98	09:00:00	ACME TREE SERVICE	0.38	0.48	JOHN MCGOVERN	
00008	02/23/98	09:00:00	ALBERTSONS SUPRMKT	0.54	0.65	JOHN MCGOVERN	
00009	02/24/98	09:00:00	EMERSON ELEMENTARY	0.18	0.34	HENRY HODGE	
00010	02/26/98	09:00:00	EMERSON ELEMENTARY	0.27	0.37	JOHN MCGOVERN	
00011	03/01/98	09:00:00	ACME TREE SERVICE	0.20	0.31	JOSEPH GARCIA	
00012	03/02/98	09:00:00	ALBERTSONS SUPRMKT	0.41	0.56	JOSEPH GARCIA	
00013	03/03/98	09:00:00	EMERSON ELEMENTARY	0.11	0.30	HENRY HODGE	
00014	03/05/98	09:00:00	EMERSON ELEMENTARY	0.28	0.39	JOHN MCGOVERN	
00015	03/08/98	09:00:00	ACME TREE SERVICE	0.37	0.49	JOHN MCGOVERN	
00016	03/09/98	09:00:00	ALBERTSONS SUPRMKT	0.54	0.65	JOHN MCGOVERN	
00017	03/10/98	09:00:00	EMERSON ELEMENTARY	0.12	0.31	HENRY HODGE	
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00021	03/15/98	09:00:00	QUALIFICATION TEST	0.33	0.50	HENRY HODGE	
00022	03/15/98	09:00:00	QUALIFICATION TEST	0.43	0.55	JOHN MCGOVERN	
00023	03/16/98	09:00:00	ALBERTSONS SUPRMKT	0.38	0.57	JOSEPH GARCIA	
00024	03/17/98	09:00:00	EMERSON ELEMENTARY	0.15	0.30	HENRY HODGE	
00025	03/19/98	09:00:00	EMERSON ELEMENTARY	0.36	0.46	JOHN MCGOVERN	
00026	03/22/98	09:00:00	ACME TREE SERVICE	0.34	0.43	JOHN MCGOVERN	
00027	03/23/98	09:00:00	ALBERTSONS SUPRMKT	0.40	0.51	JOHN MCGOVERN	

Task

Progress



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File View DTEX Help

Test Records

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00002	02/05/98				
00003	02/15/98				
00004	02/16/98				
00005	02/17/98				
00006	02/19/98				
00007	02/22/98				
00008	02/23/98				
00009	02/24/98				
00010	02/26/98				
00011	03/01/98				
00012	03/02/98				
00013	03/03/98				
00014	03/05/98				
00015	03/08/98				
00016	03/09/98				
00017	03/10/98				
00018	03/12/98				
00019	03/15/98				
00020	03/15/98				
00021	03/15/98				
00022	03/15/98				
00023	03/16/98				
00024	03/17/98				
00025	03/19/98	09:00:00	EMERSON ELEMENTARY	0.36 0.46	JOHN MCGOVERN
00026	03/22/98	09:00:00	ACME TREE SERVICE	0.34 0.43	JOHN MCGOVERN
00027	03/23/98	09:00:00	ALBERTSONS SUPRMKT	0.40 0.51	JOHN MCGOVERN

Filter Data

Select Location(s)

☐ ACME TREE SERVICE  
☐ ALBERTSONS SUPRMKT  
☒ EMERSON ELEMENTARY  
☐ QUALIFICATION TEST

All Clear

Select Operator(s)

☒ HENRY HODGE  
☒ JOHN MCGOVERN  
☒ JOSEPH GARCIA

All Clear

Select DTEX Unit(s) - by Serial No.

☒ 00014  
☒ 00045  
☒ 00073

All Clear

Date Range

From  (i.e. 3/17/99)  
To

TDL Range RDL Range

Upper  Upper   
Lower  Lower  (i.e. 0.25)

Altitude Range Temp. Range

Upper  Upper   
Lower  Lower  (i.e. 20)

Note: Blank fields ignored when filtering.

