

Combustible Gas Indicator

Daily Operational Tests

- Check hoses
- Check for leaks
- Change filters as needed
- Check calibration
- Check batteries
- Voltage Test
- Air Tightness Test
- Dual Scale Zero Test



Methods of Leak Survey



Walking



Mobile

Equipment - Mobile

- Maps
- Safety equipment
- FID
- CGI
- Soap bottle
- Plunger bar
- Necessary paper work
- Communication equipment



Mobile Leak Detection Evolution



OMD™ Optical Methane Detector

Factors to consider

- Wind
- Ground moisture
- Venting conditions
- Speed of travel
- Location of gas main



Equipment - Walking

- Maps/pipe locators
- Hydrogen Flame Ionization Instrument
- Combustible Gas Indicator
- Soap bottle
- Plunger bar
- Necessary paper work (I.e., leak reports)
- Communication equipment
- TRAINED TECHNICIAN TO CONDUCT THE SURVEY

Surface Sampling Laser Leak Detectors



- Heath Detecto Pak-Infrared (DP-IR)



- Southern Cross '46 Hawk



- Heath Remote Methane Leak Detector (RMLD)

Remote Methane Leak Detector (RMLD)



- Laser capable of detecting leaks up to 100 feet away
- Ideal for checking bridge crossings, fenced in yards, overhead piping
- Self calibration
- Methane only

Hydrogen Flame Ionization (HFI)

Portable Instruments

- Search tool
- Visual and audible indication of gas concentrations in ppm
- Indications must be confirmed with a Combustible Gas Indicator (CGI)



HFI's



- **Original portable Hydrogen Flame Ionization Instruments were large and bulky. Once the micro-processor was invented, it allowed the HFI instruments to become more streamlined.**

Solid State Sensors

Bascom Turner Gas - Rover



Examples of “Ticker” Type

(Non-quantitative just a different air indicator)

Tiff 8800



Gas Trac



Incident (2007)

Company Retention \$1,000,000.00

- A contractor working for the local phone/cable provider struck and damaged a properly marked 2” gas main operating at 45 psig. Natural gas migrated through the soil to a residence causing an explosion fatally injuring two people, one of which was a gas company employee.
- Prior to the incident two homes were evacuated when gas was detected at the foundations with a combustible gas indicator (CGI) and their gas meters were shut off. The crews began to excavated on both sides of the main to “squeeze off” and began repairs. 1 hour and 45 minutes later the repair was completed. 15 minutes later a resident at one of the evacuated homes asked if she could re-enter her home to check on her dog.
- A gas company service technician accompanied the homeowner into the house carrying a non-quantitative “ticker” instrument to test the atmosphere. Shortly after entering the home the explosion occurred fatally injuring both the homeowner and the gas company employee.

Incident (2007)

Company Retention \$1,000,000.00

Lessons Learned

- If the gas company technician had followed company procedures and checked for a hazardous concentration of natural gas by using a calibrated Combustible Gas Indicator (CGI) prior to allowing the homeowner to enter the residence, he would have identified the presence of natural gas and these fatalities may have been prevented. **The Combustible Gas Indicator should be used to check the atmosphere because it provides the operator with a percentage of the gas in air reading and indicates if the employee is entering a hazardous atmosphere.**

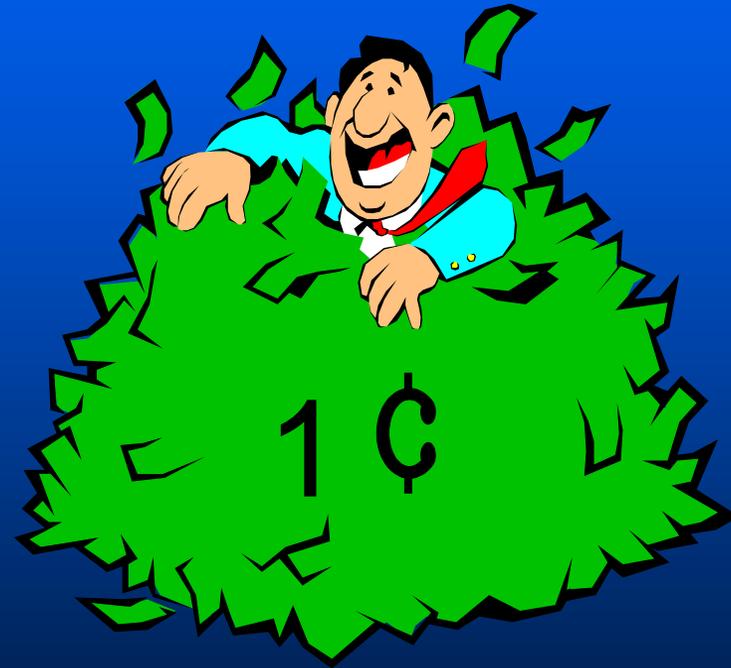
Insurance Incurred \$2.8 Million

Conversion of Parts Per Million To Percentage of Gas

- 10,000 PPM equals 1 percent gas/air
(20% LEL)
- 1,000 PPM equals 1/10 percent gas/air
(2 LEL)
- 1 PPM equals 1/10,000 percent gas/air

