Methane Leak Detection and Measurement Technologies

Turkmenistan Symposium on Gas Systems Management: Methane Mitigation

April 26th 2010 – Ashgabat, Turkmenistan

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Agenda

- Portable Infrared Methane Detectors
- Mobile Infrared & Optical Methane Detectors
- Catalytic / Thermal Conductivity / Electrochemical Detectors
- Infrared Laser Based - Remote Methane Leak Detectors
- Infrared Gas Imaging Cameras
- High Flow Samplers
- Calibrated Measurement Bags
- Aerial Leak Detection

Portable Infrared Methane Detector

Methane to Markets

Optical Methane Detection

ATV - Optical Methane Detector

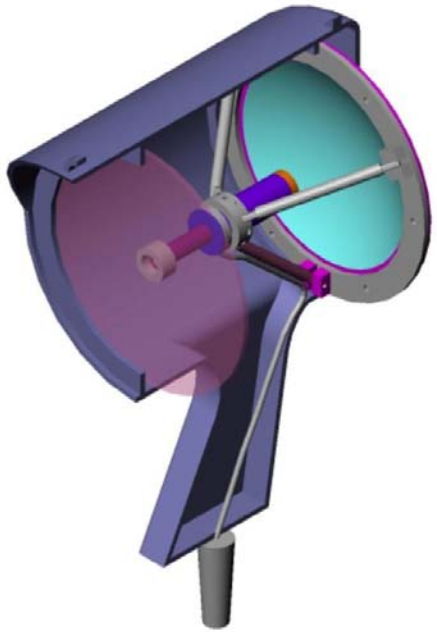
Multi-Function Gas Detectors

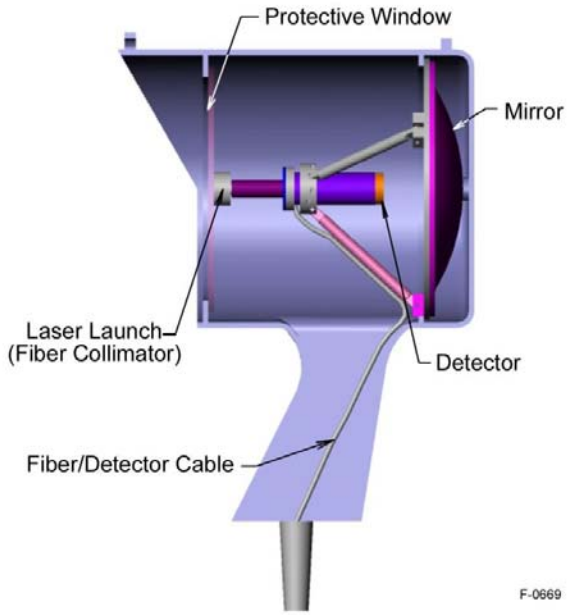
- Catalytic oxidation, thermal conductivity hydrocarbon detectors
- Display reading in lower explosive range of gas (LEL) and % volume gas

