

Odorant Level Analysis

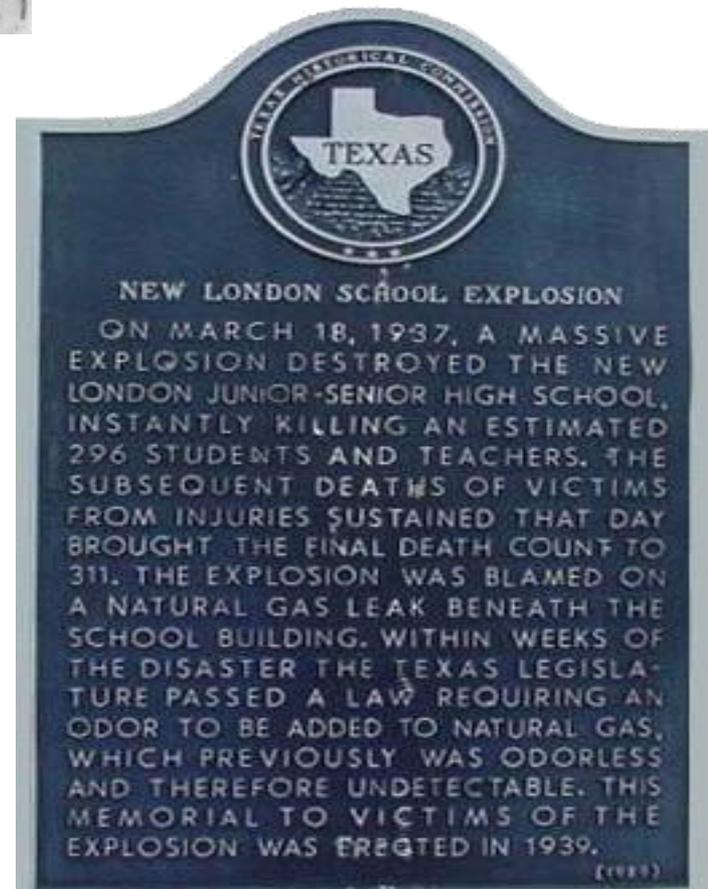
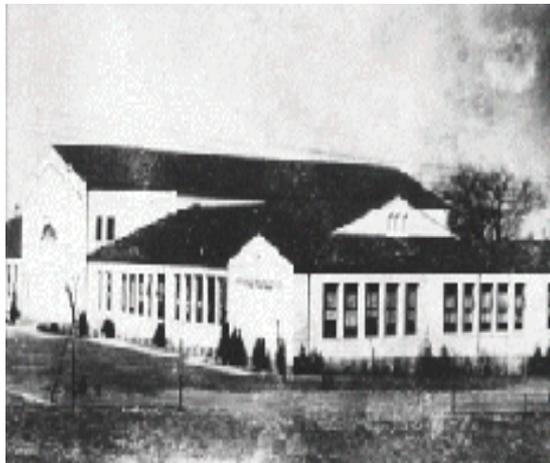
Ohio Gas Association

Eric Six

Heath Consultants Incorporated

June 24, 2014

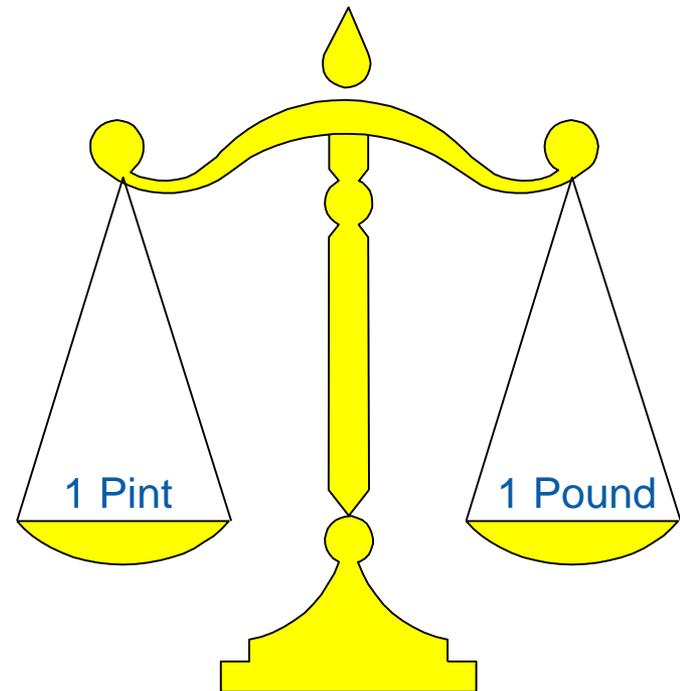




Odorant Injection Rates

Equivalent Weights at 1 Lb/MMcf

- 1 pint is approximately 1 pound of odorant
- 0.25 grains of sulfur
- 4 parts per million of odorant



WHY ODORIZE / ADD ODORANT TO NATURAL GAS?