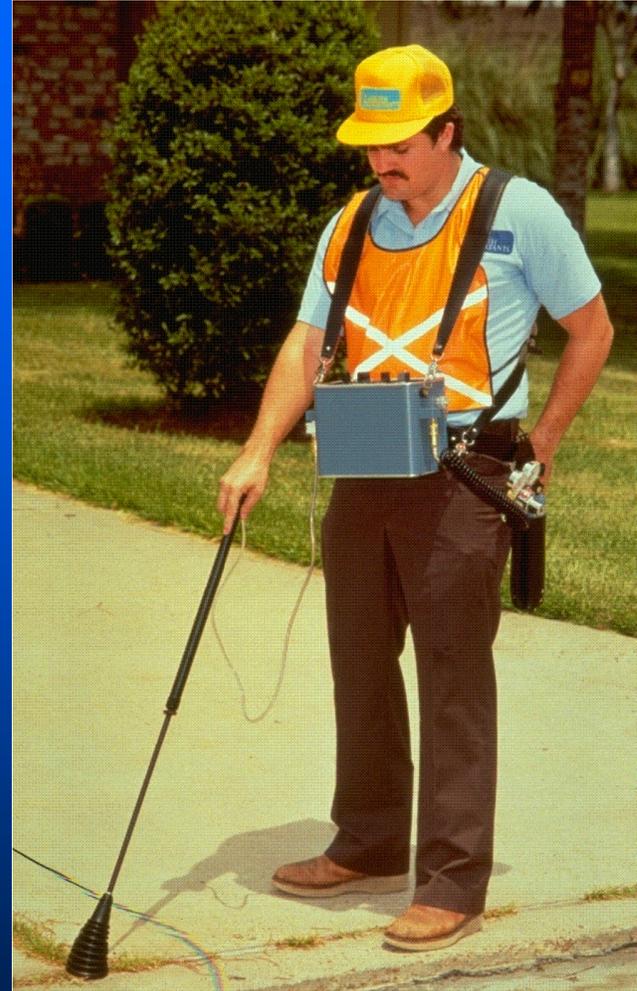
1 Part Per Million (PPM)

One penny
in
Ten Thousand
Dollars



No matter the instrument used, the following apply and need to be taken into consideration while performing the survey:

- Wind
- Ground Moisture
- Venting Conditions
- Speed of Travel



Daily Care & Preventive Maintenance

- Check hoses
- Change Filters as needed
- Check/Perform Calibration
- Check batteries
- Use proper fuel - Certified Gas Only.
- Clean probe with water