Multi-Function Gas Detectors

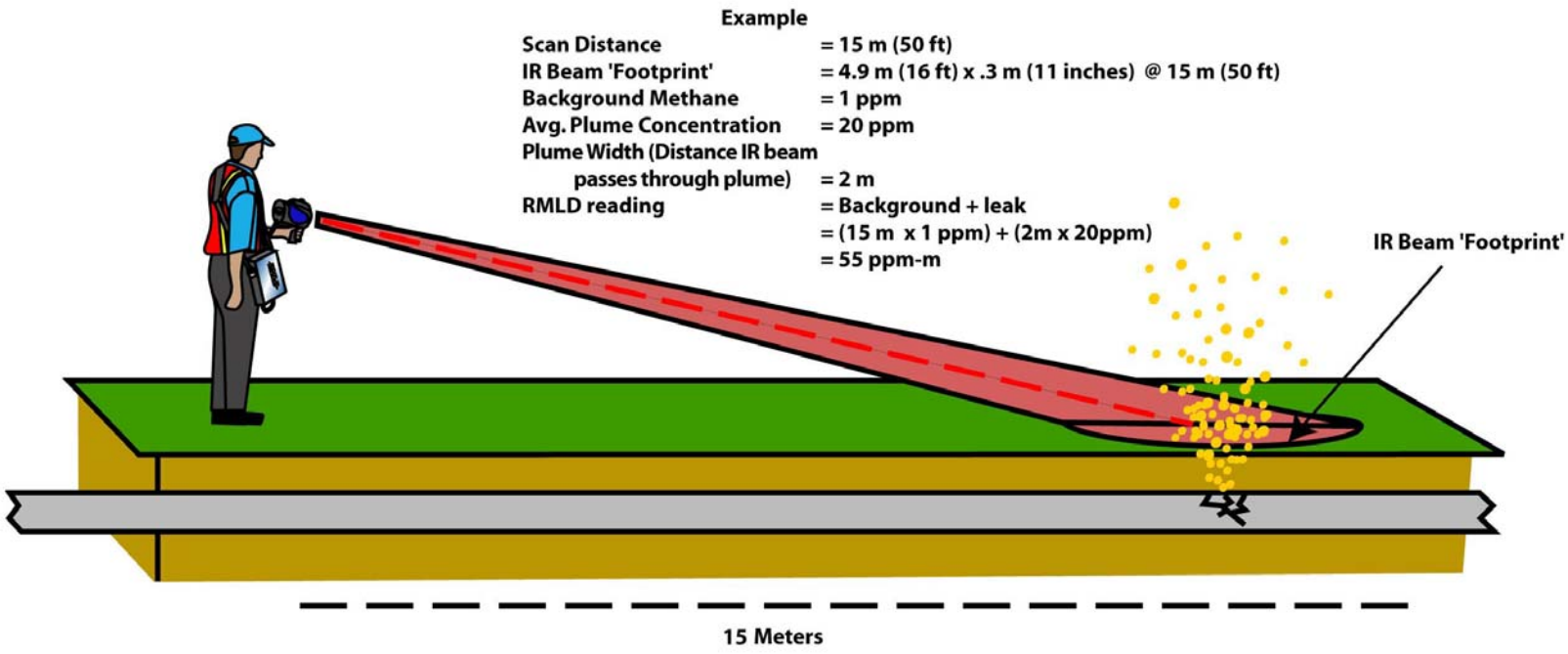
Remote Methane Leak Detection

- Works using Tunable Diode Laser Absorption Spectroscopy (TDLAS)
- Specific to methane gas only
- Displays gas reading in parts per million metered



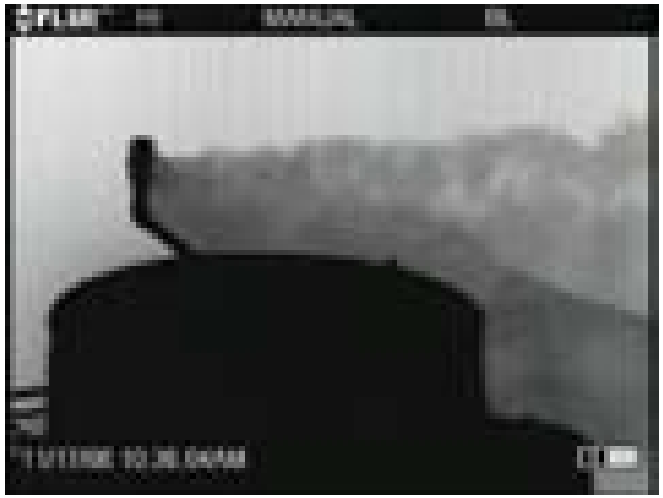


How Does the RMLD Measure Gas?



Infrared Gas Imaging Camera

FLIR – Gas Find IR Camera



Methane to Markets

NaturalGas
EPA POLLUTION PREVENTER

OPGAL: EYE-C-GAS
Fugitive Emissions Detection Camera

Hi Flow Sampler Applications

Advantages:

- Total leak capture
- Measures leak rate directly
- Accuracy of calculated leak rate = +/- 10 % of reading
- Can measure 30 components per hour
- Repair decision based on leak rate and repair costs

Technical Specifications – Hi Flow Sampler

- Measurable leak rate
  - 0.05 to 10.5 standard cubic feet per minute (scfm) or 1.42 to 226 liters per minute (LPM)
- Accuracy of calculated leak rate
  - +/- 10% of reading
- Temperature:
  - Operating……0 to 50 ^{o}C (32 to 122 ^{o}F)
  - Storage……-40 to 60 ^{o}C (-40 to 140 ^{o}F)

Hi Flow Sampler Technical Specifications

- Humidity……5 to 95% RH
- Sampling flow rate:
  - Maximum — 10.5 scfm (297 LPM) at full battery charge
  - Operating Flow — Initial flow approx. 10 scfm (283 LPM)
    Second flow approx. 8 scfm (226 LPM)
    (The second flow rate is 25% of the initial flow)
- Measurement method
  - Differential pressure across restriction

Calibrated 3 Cubic Foot Measurement Bag

Three Cubic Foot Anti-Static Measurement Bag

Description:

The largest emissions observed at compressor stations are typically from open ended lines (2" to 12" I.D.) that are used as vents for blow down valves, unit valves, scrubber dump valves, pressure relief valves and rod packing systems. Some of the largest leaks from these vents occur when compressors are blown down and the blow down valve is open, allowing leaks across the suction and discharge block valves to vent through the blow down line. For scrubber dump valves, large leakage can occur after valve actuation when dirt and debris get caught in the valve seat allowing high pressure gas to leak through the unclosed valve to the condensate tank and then vented to open atmosphere. Unchecked compressor rod packing systems can leak substantial amounts of gas when running or idle because of several contributing factors which typically go unnoticed. It is under these conditions, we have measured leaks as large as 240 scfm of natural gas. To make measurements on leaks of this magnitude, we have fabricated calibrated bags of anti-static plastic of various sizes with a special neck to fit over vent openings. This allows a low-pressure drop measurement of vented systems that may not tolerate significant backpressure. The use of these "Vent-Bags" has been calibrated in our laboratory against rotameter measurements and been found accurate to within ±10%. Given proper training while observing strict safety guidelines, this technique for measuring large natural gas leaks can be safe, expedient and affordable.

Please contact a representative from Heath's Professional Services Division for further information about this product.

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HEATH CONSULTANTS
Professional Services

Calibrated 3 Cubic Foot Measurement Bag

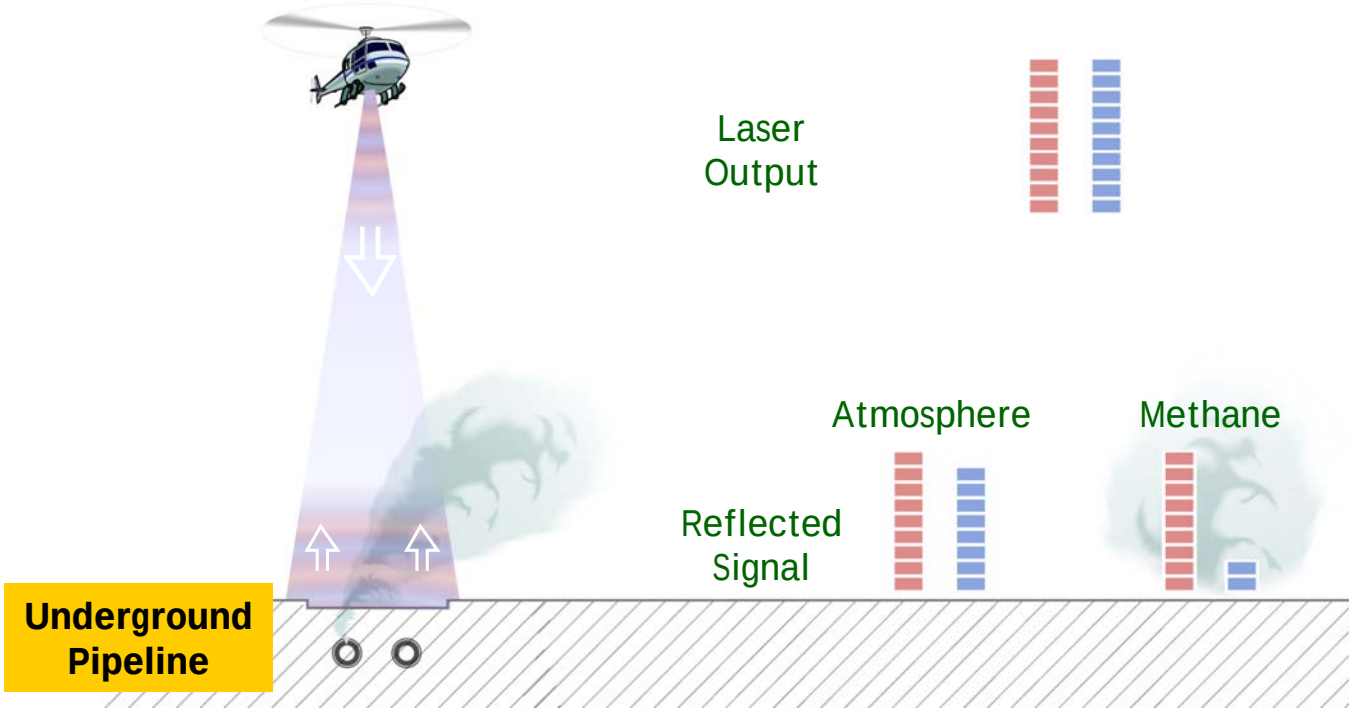
Aerial Leak Surveys

- **Aerial leak surveys with infrared leak detection devices can aid in leak identification over large sections of pipelines**
- **Aerial surveys can be conducted in helicopters or fixed wing aircrafts using both active and passive IR detection devices**

Source: LaSen Inc.

