Methane lidar camera

Continuous methane monitoring for high-priority facilities

Know when, where, and how much your facilities are emitting.

Validation

- Best-in-class METEC* results

Methane image

- Precise identification of emissions source

Range

- Up to 200 m [656 ft]

US EPA approvals

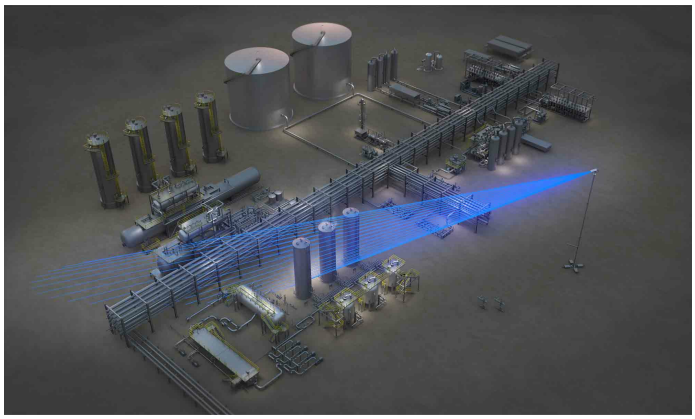
- Periodic screening
- All leak resolution thresholds (1, 2, 3, 5, 10, and 15 kg/h)
- Component-level spatial resolution
- Broadly applicable across the sector

Applications

- 24/7 methane emissions monitoring, in real time
- Alternative test method approved by the US Environmental Protection Agency (US EPA) under OOOO regulations, with component-level spatial resolution, for all basins and all leak resolution thresholds
- Onshore oil and gas upstream, midstream, and distribution facilities anywhere in the world
- Particularly suited to large, complex, or dense facilities
- Non-O&G sectors such as agriculture, waste, and mining

Benefits

- See the exact leak location, distinguishing between leaks and permitted emissions
- Monitor regions up to 400 m [1,312 ft] in diameter with one device
- Quantify the methane mass emission rate with industry-leading quantitative accuracy
- Detect methane specifically, unaffected by other gases or water vapor
- Monitor day and night, without interference from light weather conditions or the temperature difference between the background and gas plume (ΔT)



A laser on a pan and tilt stage scans your facility, providing images of methane plumes and measurements of the mass emission rate in real time, both day and night.

How it improves performance

Many oilfield methane emissions come from sources that leak and vent intermittently during normal operations. Continuous monitors can measure these emissions more accurately than handheld devices or mobile sensors mounted on satellites, airplanes, or drones.

Our methane lidar camera** is designed for continuous monitoring at sites such as large well pads, gathering and boosting stations, and LNG terminals. It enables simple, robust visualization and precise quantification of methane emissions on a continuous basis—from a compact, readily available, and cost-effective equipment platform.

The camera uses eye-safe laser technology to detect, locate, visualize, and quantify methane emissions. Permanently mounted on a pole or mast, it creates a picture of the methane plume, showing the exact location of an emissions source. The camera provides continuous monitoring to detect intermittent emissions. An anemometer mounted on the same mast measures wind speed and direction on location. A first-principles algorithm interprets the lidar and anemometer data to quantify the methane mass emission rate, with no modeling required.

Unlike optical gas imaging (OGI) surveys and other traditional methane cameras based on natural light, our methane lidar camera uses a laser to measure methane. The laser offers several distinct advantages:

- Because lasers travel in a straight line, the lidar camera can measure emissions from far away. It has a range of 200 m and is mounted on a mast for continuous monitoring. Natural-light cameras have shorter ranges and are designed for handheld measurement, where the operator carries the camera to the source.
- The laser quantifies the emission rate directly, without need for follow-up measurement.
- It detects methane night and day, on both sunny and cloudy days, and in light fog, rain, fresh snow, and dust.
- It is not sensitive to the temperature difference between the background and the gas plume (ΔT) and does not respond to other gases, such as water vapor.

How it works

Using a new technique called tunable diode lidar, our methane lidar camera combines the advantages of a range of gas-detection technologies to enable remote spectroscopy and ranging with low-power semiconductor diode lasers.

The automated camera scans the entire facility within its field of view and zooms in on any detected leaks to identify the leaking component. A wind sensor is connected to the camera and measures the local wind speed and direction. This technology visualizes methane emissions and quantitatively determines the emission rate, duration, location, persistence, and timing. Equipped with this information, you can report emissions and prioritize repairs.

How it performed at METEC

Our methane lidar camera was evaluated in single-blind controlled testing at METEC. Across hundreds of controlled releases during 11 weeks in 2023, the instrument achieved the following ranks compared with eight other continuous monitors tested at the same time:

- #1 in localization accuracy, which measures the ability to pinpoint the emission source
- #1 in quantitative accuracy, which measures the ability to quantify the emission rate
- #2 in 90% detection limit, which measures the ability to detect small leaks
- #1 in time to detection, which measures the ability to detect emissions quickly.