- SAFETY

- A warning device for the public – it is the customer's leak detector and lifeline to safety

- COST REDUCTION FOR COMPANIES

- Aids in the detection of leaks and avoids liability

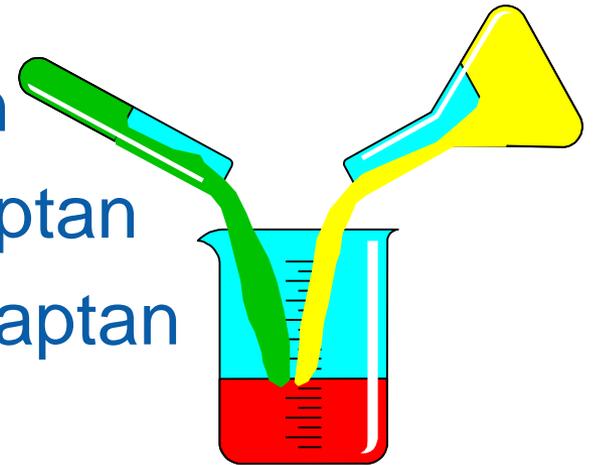
- COMPLY WITH GOVERNMENT REGULATION

- DOT 192.625 – Odorization of gas



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 Mercaptan
THT	Thiophane



Physical ailments

Age

Masking

Distraction

Factors Which Affect Odorant Quality



Odorizer shut-down
Contaminants in odorizer
Naturally occurring sulfurs
Distillates in pipeline
Pipewall adsorption
Oxidation in pipeline
Soil adsorption

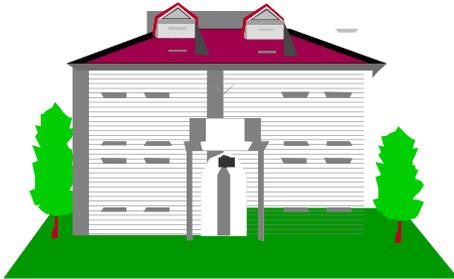
Factors Which Affect Odorant Quantity



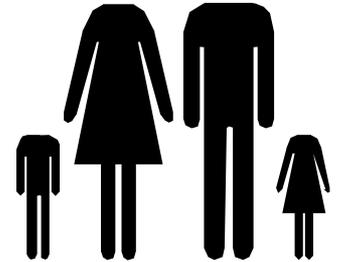
WHY ODORIZE ?



Why Odorize?



SAFETY!



To protect **LIFE** and
PROPERTY!

Warning **AGENT!**

WHY ODORIZE?

- Cost reduction for companies
- Aids in the detection of leaks.
- Which help in avoiding liability.

DOT REQUIREMENTS

Federal Odorization Standard 192.625 (2-22-88)

