



Overview of System Surveillance Technologies and Applications

Turkmenistan Symposium on Gas Systems Management: Methane Mitigation

April 26th 2010 – Ashgabat, Turkmenistan

Milton W. Heath III, Heath Consultants Incorporated
Division Manager, Environmental Services

Agenda

- Introduction – Why do we Perform System Surveillance
- Portable Walking Leak Surveys
- Remote Methane Leak Detector (RMLD)
- Portable Catalytic / Thermal Conductivity / Electro-Chemical Technology (CGI)
- Mobile Leak Surveys
- Portable & Mobile Optical / Infrared Technology
- Mobile Optical Methane Detector (OMD)
- Turkmengaz Project in Turkmenbasy
- Imaging Cameras
- Aerial Detection – Helicopter & Fixed Wing Optical / Laser Technology

Major Causes of Gas Leakage

- Corrosion
- Construction/
material defect
- Third party damage
- Human error
- Mechanical failure



Corrosion / Outside Damage

- Corrosion is a major cause of leaks, but has a small percentage of incidents

Verses

- Outside damage has been found to be the greatest threat to a pipeline system with a high percentage of incidents

Reasons For Conducting Leakage Surveys

Public Safety

- State & federal requirements
- Reducing unaccounted-for gas
- System overview/budget funds where needed
- Reduce operating costs/odor complaint call outs
- Public image

Three Phases of a Leak Detection Program

- Detect
- Pinpoint
- Repair

Factors Which Can Influence Gas Migration

You cannot control these, but you must recognize them

- Soil type
- Depth of pipe
- Line pressure
- Size of leak
- Age of leak
- Soil moisture
- Surface cover
- Slope

Centering
Where Is The Gas?

Pinpointing
Where Is The Leak?

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

Remember!

- The most important safety characteristic of natural gas is ...
“The fact that it is lighter than air”
- However, it will eventually vent to atmosphere, by taking the path of least resistance

