History of Leak Detection Technology

- Vegetation Leak Surveys – 1930’s to early 1990’s
- Bar-Hole Leak Surveys (CGI) – mid-1940’s to early 1960’s
- Mobile FID Leak Surveys – late 1950’s to present
- Portable FID Leak Surveys – late 1960’s to present
- Portable Catalytic / Thermal Conductivity / Electro-Chemical Technology (CGI) – late 1980’s to present
- Mobile Optical Methane Detector (OMD) late 1990’s to present
- Remote Methane Leak Detector (RMLD) mid-2000’s to present
- Portable & Mobile Optical / Infrared Technology mid-2000’s to present
- Imaging Cameras – mid-2000’s to present
Vegetation Leak Surveys

- Natural Gas displaces oxygen and moisture in the soil.
- Results in dead or dying vegetation.
- Once used as a means of DOT 192 Compliance.
- Early 1990’s eliminated as a means of DOT 192 regulatory compliance for leak survey.
Vegetation Leak Surveys

• More prevalent during growing season
• Better results when main & services located under grass.
• Practically useless when main & services located under concrete or asphalt.
• Currently a lost “art” but definitely gas company employee’s should be aware of affects and respond accordingly.
Vegetation Damage
Bar-Hole Leak Surveys

- No longer used for leak survey with the exception of heavier than air gases like propane
- Now used to confirm / grade / pinpoint leakage.
- Labor intensive
- Risk damage to underground structures
- Extremely accurate in determining leak location
Confirming Leak Indication with Combustible Gas Indicator
Mobile FID Technology

- Early versions permanently mounted in vehicle.
- Later versions could be removed for portable applications.
- Total hydrocarbon detection including false positives like car exhaust / gasoline and atmospheric contaminants.
- Requires external fuel and calibration gases
- External sample pump and tubing maintenance
- Detection capabilities of 1 ppm to 10,000 ppm or 1% gas by volume.
Mobile Flame-Ionization (FID) Leakage Surveys
Early Versions – 1960’s
Early Versions – 1980’s
Current Flame-Ionization Technology
Portable FID Technology

- Portable access to main & service lines and rear easement applications inaccessible to a vehicle.
- Requires external fuel and calibration gases.
- A “total” hydrocarbon detector.
- Detection capabilities of 1 ppm to 10,000 ppm or 1% gas by volume.
- Internal sample pump
Portable FID Technology
Early Combustible Gas Indicator (CGI) Technology

- Early versions were LEL (catalytic combustion) only.
- Hand-aspirated sample draw
- Analog meter display
- Realistically 2 LEL or 1000 ppm detection capability.
- Used primarily for bar-holing and atmosphere testing.
- Manual internal calibration
- Limited application / modes of operation
Early Analog LEL / Volume Gas Technology Hand Aspirated
Early Analog CGI
Current Digital CGI Instruments

10 % GAS
SAMPLE

0 20 40 60 80 100
Latest Combustible Gas Indicator (CGI) Technology

- Internal sample pump
- Addition of semi-conductor (ppm) and thermal conductivity (volume gas) sensor technology.
- Addition of CO, O2 and H2S sensors
- Data-logging & alarm capabilities
- Microprocessor diagnostic design
- Automatic external calibration options
- Digital display
- Numerous application / modes of operation.
- Sensitivity from 50 ppm to 100% by Volume combustibles.
Ergonomic – Multi-Gas Technology
Automated Calibration Stations
Optical Methane Detector (OMD)

• 1st mobile replacement for FID technology
• Infrared methane detection only
• No external sample pump or tubing
• No external fuel and calibration gases
• Increased speed of survey
• Less false positive indications
• Microprocessor technology with data-logging and GPS capabilities
• Sensitivity from 1 ppm to 10,000 ppm
Mobile Optical Methane Detector  
(OMD)
Remote Methane Leak Detector (RMLD)

- 1st device to detect methane outside of the leak plume.
- Conventional technology had to be in the leak plume.
- Ability to reach inaccessible areas like behind locked gates, piping suspended from bridges, ceilings, fenced areas, etc.
- Excellent emergency response tool for rapid location of venting gas.
- Sensitivity from 5 ppm to 10,000 ppm
- Infrared Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Remote Methane Leak Detector

Transceiver

- SPOTTER
- MEASURING LASER SOURCE
- SPOTTER LASER TRIGGER

Control Unit and Harness
RMLD

Example

- **Scan Distance**: 15 m (50 ft)
- **IR Beam 'Footprint'**: \(4.9 \text{ m (16 ft)} \times 0.3 \text{ m (11 inches)} \) @ 15 m (50 ft)
- **Background Methane**: 1 ppm
- **Avg. Plume Concentration**: 20 ppm
- **Plume Width (Distance IR beam passes through plume)**: 2 m
- **RMLD reading**: Background + leak = \((15 \text{ m} \times 1 \text{ ppm}) + (2 \text{ m} \times 20 \text{ ppm})\) = 55 ppm-m

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Field Applications
Field Applications
Mobile RMLD

- Efforts currently under development for a mobile RMLD.
- Ability to mount RMLD on vehicle to survey mains and adjacent services.
- Video enhanced
- GPS / GIS application
- Application for gas gathering, transmission and distribution
Mobile RMLD
Mobile RMLD
Optical / Infrared (IR) Technology

- Ability to operate in both portable and mobile applications.
- Methane detection only
- Internal calibration
- Detection from 1 ppm to 100% by volume.
- Combination search instrument and CGI tool in one
- Data-logging / GPS / Bluetooth technology
- Infrared Controlled Interference Polarization Spectrometer
- Internal sample pump
Portable / Mobile Survey / Pinpointing Infrared Technology
Imaging Cameras

- Not specific to methane but images temperature differential as well as wide range IR light band
- Non-quantitative
- Not capable of detecting low volume indications.
- Application for hard to reach areas.
Imaging Cameras
Imaging Cameras
Aerial Laser / IR Technologies

- Capable of methane only detection
- Must have unobstructed line of site
- Application for gathering and transmission rather than distribution
- Generally can fly fixed wing / helicopter at 500 – 1000 feet above the ground.
- Ability to incorporate aerial photography / video for ROW of maintenance / compliance.
Aerial Laser / IR Technologies
Aerial Laser / IR Technologies
Aerial Laser / IR Technologies
QUESTIONS?