Leak Detection Technology & Methodology

Natural Gas Star
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Personal Monitors

- LEL
- Carbon Monoxide
- Hydrogen Sulfide
- Oxygen
- Single Gas
- Multiple Gas
- Automated Calibration Docking Stations
Combustible Gas Indicators

- Confined Space Monitors
- Volume Gas
- Amplified Catalytic Sensors for PPM
- Semi-conductor for track gas / PPM
- Custom Configurable
- Leak / Odor Investigation tool
- Automated Calibration Docking Stations
Gasurveyor 700 Series
Compliance Leak Survey Instruments

- Low level PPM capability
- Volume Gas
- Flame-ionization
- Optical Infrared
- Laser
- Portable
- Vehicle Mounted
EyeCGas® Infrared Imaging Camera
RMLD-UAV

- Advanced sUAV suitable for all weather flight
- Auto search, detection, localization and flux quantification
- Methane specific
- Open path bi-static Tunable Diode Laser Absorption Spectroscopy
Portable Standoff Near-IR TDLAS for Leak Survey

- Laser beam illuminates a distant surface
- Senses analyte gas between transceiver and illuminated surface
  - **Standoff range ~100 ft with handheld transceiver**
- Scanning laser beam across plume results in rapidly changing analyte gas measurement
- ~2500 RMLDs™ in use for natural gas leak surveying
Open Path Pipeline Monitors

- Permanent laser-based open-path alarms to detect and mitigate small to potentially explosive leaks
  - Wireless, solar-powered
  - Easy installation and alignment
  - Real-time alarm notification
- Operator alert within one minute of urgent leak detection
- Hourly notification of non-urgent leaks, enabling proper operator assessment and response
- Enabled by proven, industry-accepted RMLD™ technology
- CH$_4$ version demonstrated at PGE Livermore CA Training Center
  - 580’ path
  - Months of maintenance-free operation
- CO$_2$ version tested for more than two years at PSI and Illinois-Basin Decatur Project (IBDP) CCS Site

Pipe under road 1 mile
Remote Emissions Monitor (RMLD-REM)
MobileGuard
Ultra Sensitive Mobile Monitoring

- High sensitivity sensor
  - Parts per billion (ppb)
  - Instantaneous response

- Mobile Platform
  - Geo-located measurements
  - Survey quickly and efficiently
  - Simple configuration (easy install)

- Leak Detection Software
  - Easy to use interface
  - Real-time plotting of leak Indications
  - Real-time gas discrimination
  - GIS compatible
Development of Next Generation Mobile Monitoring

• Vehicle-mounted sensors have a long history and have been extensively vetted - Developed in 1995 have
• Gone from legacy Cavity Ringdown to OA-ICOS
• Started mobile survey use and perfecting survey methodology since 2010
• Allows for cost-effective surveys of large areas at a rapid pace
• Requires:
  • Manufacturable, easy-to-use gas sensors that do not require researchers
  • Complete sensor suite - sensor, GPS, anemometer, gas inlet...
  • Leak detection software – analysis interpretation, leak aggregation
  • Data presentation user interface
MobileGuard Technology
Patented Off-Axis ICOS (OA-ICOS)

- Patented 4th generation cavity-enhanced technique
- Optical path provides very long pathlength
- Increased dynamic range
- Very robust – exact alignment is not critical, enabling mobile monitoring
- All advantages of conventional TDLAS, with increased sensitivity (ppb) and dynamic range
MobileGuard Solution
MEA for Mobile Monitoring

Mechanical Features

• 19” rack compatible
• 4U High (7”)
• 12 VDC
• Integrated Pump
• Integrated GPS Receiver
• Water Trap
• Humidity Interlock
Vehicle Integration

Methane, location and wind speed are analyzed by the computer to create leak indications.
User Interface

Measured Data and Automated Alarms

- Real-time Status
- Leak Indications List
- Methane Time Chart
Drive Reports
Available Formats

PDF
• Printable, static file
• Universally sharable

KMZ/KML
• View in Google Earth
• Import layers into GIS

Proprietary XML
• Machine readable
• Database import
Combustible Gas Indicators (CGI)
QUESTIONS?