OK Cancel

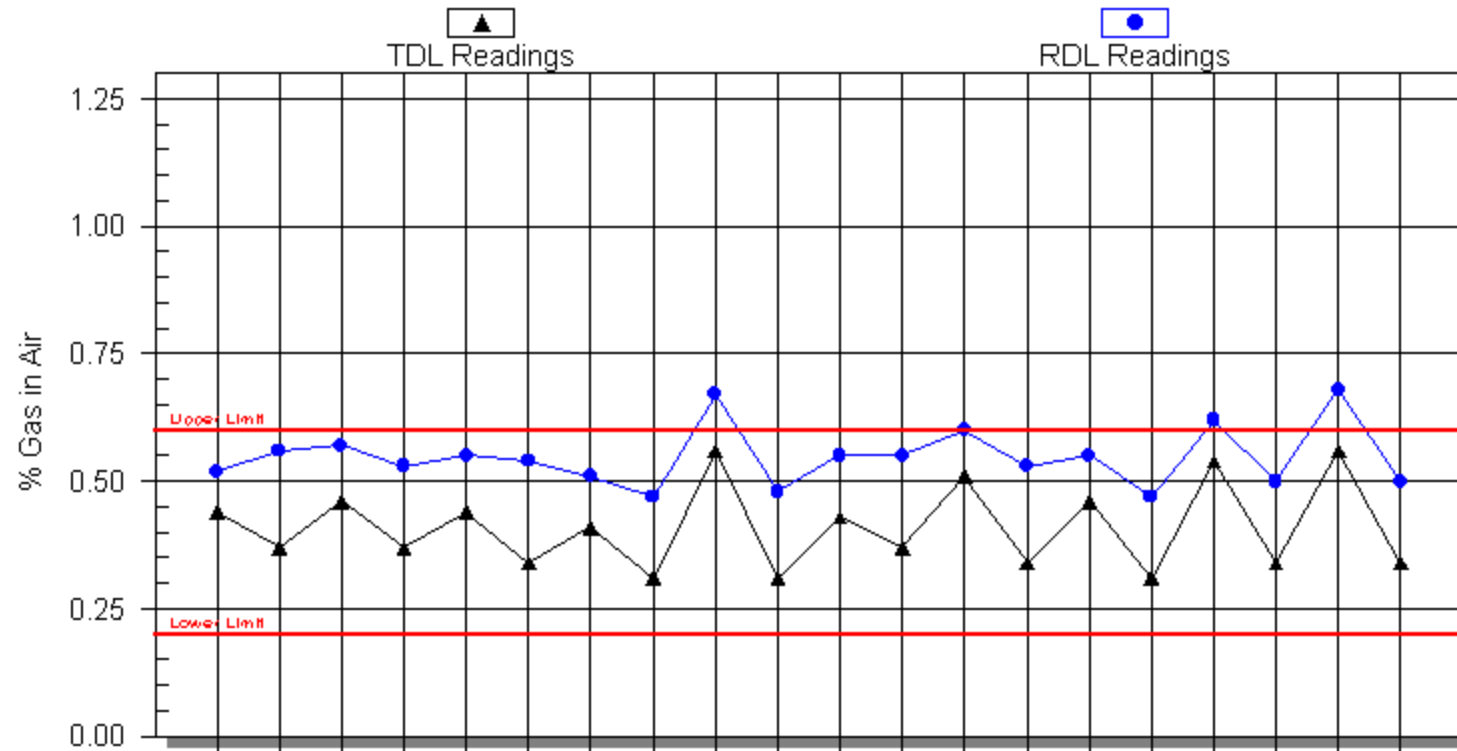
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Test Log Graph

January 1999

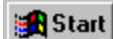


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TDL Readings	0.44	0.37	0.46	0.37	0.44	0.34	0.41	0.31	0.56	0.31	0.43	0.37	0.51	0.34	0.46	0.31	0.54	0.34	0.56	0.34
RDL Readings	0.52	0.56	0.57	0.53	0.55	0.54	0.51	0.47	0.67	0.48	0.55	0.55	0.60	0.53	0.55	0.47	0.62	0.50	0.68	0.50

Settings

Export/Print

Close



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# Periodic Sampling

- ◆ "Period(ic)" is defined as " 1 : occurring or recurring at regular intervals"  
(Merriam-Webster Dictionary, on-line edition)
- ◆ Regular, systematic schedule

## Rule of Thumb

1 test per month per 1000 meters

or

1 test per week whichever is greater  
(up to 1-2 tests per day)

# Periodic Sampling

- ◆ OPS Interpretation December 17, 1970
  - ***Question:** Section 192.625 - Odorization of Gas. (f) What is OPS meaning of "periodic sampling"?*
  - ***Answer:** In Section 192.625(f), the term "periodic sampling" is used instead of requiring a specific amount of time between tests, because each system will have different requirements. For example, where gas flow is low, the odorant may intend to drop out of the gas stream and especially on a new system, the odorant may tend to be absorbed, on the inside surface until the pipe wall becomes saturated. Because of these conditions, odorant sampling should be done more often in such situations than in systems operating under normal conditions. The operator must sample as often as experience indicated the need, to assure proper odorant level.*

# Test Points

- ◆ End of system, farthest point in pipe miles from odorizer.
- ◆ Areas of low or changing flow rates.
- ◆ Known problem areas.
- ◆ Downstream of areas where liquids collect.
- ◆ New construction, steel or plastic.
- ◆ Random test locations.



