



Optical Gas Imaging in the Oil and Gas Industry

WHITE PAPER



Government regulation, concern for the environment, personnel safety and economic considerations have made locating hydrocarbon and other gas leaks a priority for today's energy industries. Most industrial gases and chemical compounds emitted are invisible to the naked eye. Companies use a wide variety of tools to monitor, identify and contain these compounds both upstream in exploration and production, downstream in refining and distributing, and during transport. Infrared imaging allows workers to detect volatile organic compounds (VOC) that cannot be seen by the human eye. Infrared cameras are able to visualize the presence of fugitive emissions that are often odorless and invisible and are also toxic or flammable. More specifically, mid-wave infrared (MWIR) cameras are spectrally optimized to image at the peak absorption wavelength of many VOC's.

Currently handheld devices are being used to identify these fugitive emissions. The Environmental Protection Agency (EPA) has suggested that by using optical gas imaging (OGI) technology, an organization can increase the number of pieces of equipment that can be inspected and therefore reduce the cost of identifying the leaks. It is of vital importance that the organization is able to obtain as complete a picture as possible of the condition of the plant to enhance safety, efficiency and profitability, as well as to be environmentally responsible.

IRCameras, LLC has introduced the Niatros™, an MWIR OGI core that detects and provides a real time image of fugitive emissions. Fugitive emissions contribute to safety issues, economic loss, air pollution and climate change. The Niatros™ provides 24/7 continuous and persistent surveillance of the entire area being scanned. It offers a full picture of all equipment at once, and the leaks appear as "smoke" when viewed on your computer's monitor.



Surveilling a large area at once allows you to rapidly detect sources of emission, and quickly respond to repair or replace faulty equipment. By identifying leaks faster, organizations can minimize emissions, reduce unaccounted gas and reduce the amount of man hours it takes to conduct ongoing inspections.

Leaks from process equipment, no matter how small, not only pose a danger to the environment, but they also represent an economic loss to the company. OGI camera cores can be used to detect gas from many different sources. Some of the most common sources are:

- Flanges
- Valves
- Plugs and Caps
- Couplings
- Pump seals
- Drain covers
- Instrument Connections

To sum it up, the use of OGI cores provides the ability for better planning and scheduling., Additionally, to the early identification of compliance issues reduces fines and allows your organization to become a better steward of the environment.

OGI cores are a fit for all areas of the oil and gas industry:

- Petrochemical and Oil Refining
- Pipelines
- Chemical
- Power Generation
- Natural Gas
- Leak Detection and Repair (LDAR)
- Regulators

Importance of MWIR Technology in Gas Detection

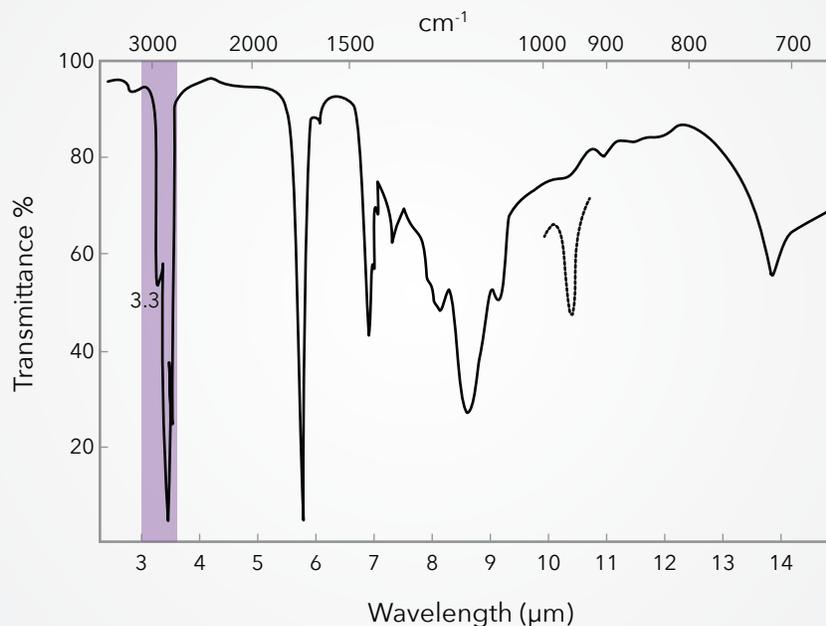
When it comes to leak detection in the oil and gas industry, the use of cameras based on mid-wave infrared (MWIR) technology is a must.