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

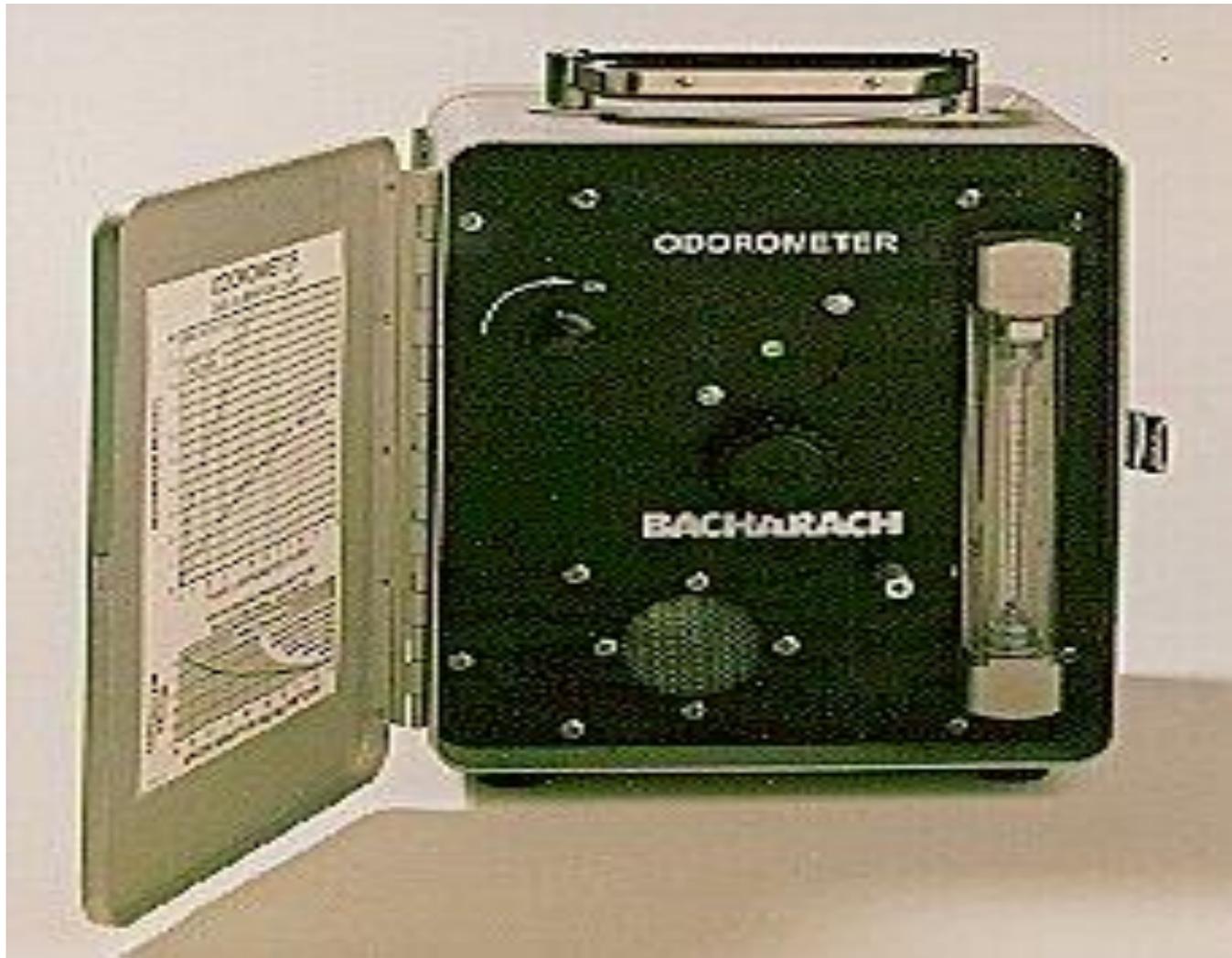
- (f) To assure the proper concentration of odorant in accordance with this section, each operator must conduct periodic sampling of combustible gases using an instrument capable of determining the percentage of gas in air at which the odor becomes readily detectable.

Odorant is the customer's leak detector.

INSTRUMENTATION

- Instrumentation used shall consist of a:
 - gas inlet control valve
 - gas / air mixing chamber
 - a sample port for sniffing the gas / air mixture
 - a method to determine the relative concentration of the gas / air mixture.

BACHARACH ODOROMETER: rate of gas flow reads out on the flowmeter and is compared to chart on the inside door panel



HEATH ODORATOR: Electronic measuring device with a digital display



YZ INDUSTRIES DTEX: Microprocessor records and date stamps all info



DETECTABLE AT 1/5 OF LEL!

- Explosive limits: 5% Lel to 15% Uel
- Must be able to smell odorant in no more than 1% of natural gas

-less than 1% is “good”

-greater than 1% is “bad”

Incident (2000)

Company Retention \$200K

- While parking the family car in his attached garage, a retired 83 year-old physician lost control of his automobile and struck the concrete block foundation that supported and elevated his home's heating and hot water equipment.
- The impact moved the boiler about one foot from its original position. The damage was severe enough to warrant an inspection, so the doctor called his regular plumbing and heating service provider who agreed to check the unit that afternoon.
- The doctor then called the local gas company and explained what had happened.

Incident (2000) Cont'd.

Company Retention \$200K

Cont'd.

- He was asked whether he smelled gas. He answered that he did not. The company's call center representative then explained that the company would not examine the damage unless he smelled gas, but if he did, he should please call back and they would gladly send someone out to his home.
- 90 minutes later the home exploded and the doctor and his wife were severely burned. Less than one month later, suffering from severe burns over most of his body, the doctor died.

What Happened?

- At times, customers and the general public seek assistance from gas utilities for situations that are not commonly encountered. Such was the case in this unusual incident. The call center representative did not recognize the potential severity of a situation involving an automobile striking the heating equipment.
- Listening to callers and their circumstances is critical to effectively achieve the ultimate goal of emergency response and the protection of life and property.
- The doctor, being 83 years old may have lost much of his sense of smell with age.