# Compliance Actions

- ◆ 1. §192.625(f) Each operator shall conduct periodic sampling of combustible gases to assure the proper concentration of odorant in accordance with this section.
  - At the time of the inspection CPL personnel could not produce documentation that would indicate compliance with the odorization requirements of 192.625
- ◆ (8). Section 192.625, in that your manual does not contain procedures for monitoring odorization levels throughout your system to ensure that the gas is readily detectible at concentrations of 1/5 lower explosive limit (LEL). In order to ensure that the gas is detectible at this level, tests must be conducted with a properly calibrated instrument at specified intervals.

# Operator Qualification

- ◆ Qualification required by October 28, 2002
  - Perform assigned covered tasks; and
  - Recognize and react to abnormal operating conditions.
- ◆ Odorization must meet 49 CFR 192.625
- ◆ Odorization includes two different functions
  - Operation and maintenance of odorizers
  - Testing to verify odor levels

# Benefits of Qualification

- ◆ Qualification of personnel needed for compliance
- ◆ Helps ensure public safety.
- ◆ Training, testing and review are critical in developing and maintaining a qualified work force.

# OQ2 Protocols

- ◆ "Evaluation methods of operator employees and contractors include the evaluation of an individual's knowledge, skills, and abilities to ensure that the individual can perform the assigned covered tasks."

# Required Knowledge, Skills and Abilities

- ◆ Knowledge of regulations and compliance parameters.
- ◆ Understanding operation and maintenance of odorization equipment.
- ◆ Ability to conduct odor concentration tests.
- ◆ Recognizing abnormal conditions.
- ◆ Documentation.

# Regulations And Compliance

- ◆ Required levels of odor for compliance.
  - What limits have companies prescribed in their O&M Manuals?
  - Even though the regulations state 1/5 LEL, if an operator has set more stringent levels the testing personnel must follow the O&M and react accordingly.
- ◆ The same holds true for injection rates described in the O&M Manual.

# Operation And Maintenance Of Odorization Equipment

- ◆ Odorant types
  - Which odorant for which odorizer?
- ◆ Operation and maintenance of odorizers.
  - Start up, shut down, and on-line adjustments.
- ◆ Safe handling of odorants.
  - Personal protective equipment
  - Environmental protection

# Conducting The Odor Concentration Test

- ◆ Variety of personnel used to conduct tests
- ◆ Operation and maintenance of odor concentration meters.
  - Inlet pressure
  - Instrument start-up
  - Test procedures
  - Understanding test results.
- ◆ Training on new odor concentration meters per 192.805(f)



# Abnormal Conditions

- ◆ No odor detected.
- ◆ Odor levels above or below company established limits.
- ◆ Change in gas odor.
- ◆ Injection rates above or below company established limits.
- ◆ Odorizer failure.
- ◆ Odorant tank is empty at the next inspection.
- ◆ No change in odorant level in run tank between inspections.
- ◆ Unexpected change in odor/leak call complaints. (This may be part of covered tasks for other personnel as well.)

# 192.805(f) Communication of Change

- ◆ (f) Communicate changes that affect covered tasks to individuals performing those covered tasks
  - ◆ New odorizers
  - ◆ New operating and maintenance procedures.
  - ◆ Details of new odorant blend.
  - ◆ Change in injection rate (dilute vs. full strength).
  - Potential change in downstream odor intensity requiring adjustment of injection rates.