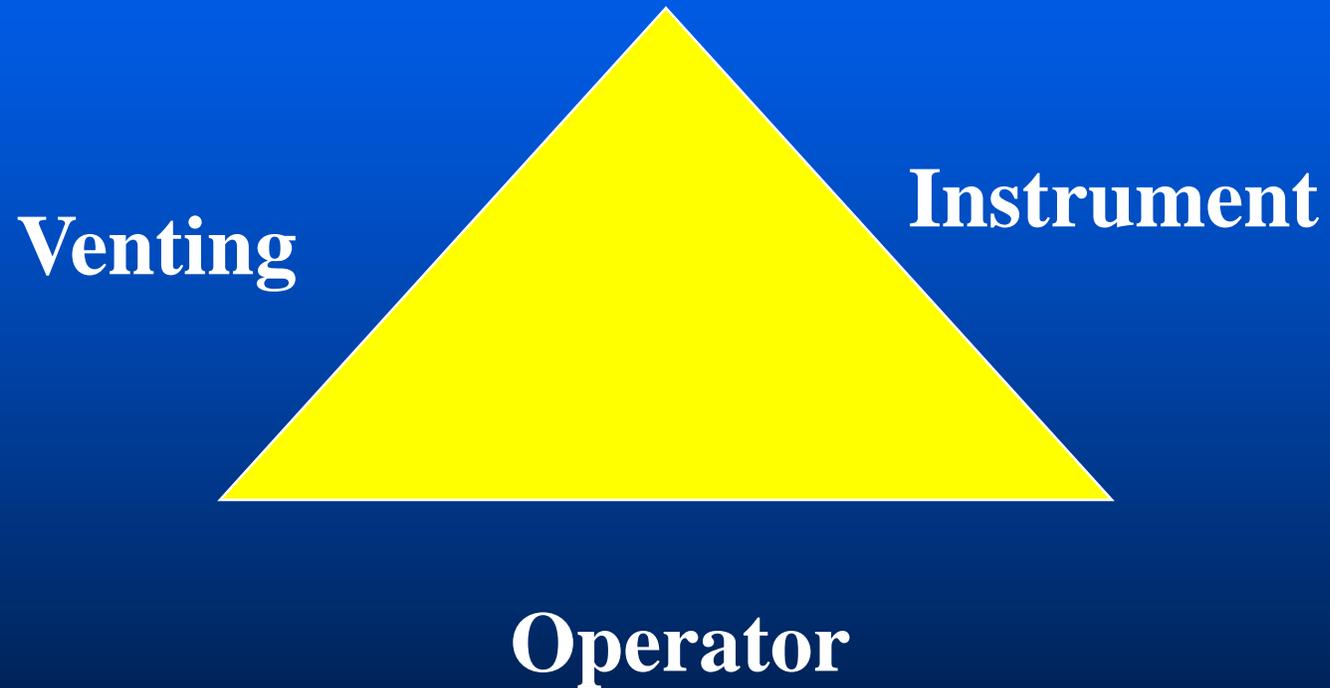
Calibration

- Used to document that the instrument is working properly.
- A certified, known sample of gas is drawn into or passed through the sensor.
- The instrument is adjusted to read the known sample at the certified percentage level (Examples: 100ppm, 2.5% or 100% Methane/Air).
- This test is then recorded and documented on a calibration sheet for each instrument, or stored internally on the unit.

Calibration (cont'd)

- Technician must be trained
- Sample delivery system suited for the instrument
- Gases must be certified
- Certain gases (CO/H₂S) have a shelf life/check date
- Documentation/Separate form for each instrument

Optimum Survey Triangle



Combustion Chamber

Combustion Chamber Demonstration

Lessons Learned:

- Natural gas is lighter than air
- Flame wave moves up-over-down
- Pressure wave moves upward first
- The optimum mixture (10%) creates the most efficient burning
- The greatest forces are created when there is a low point of ignition
- The two major by-products of the combustion process are carbon dioxide (CO₂) and water vapor (H₂O)

Relative damage in a natural gas-related incident is related to:

- Point of ignition-vertically
- Point of ignition-horizontally
- Source of ignition
- Type of leak=volume of gas
- Type/structure of building
- Other combustibles in area



Finding a Leak...



Conducting the Survey...At
What Speed Should the Survey
be Completed?

- **Walking Survey:** Normal walking speed. Coverage per day will vary due to local conditions and leak indication frequency.
- **Mobile Survey:**
 - **Pumped sample:** 3-5 mph for normal compliance survey...10-15 mph for frost patrol.
 - **OMD/laser based:** 10-20 mph for compliance...20-30 for frost patrol.

Leak Classification

- Find the surface “hot spot”
- Take CGI readings
- Center the leak
- Determine the spread
- Grade leak
- Pinpoint leak

CENTERING

Where Is The Gas?

PINPOINTING

Where Is The Leak?

**The Leak Must Be Centered
Before It Is Pinpointed!**

**CENTERING=
WHERE IS THE GAS?**

Centering The Leak...Barholes

- Probe holes must be of sufficient depth
- Test all available openings
- “Zero out” N-S-E-W
- Note the stabilized readings
- You must have sufficient information to make a good judgement



Be Careful – “Don’t make a leak, looking for a leak.”

Incident (2005)

Company Retention \$500K

- **A homeowner contacted the gas company stating that “she smelled a very strong odor of gas in the vicinity of her gas meter”.**
- **The gas company sent a service technician to investigate the odor complaint. Upon arrival, the technician noticed the smell of gas as soon as he got out of his truck.**
- **He decided to put a bar hole down near the riser to check the soil atmosphere. The temperature was around 5 degrees and there was frost in the ground making it difficult to make the test hole.**

Incident (2005)

Company Retention \$500K

Cont'd.

- **After a lot of effort, he was able to get a test hole in the ground below the frost layer. When he pulled his probe bar out of the ground, gas started blowing up through the test hole. The escaping gas was making considerable noise so he put the probe bar back in the hole. He ran back to the truck to get a shovel to dig the plastic service up in order to squeeze it off and stop the leak.**
- **As he was attempting to expose the service, approximately 30 minutes after the line was hit, there was an ignition and two people inside of the home were slightly injured.**

What Happened?

- **Bar testing and checking the soil atmosphere for gas is a crucial part of the overall odor complaint investigation. It is necessary to make the test hole a sufficient depth in order to obtain an accurate reading, thus getting below the frost layer is essential.**
- **In this case, the bar should have been left out of the bar hole to allow the gas to “vent” and notifying the occupants to leave the house until the line could be shut off.**
- **The main priority is Public Safety!**

GPTC Guidelines

Leak Classification

The following establishes a criteria by which leakage indications of flammable gas can be graded and controlled. When evaluating any gas leak indication, the initial step is to determine the perimeter of the leak area. When this perimeter extends to a building wall, the investigation should continue into the building

GPTC Guidelines

Class 1 Definition

A leak that represents an existing or probable hazard to persons or property, and requires immediate repair or continuous action until the conditions are no longer hazardous.