When we look for leaks, the majority of hydrocarbon gas compounds we inspect for in the oil and gas industry have a peak absorption in the 3.2 – 3.5 micron wavelength region of the electromagnetic spectrum. This is the most sensitive and efficient area for a number of infrared detectors, including those used in the Niatros™ optical gas imager. Although there are a number of gases that absorb in the 7-14 micron wavelength region, for environmental purposes, the primary concern is with methane and similar VOC's which can only be "seen" with a properly configured MWIR camera.

OGI cameras are specially configured to detect infrared radiation from approximately 3.2µm to 3.5µm. This, combined with the high sensitivity of the cooled MWIR photon detectors incorporated in these cameras, makes this technology ideal for detecting hydrocarbon gases that emit within that region, including:

- Butane
- Benzene
- Ethane
- Ethylbenzene
- Ethylene
- Heptane
- Hexane
- Isoprene
- MEK
- Methane
- Methanol
- MIBK
- Octane
- Pentane
- 1-Pentane
- Propane
- Propylene
- Toluene
- Xylene

Spectral Response of Methane and similar VOC's



Safety: Detect Early, Detect Often

The advantages of using an MWIR camera core to detect gas emissions are plentiful, and include increasing safety for both personnel and equipment. If left undetected, dangerous gas emissions are not only harmful to the environment, but could cause explosions or cause bodily harm as a toxic agent. An MWIR camera core can surveil an area 24 hours a day, 7 seven days a week, 365 days a year to provide detection early, and often, in even the most difficult-to-access locations. OGI technology is so precise that it will detect the origin of most leaks – large or small – in real-time. This allows you to correct the problem immediately and insure safety at the facility, and reduce errors in identifying a leak's origin, which can result in costly shut downs and lost time.

Current & Preventive Maintenance

Even small leaks, if left unattended, can cause extensive damage to your equipment, the environment and your bottom line. Because an OGI camera core is constantly observing the facility and can detect leaks remotely from a distance, you can identify and eliminate the small leaks that can result in a significant loss of product over time and impact your bottom line.

Additionally, an MWIR camera core can be used at any point in the facility and equipment life cycle – including during production or equipment start-up. This is important as it is well documented that many issues can occur after equipment is serviced, resulting in leaks that were not previously present.

Evolving Landscape of Environmental Regulations

In addition to safety issues and financial loss, gas leaks are very harmful to the environment.

As the largest industrial source of VOC emissions, the oil and gas industry must adhere to a strict set of guidelines that seek to reduce harmful emissions.ⁱ Not adhering to these regulations could contribute to environmental damage and result in potential fines.

The EPA has issued a set of standards and regulations to reduce VOCs from the oil and gas industry. When fully implemented, the final rules are intended to yield a nearly 95 percent reduction in VOC emissions from more than 11,000 new hydraulically fractured gas wells each year.ⁱⁱ

New and proposed regulations seek to further reduce emission of methane, a greenhouse gas that is more than 20 times as potent as carbon dioxide.ⁱⁱ In 2014, Colorado's Air Quality Control Commission approved a new set of regulations designed to reduce pollution caused by oil and gas operations as well as methane leaks. In January 2015, the Obama administration announced an action plan with a new goal to cut methane emissions from the oil and gas sector by 40 – 45 percent from 2012 levels by 2025.^{iv}

Sources:

ⁱ EPA Website, Oil and Natural Gas Air Pollution Standards – Basic Information. <http://www.epa.gov/airquality/oilandgas/basic.html>

ⁱⁱ EPA Website. Oil and Natural Gas Air Pollution Standards. Home - <http://www.epa.gov/airquality/oilandgas/>

ⁱⁱⁱ Cathy Proctor. Denver Business Journal. Obama wants to cut oil & gas methane emissions; Colorado did that a year ago. Published in January 14, 2015. http://www.bizjournals.com/denver/blog/earth_to_power/2015/01/obama-wants-to-cut-oil-gas-methane-emissions.html

^{iv} FACT SHEET: Administration Takes Steps Forward on Climate Action Plan by Announcing Actions to Cut Methane Emissions. The White House Office of the Press Secretary. Released on January 14, 2015. <https://www.whitehouse.gov/the-press-office/2015/01/14/fact-sheet-administration-takes-steps-forward-climate-action-plan-anno-1>



About IRCameras

IRCameras is a full service provider of high performance, customizable infrared imaging systems and Integrated Dewar Cooler Assemblies (IDCAs).

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