# Odorant Injection Rates

- ◆ Equivalent weights at 1 lb/mmcf
  - 1 pint is approximately 1 pound of odorant
  - .25 grains of sulfur
  - 4 ppm of odorant in the gas stream

# Odorant Components

- ◆ EM Ethyl Mercaptan
- ◆ DMS Dimethyl Sulfide
- ◆ IPM Isopropyl Mercaptan
- ◆ TBM Tertiary Butyl Mercaptan
- ◆ NPM Normal Propyl Mercaptan
- ◆ MES Methyl Ethyl Sulfide
- ◆ SBM Secondary Butyl
- ◆ THT Thiophane

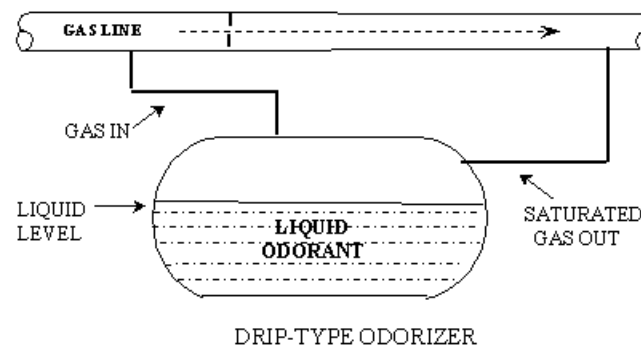
# Types of Odorizers

- ◆ Wick
- ◆ Wick By-pass
- ◆ Drip
- ◆ Meter driven pump (Peerless MP)
- ◆ Bourdon Tube (Williams)
- ◆ Injection

# Factors Which Affect Odorant Quantity

- ◆ Odorizer malfunction
- ◆ Contaminants in the odorizer
- ◆ Distillate or other liquids
- ◆ Pipewall adsorption
- ◆ Oxidation

# Bypass Odorizer



# Factors Which Affect Odor Intensity or Perception

- ◆ Anosmia - odor blindness
- ◆ Smoking
- ◆ Colds and Allergies
- ◆ Physical condition – age, gender, exposure
- ◆ Psychological effects



# Document Review Can Find -

- ◆ Incorrect reporting of odor intensity.
- ◆ Lack of variation in reported odor levels.
- ◆ Erratic readings at same location.
- ◆ Consistent change in odor levels
  - Change in sense of smell
- ◆ Lack of required information.
- ◆ Failure to follow company standards.

# Ensure Qualification

- ◆ Written test
- ◆ Observation of odor tests
- ◆ Document review
- ◆ Verification of sense of smell

# University of Pennsylvania Smell Identification Test

Sensonics, Inc.

PO Box 112

Haddon Heights, NJ 08035

ph. 856-547-7702,

<http://www.smelltest.com>.

# The Liability of Odorization

- ◆ Unintended releases can be dangerous.
- ◆ Regulations require
  - Specific detection levels.
  - Odorant quality
  - Periodic testing
- ◆ Operators have a duty to exercise *a high degree of care*.

# Odorization Risk Management

- ◆ Odorization is a means to provide the public with an effective warning device to alert them when there is a possible problem.
- ◆ Can the operator prove the odorization of their system is continuous, consistent and operating as designed?

# Odor Related Incidents

- ◆ Low odor, improper operation of odor concentration meter
- ◆ Failure to train, improper odorization

# Manage Risk and Liability with an Odorization Audit

- ◆ Records and Documentation
- ◆ Odorizing equipment
- ◆ Personnel qualifications
- ◆ Test points and equipment
- ◆ Overall leak call rate

# Why Audit Odorization?

- ◆ Insure that odorization is continuous
- ◆ Verify that odorization is consistent
- ◆ Make sure the odor works



# Records and Documentation

- ◆ Injection rates
- ◆ Amounts and types of odorant purchased
- ◆ Odorizer inspection reports
- ◆ Test results from odor concentration meter tests

# Records and Documentation

- ◆ Training records
- ◆ Types of odor calls received
- ◆ Results of odor call investigations
- ◆ Total number of odor calls received

# Odorizing Equipment

- ◆ Types of odorizers
- ◆ Type of odorant used
- ◆ Maintenance activity
- ◆ Locations

# Personnel Qualifications

- ◆ Training on test instruments
- ◆ Sense of smell
- ◆ Variations in sensitivity
- ◆ Training for the masses

# Test Points and Equipment

- ◆ Location of test points
- ◆ Testing frequency
- ◆ Odor concentration meters
- ◆ Chromatographs

# Leak Calls

- ◆ Frequency of calls
- ◆ Types of leaks/sources found
- ◆ Recurring locations.

# Evaluation

- ◆ Is the odor continuous?
- ◆ Is the odor consistent?
- ◆ Is the program working as designed?

# Conclusion

- ◆ We are able to show we are experts
- ◆ Program meets its goals
- ◆ We are serious about Public Safety