METEC has published the results in a **peer-reviewed paper**; the methane lidar camera is Solution B.

How it complies with OOOO regulations from the US EPA

* Methane Emissions Technology Evaluation Center, Colorado State University
** The methane lidar camera is a licensed product of QLM Technology Ltd.
25-MPS-2482287

Methane lidar camera

The OOOO family of regulations requires some US production and processing facilities to be monitored for fugitive methane emissions. Our methane lidar camera has been approved by the US EPA as an alternative test method, meaning operators can use the camera to satisfy this requirement.

The camera's approval is broadly applicable across the sector, so it can be used in all regulated basins.

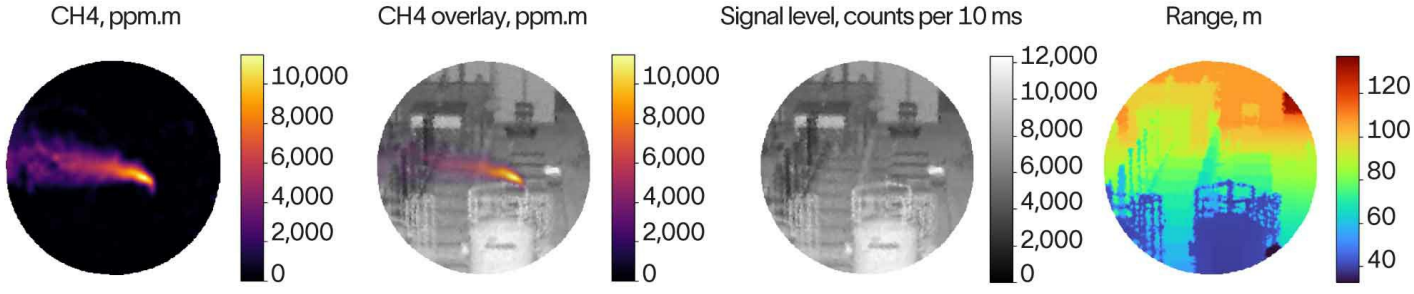
Because the camera was approved at all leak resolution thresholds, operators can choose how frequently to screen for leaks and consequently, the size of leaks requiring follow-up inspection. At some screening levels, there is no need to perform routine OGI surveys.

The camera was approved for component-level spatial resolution, meaning that it can identify exactly where emissions are coming from. This approval provides operators with two advantages. First, when leaks occur, repair crews can go directly to the leaking component, with no need to perform an OGI survey of the entire facility. Second, permitted vents are readily identified and do not create false positives requiring follow-up investigation. Unlike other methods that have been approved by the US EPA but have less-precise spatial resolution, operators who use our methane lidar camera will not need to follow up whenever permitted vented methane is detected and will not need an OGI survey of the entire facility when a fugitive leak occurs.

Specifications

Instrument performance (as measured by METEC in the 2023 ADED* tests)	Limit of detection: 5 kg/h, 90% probability of detection
	Estimates leak rate within a factor of three with 90% confidence
	Emission localization precision of 90% at unit level
Laser	Class 1, eye-safe laser
	200-m [656-ft] range
Other sensors	Sonic anemometer
	Color camera
	GPS compass
Algorithm	First-principles, mass balance algorithm
	No tuning parameters
Environmental effects	Detects day and night
	Operates in light fog, rain, fresh snow, and dust
	No sensitivity to temperature difference between background and gas plume (ΔT)
	No interference from water vapor
Mounting	16.8-m [55-ft] mast rated to 185 km/h [115 mi/h]
	Mobile and custom installations available
Installation	Nominal power consumption 70 W
	Connectivity options via cellular, Ethernet, or WiFi
Size and weight	43 × 18 × 18 cm [16.9 × 7.1 × 7.1 in]
	8 kg [17.6 lbm], including pan and tilt mount
Cloud interface	24 /7, with real-time display of emissions
	Real-time alerts
	If required, can be integrated with other measurements in the methane digital platform
Certification	CE/UKCA/CSA/RoHS/FCC/ETL
Environmental conditions	Storage temperature, unpowered: –40 to 70 degC [–40 to 158 degF]
	Survival temperature rating: –40 to 70 degC
	Operational temperature rating: –20 to 50 degC [–4 to 122 degF]
	IP65/NEMA 4X water ingress protection
	Relative humidity: 0% to 95%, noncondensing

All specifications are subject to change without notice.
* Advancing Development of Emissions Detection



The methane lidar camera provides an image of a methane plume overlaid on a picture of the facility (second from left), clearly identifying the emission source. Other images acquired by the camera include an isolated image of the methane plume (left), an image of the lidar signal strength (second from right), and an image of the distance from the lidar camera (right).

* Methane Emissions Technology Evaluation Center, Colorado State University
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slb.com/lidar

Methane lidar camera

Larger emissions create larger methane plumes—enabling the methane lidar camera to quantify the emission rate.

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