ALPIS Pipeline Surveys

- ALPIS (Airborne Lidar Pipeline Inspection Service)
- Over 10 times faster than ground surveys
- Full coverage of the right-of-way
- Easy access to rough terrain and non-disruptive to private land owners



ALPIS: Effectiveness of Inspection

15 miles of transmission line inspected on April 13, 2006

Cost of Inspection $1,875.00 *

Annual Product Loss $16,407.00**

LASEN Marker	Indication size	As-Found Daily Leakage Rate (mcf)	Annual Leakage Rate (mcf) m=1,000	Annual BTU Loss	Annual product loss ($)	Description of leak and repair
A-210994	medium	0.1776	64.82	64,824,000	583.42	Leak found on fuel tap valve operator (booster station). Lubricated stem and operated valve to stop leak.
A-216681	small	0.4181	152.61	152,606,500	1,373.46	Leak found from plug in top of drip valve. Removed, cleaned, taped and replaced plug to stop leak.
A-231599	medium	0.1672	61.03	61,028,000	549.25	Leak found from plug in top of drip valve. Removed, cleaned, taped and replaced plug to stop leak.
A-316434	medium	0.5017	183.12	183,120,500	1,648.08	Leak found within booster station yard (piping). Will have to hand excavate to perform repair(s).
A-357112	large	1.5840	578.16	578,160,000	5,203.44	Leaking dresser coupling repaired with full encirclement sleeve.
A-357584	small	1.7280	630.72	630,720,000	5,676.48	Leaking dresser coupling repaired with full encirclement sleeve.
A-387233	small	0.4181	152.61	152,606,500	1,373.46	Leak was from a thermocouple in meter tube. Will isolate meter tube and replace leaking thermocouple.
Total		4.9947	1,823.07	**1,823,065,500**	**16,407.59**	

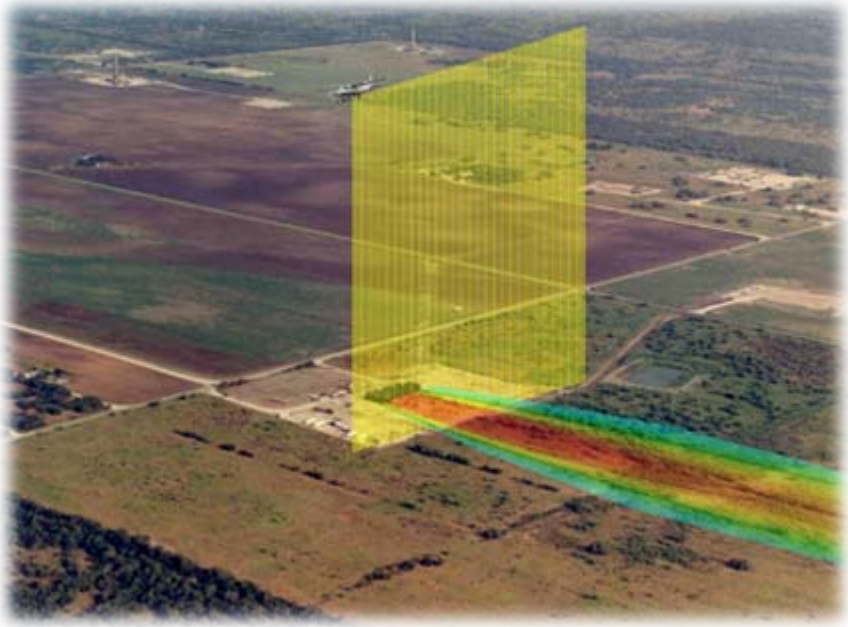
* Cost of inspection does not include setup fee

** Calculations are made based on the price of $9 for 1000000 BTU

ITT's Aerial Leak Detection Lidar (ANGEL) Service

Aerial Leak Detection – Emission Rate Quantification

- Airborne Differential Absorption Lidar (DIAL)



- Consider a “fenceline” 100-ft high by 100-ft wide (10,000 ft2)
- At a wind speed of 2 mph = 10,560 ft/h, 1.056 E8 Std-ft3/hr of air flow across that fenceline under standard conditions
- If the air contains 1000 ppm of methane on average (0.1%), then the methane flow is 105,600 SCFH = 2545 MSCF/D

Methane to Markets

Contact Information and Further Information

- More detail is available on these practices and over 80 others online at: epa.gov/gasstar/tools/recommended.html
- For further assistance, direct questions to:

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