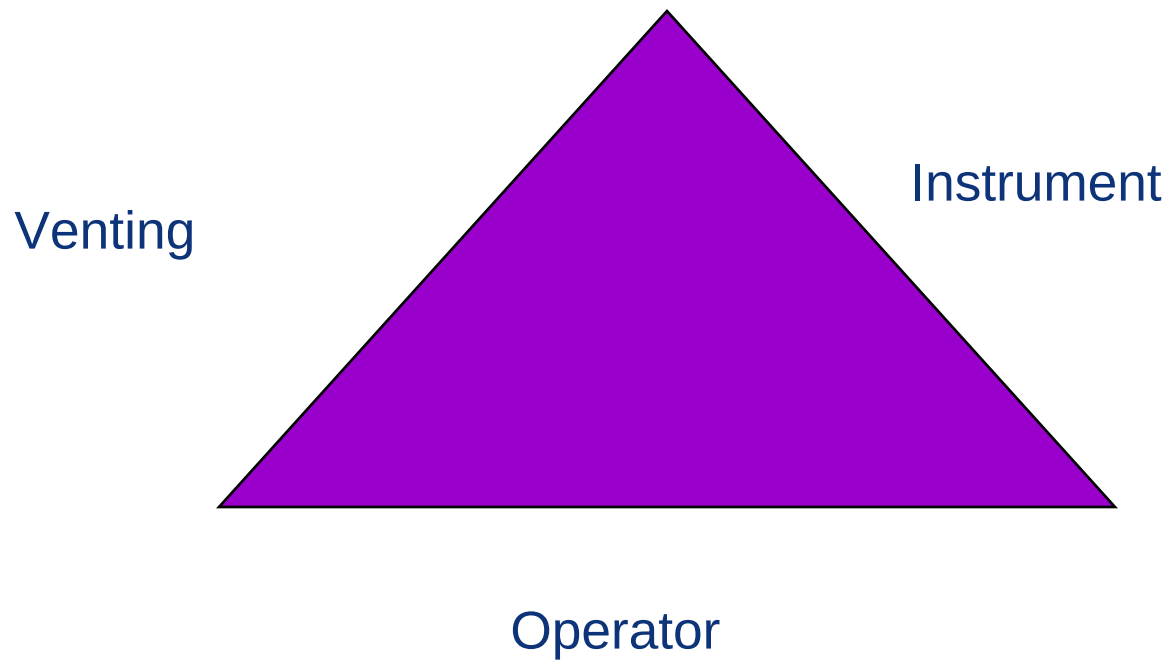
Natural Gas Effects On Vegetation

- Displaces oxygen and moisture
- Reduces the oxygen content of the soil
- Dries the soil out (drought effect)
- Results in dead or dying (brown) vegetation
- Natural gas does not poison the soil
- It reduces the soil's ability to support plant growth





Optimum Survey Triangle



GPTC Leak Classification Guideline (U.S. Standards)

Grade 1

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

GPTC Leak Classification Guideline (U.S. Standards)

Grade 2

A leak that is recognized as being non-hazardous at the time of detection, but justifies scheduled repair based on probable future hazard

GPTC Leak Classification Guideline (U.S. Standards)

Grade 3

A leak that is non-hazardous at the time of detection and can be reasonably expected to remain non-hazardous

