BOREAL Laser Gas Finder AB

METHANE DETECTION AND DATA ANALYSIS

Webinar

05.24.16
Who is BOREAL?

• Based in Edmonton, Alberta, Canada
• Manufacturer of laser based gas detectors since 1996
  – Products use single-line absorption spectroscopy in NIR with wavelength modulation spectroscopy

• 2000 – transitioned from research to commercial sales
• 2013 – 5 distinct “GasFinder” product lines
  – World-leading supplier of open-path laser gas detection systems for safety and environmental applications.
  – Installations in over 45 countries worldwide
  – >600 GasFinder systems shipped (>1200 measurement paths)
  – Reputation based on product reliability and technical support
  – Commitment to providing factory-trained local sales and service
GasFinderAB – Benefits for Pipeline Surveys
Over 50 Systems Worldwide

- Methane specific
- No interferences & no false alarms
- High resolution – 1 ppm
- Wide measurement range
- Fast response time – 0.25 seconds
- Airborne, vehicle and pedestrian probes available
- Survey vehicle can fly/drive at normal speed
- Self-calibrating—no calibration needed
- Direct measurement – no sample line
- Robust, solid state instrument
- No need for instrument operator
- Easy installation and removal
- GPS line location
- Works with complementary technologies such as forward looking infrared (FLIR)
- Ideal front end for Red Hen Systems data acquisition and presentation application
How It Works

Gases that Lasers can “See” Absorb Energy in the Near InfraRed (NIR) Region

Measurement is made in the near infrared (N.I.R.) region, less effected by scattering than visible wavelengths.
The almost monochromatic nature of the laser emission enables TDLAS to isolate individual gas absorption lines. Wavelength Modulation Spectroscopy (WMS) techniques are used to maximize sensitivity. By modifying the diode injection current, the laser wavelength can be scanned across the gas absorption line, resulting in a harmonic distortion signal whose size is dependent on the amount of gas present.
Leak Detection Applications

- **Fixed laser leak detection installations**
  - CH$_4$ / H$_2$S leak detection in gas production and processing
  - CO$_2$ monitoring at carbon sequestration facilities
  - NH$_3$ fugitive emissions in fertilizer manufacturing
  - HF leak detection

- **Portable laser leak detection**
  - CH$_4$ leaks from natural gas pipelines
  - Greenhouse gas (GHG) emissions from landfills and other area sources – CH$_2$ & CO$_2$
  - Limited duration surveys of HF, H$_2$S, NH$_3$, HCN emissions from industrial facilities

Available Gases:
- HF
- HCl
- HCN
- CH$_4$
- NH$_3$
- CO
- CO$_2$
- C$_2$H$_2$
- H$_2$S
- H$_2$O
Mobile Leak Detection with GasFinderAB

Helicopter mounted GasFinderAB detects elevated levels of CH4 in plumes resulting from leaks in high pressure natural gas pipelines
GasFinderAB Installations

Remote display on windshield

Rear cabin installation

Front cabin installation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>0.2 ppm (CH₄)</td>
</tr>
<tr>
<td>Range</td>
<td>0 to 500 ppm (CH₄)</td>
</tr>
<tr>
<td>Alarm settings</td>
<td>Default 10 ppm</td>
</tr>
<tr>
<td>Data rate</td>
<td>1 - 3 readings per second</td>
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<tr>
<td>Recommended speed</td>
<td>60 – 100 knots</td>
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<tr>
<td>Recommended altitude</td>
<td>30 – 65 m (100 – 200 feet)</td>
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<tr>
<td>Ground resolution</td>
<td>10 m at 60 knots and 3 readings per second</td>
</tr>
<tr>
<td>Maximum wind speed</td>
<td>20 knots</td>
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GasFinderAB Airborne Cell

6-pass airborne cell is mounted underneath the helicopter inside of a foam filter cover to prevent airborne debris from fouling optics. Cover is velcro-fastened for easy removal and cleaning.
GasFinderAB
Components and Schematic
VMS-333 Basic Kit

- Battery
- GPS Receiver
- Feature Trigger
- Camera
- COMS
- Power Up
- IsWhere
FLIR gas finder infrared cameras provide visual evidence of emissions

- Collects data that can be missed by sensors or sniffers
- MWIR – specifically designed for optical gas imaging (OGI)
- Captures thermal and visible imagery for real-time reporting and post analysis
- RHS uses a FLIR camera with 640 x 512 res:
  - Emissions are visible from 150 feet AGL
  - Double the resolution of standard infrared
  - GasFinder 320 (commonly used in the field) offers 320 x 280 resolution
Hardware

- Boreal Laser
- Boreal Gas Analyzer
- GPS Puck
- Sony 4k
- GoPro Hero 4k
- FLIR IR
- VMS 333
- Atmospheric Data
• **GasWhere**: Real time data collection and reporting

• **GasAnalyst**: in-depth post-mission analysis
  - Utilizes wind speed & direction
  - Accounts for temperature & humidity

• RHS can backup your data on an accessible and secure network.
GasFinderAB Platforms

CH₄ pipeline leak detection
CH₄ emissions from landfills and other area sources
CO₂ emissions in volcanic areas
CH₄ and CO₂ Background surveys
CO₂ emissions from EOR and CO₂ sequestration (CCS) projects
Spatial & Temporal resolution
• CH₄ sensitivity of 0.2 ppm
• CO₂ sensitivity of 5 ppm
• Response time < 1 second

Airborne monitoring
• Helicopter based system
• Long range (500 km/day)

Road gas detection
• Medium range (100 km/day)
• Urban pipelines

ATV gas detection
• Short range (50 km/day)
• Rural pipelines
• Off road
Aerial Methane Patrol

- FLIR - Paired OGI, Color Video and IMU
- Atmospheric Sensors
- Boreal - Combustible Gas Analyzer
Ground-based Methane Detection
Red Hen Systems and BOREAL provide initial and ongoing training services and consultation to ensure users’ success

- Friendly, knowledgeable staff
- Training plan to maximize efficiency
- Exceptional customer service
- Optional subscriptions for additional support
BOREAL Workshop 9/30/16

Join us for our BOREAL workshop on 9/30/16 in Fort Collins, Colorado. For more information, email: magaly@redhensystems.com or call (970) 493.3952

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