The call center is the “First Line of Defense”

PERIODIC SAMPLING GUIDE 192.625 (f): SAMPLE SITES

- Should be selected to ensure that all gas within the piping system has sufficient odorant.
- Test sites: based on system
 - Fixed areas
 - Random
 - 24 hour access
 - Indoor / outdoor
 - Farthest point in system

PERIODIC SAMPLING GUIDE 192.625 (f): FREQUENCY OF TEST

- Should be at sufficient intervals to ensure that the gas is odorized
 - Daily, weekly, monthly, quarterly, biannually
 - Size and population density
 - Systems age and type of pipe
 - Type of odorant
 - Past experiences / Odorization problems
 - Should be consistent

PERIODIC SAMPLING GUIDE 192.625 (f): CONDUCTING TEST

- Odor levels – use instrument in combination with your “nose” to determine odor intensity.
- Sniff Test – performed by individuals with a normal sense of smell
- Normal sense of smell – may be affected by smoking, spicy foods, chewing tobacco, gum, perfume/cologne, health conditions, or prolong exposure

CONDUCTING TEST (cont'd)

- Program for personnel:
 - Check individuals who are currently performing sniff test to see if they still have a “normal sense of smell”
- Options to consider as part of your program:
 - Standardize on one test device
 - Ongoing training program
 - Rotate employees performing the test
 - Review location of where test are taken
 - Routine calibration

PERIODIC SAMPLING 196.625 (f): RECORDS

- Operator should retain records:
 - Odor levels
 - Odorant concentration
 - Records of sniff test – date, time, person conducting test, location, and whether odorant was detected.
 - Calibration of instrument
 - Personnel training

Odorization must
be continuous
(every day)



and it must be
adequately
documented!

Incident (1996)

Company Retention \$1M

- An explosion and fire destroyed a mobile home severely burning its occupants a man and his wife. The husband spent 44 days in the hospital undergoing 6 surgical treatments and his wife spent 77 days and underwent 12 surgeries.

Incident (1996)

Company Retention \$1M

Cont'd.

- The cause of the leak was attributed to natural gas leaking from an open fuel line below the mobile home. The open fuel line was the work of a plumber hired to move the gas line. Not being “viable” – having sufficient assets or insurance coverage – he was not named as a defendant in the case.
- That left the local gas company as the sole defendant with the plaintiff only alleging that the gas was improperly odorized (no readily detectable odor).

Incident (1996) Cont'd.

Company Retention \$1M

Cont'd.

- Since the gas company performed and documented an odor-level test immediately after the incident, which indicated that the gas was readily detectable at levels 3 times the federal requirement, it was believed that the allegation would be difficult to prove.

Incident (1996) Cont'd.

Company Retention \$1M

Cont'd.

- During the trial, the odor meter used to conduct the test was introduced as evidence. When it was shown to the jury, its flexible tubing, which transports gas samples from the source into the instrument, had a distinct odor of gas; it should have borne no odor.
- The tubing, not being made of material intended for use with the instrument, retained odorant molecules – thus the smell.

Incident (1996) Cont'd.

Company Retention \$1M

Cont'd.

- The plaintiff argued this nullified the company's odor readings taken immediately after the incident.
- The jury originally found for the plaintiff and awarded \$6,500,000.00. Based on the improbability of a successful appeal, the utility accepted a negotiated settlement of \$4,100,000.00

What Happened?

- The concept of proper operation, calibration and normal maintenance of test instrumentation consistent with their manufacturers' recommendations cannot be over emphasized – not only for odor meters, but combustible gas indicators, flame ionization instruments, carbon monoxide detectors, oxygen level instruments and other safety and hazard detection instruments.
- Calibration and training in the proper operation and maintenance of these instruments is essential.
- The instrument is only as good as the operator who uses it.

TEST PROCEDURES: ODOR CONCENTRATION METHOD

- Make sure the operator is trained in the use of the instrument and understands the procedures for testing.
 - Test instrument prior to performing a test
 - Attach instrument to gas supply – off position. Sniff test.
 - Turn on gas supply and instrument – valve on instrument should be in the closed position. Sniff test.
 - Begin test by slowly turning valve until a faint odor is detected – this will be your threshold detection level.
 - Continue to open valve until a readily detectable odor is observed.
 - Other steps: continue test by recording strong level, very strong and obnoxious.

CONCLUSION

- Overall:
 - Make sure you understand your instrument
 - Read the manual
 - Get training – manufacturers rep, gas company personnel
 - Keep all records – calibration, test, etc. The PUC will check
 - Understand rules and regulations
 - Be aware of your surroundings

Questions?