Methods of Leak Survey



Mobile



Aerial



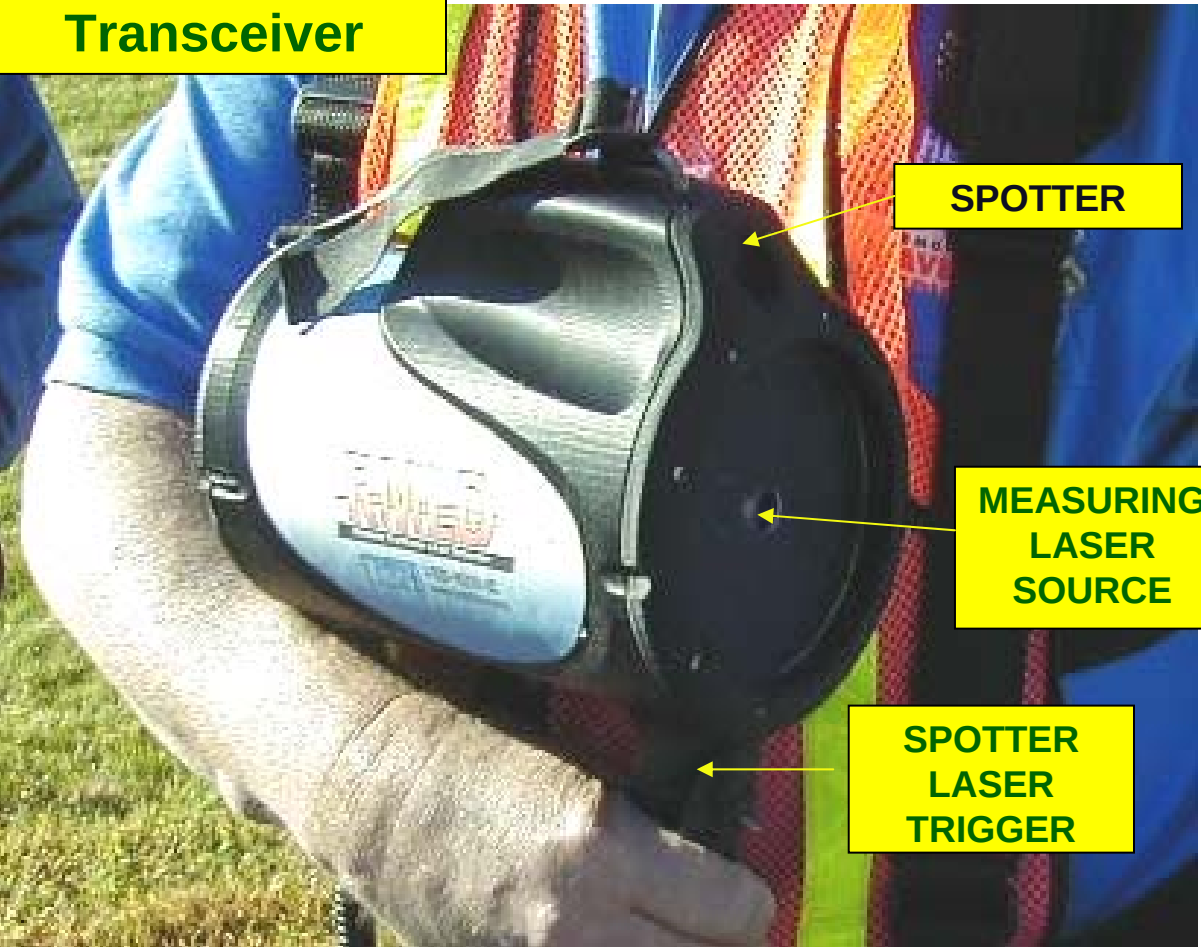
Walking

Remote Methane Leak Detector (RMLD)

- Capability of screening hundreds of components remotely in minutes vs. hours
- 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
- Perform pipeline (Right of Way) inspections fast and efficiently

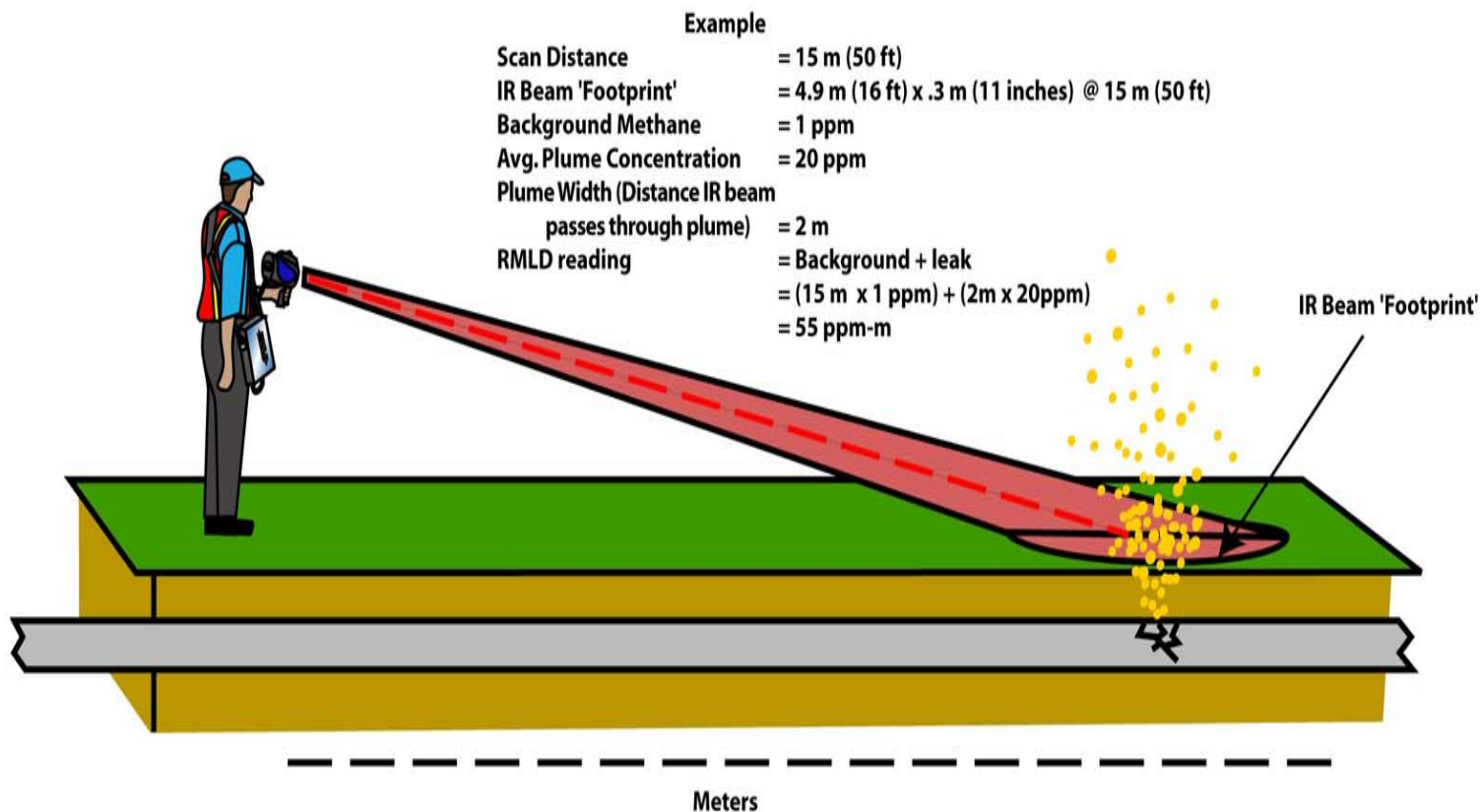
Remote Methane Leak Detector

Transceiver



Control Unit and Harness

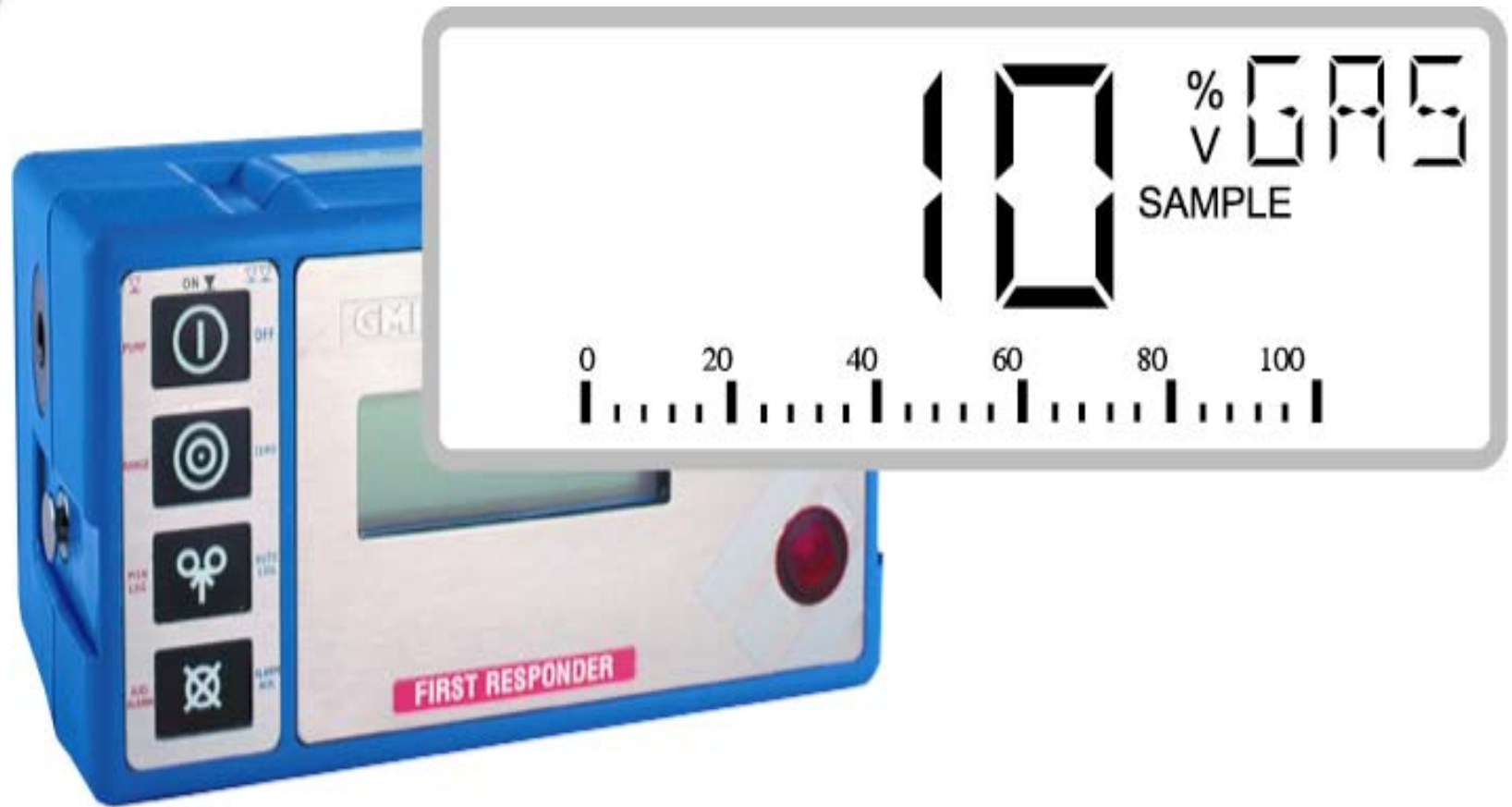
RMLD



Field Applications



Current Digital CGI Instruments



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



Combustible Gas Indicator (Our Most Important Tool)

CGI should be used:

1. Classify an atmosphere
 - a. Inside and in a confined space
2. Classify underground leakage
 - a. Determine where is the gas
3. Pinpoint underground leakage
 - a. Determine where is the leak

You must know how to properly use it and what readings might constitute a hazardous condition



M

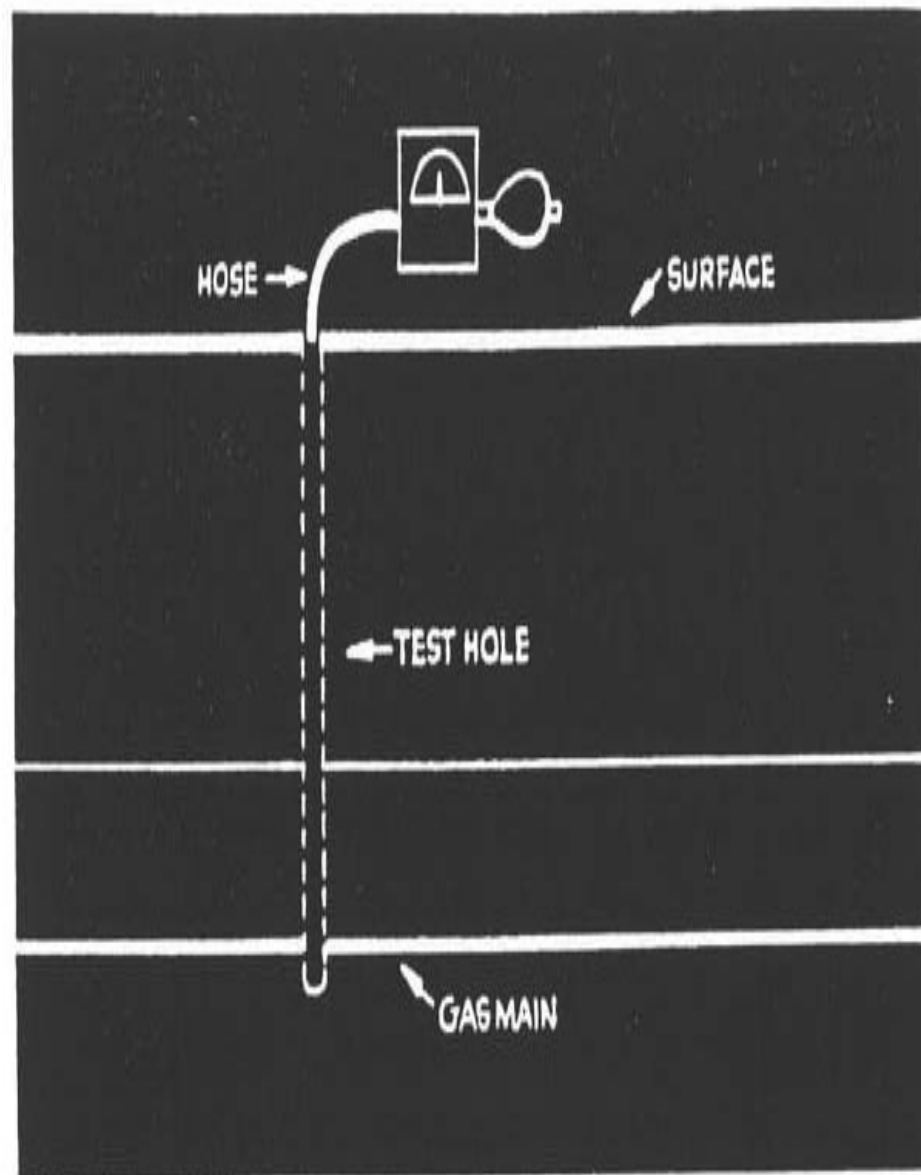


Fig. 2—Typical bar-hole test

Calibration

- Used to document that the instrument is working properly
- A certified, known sample of gas is drawn into 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

Automated Calibration Stations



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



Optical Methane Detector (OMD)

- 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)



Turkmenistan Project – WYG and Heath

Turkmenbasy, 2008



Turkmenistan Project – WYG and Heath

Turkmenbasy Region, 2008





Imaging Cameras

- Can see methane leaks and volatile organic compounds (VOCs)
- Saves time screening for hard to reach areas such as vent stacks and blow down systems elevated off the ground or along the roof line of compressor buildings
- Capability of screening hundreds of components in minutes vs. hours
- Can be used for aerial leak detection surveys for pipeline and gas gathering systems

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

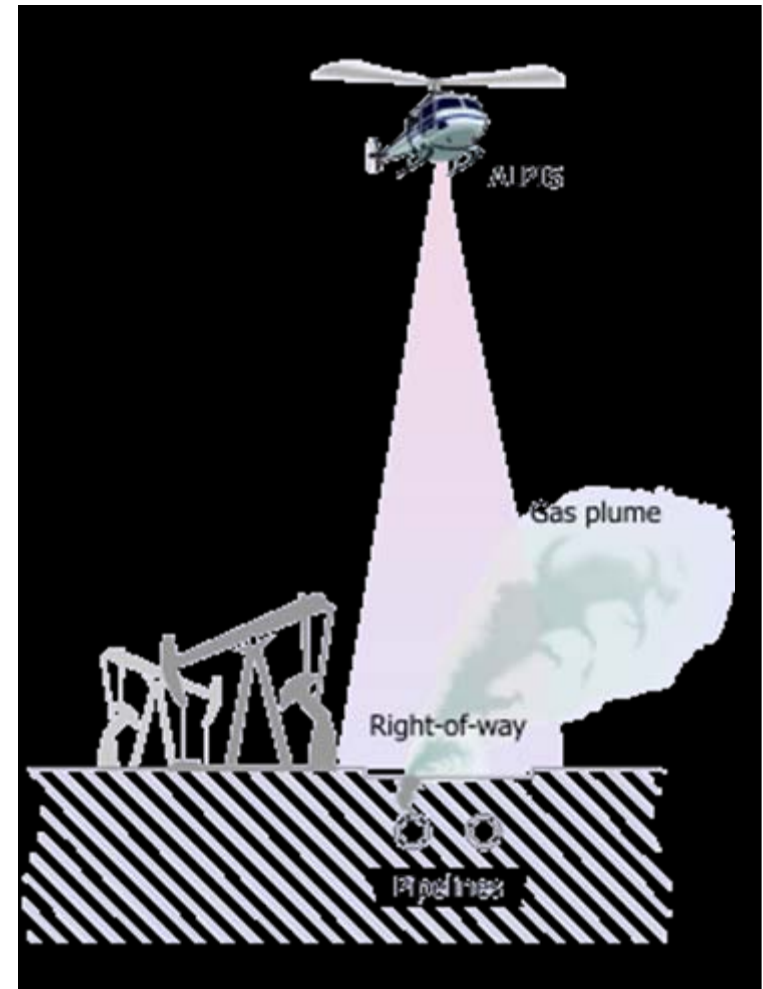
Aerial Laser / IR Technologies



Aerial Laser / IR Technologies



Aerial Laser / IR Technologies



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:

Roger Fernandez

EPA Natural Gas STAR Program

fernandez.roger@epa.gov

(202) 343-9386

Milton W. Heath III

Heath Consultants

Milt.heath3@heathus.com

(713) 844-1304

