QLM

QUANTUM LIDAR METHANE CAMERA

THE SOLUTION
FOR METHANE MONITORING

www.qlmtec.com

CHANGE THE RULES on managing methane emissions

QLM's quantum lidar methane cameras are the most advanced, reliable, and cost-effective methane detection systems ever developed.

As well as showing the locations of all excess methane over a large area in real-time 3-D images, QLM's cameras accurately quantify the precise rates of gas release.

They can operate continuously without intervention, providing game changing 24/7 monitoring over your entire operations at low cost.

And advanced cloud analytics driving automatic alerts and reports allow you to see issues, optimise your processes, and meet the most stringent global standards.

Methane measurement that pays for itself

PERIODIC SURVEYS or CONTINUOUS MONITORING

QLM Cameras measure past 200m and pan 360° over 30 acres.

They can scan a panorama or be zoomed onto specific equipment.

They image the methane density in the air and the range and the reflectivity of all the solid objects inside their range.

They can be mounted on tripods, masts, trailers or existing infrastructure, and can be set up permanently for continuous monitoring, or moved and used for shorter periods to do surveys.

Proven applications including gas wells, refineries, compressor stations, water treatment plants, landfills, and in agricultural and biogas research.

Methane monitoring that fits your needs

ACCURATE QUANTIFICATION of methane emission rates

QLM Cameras use 3-D lidar images of methane density and the lidar range of the emission sources to make a precise measurement of exactly how big a methane gas plume is.

They include a sealed methane cell for continuous calibration and to make sure they are only measuring methane, and nothing else.

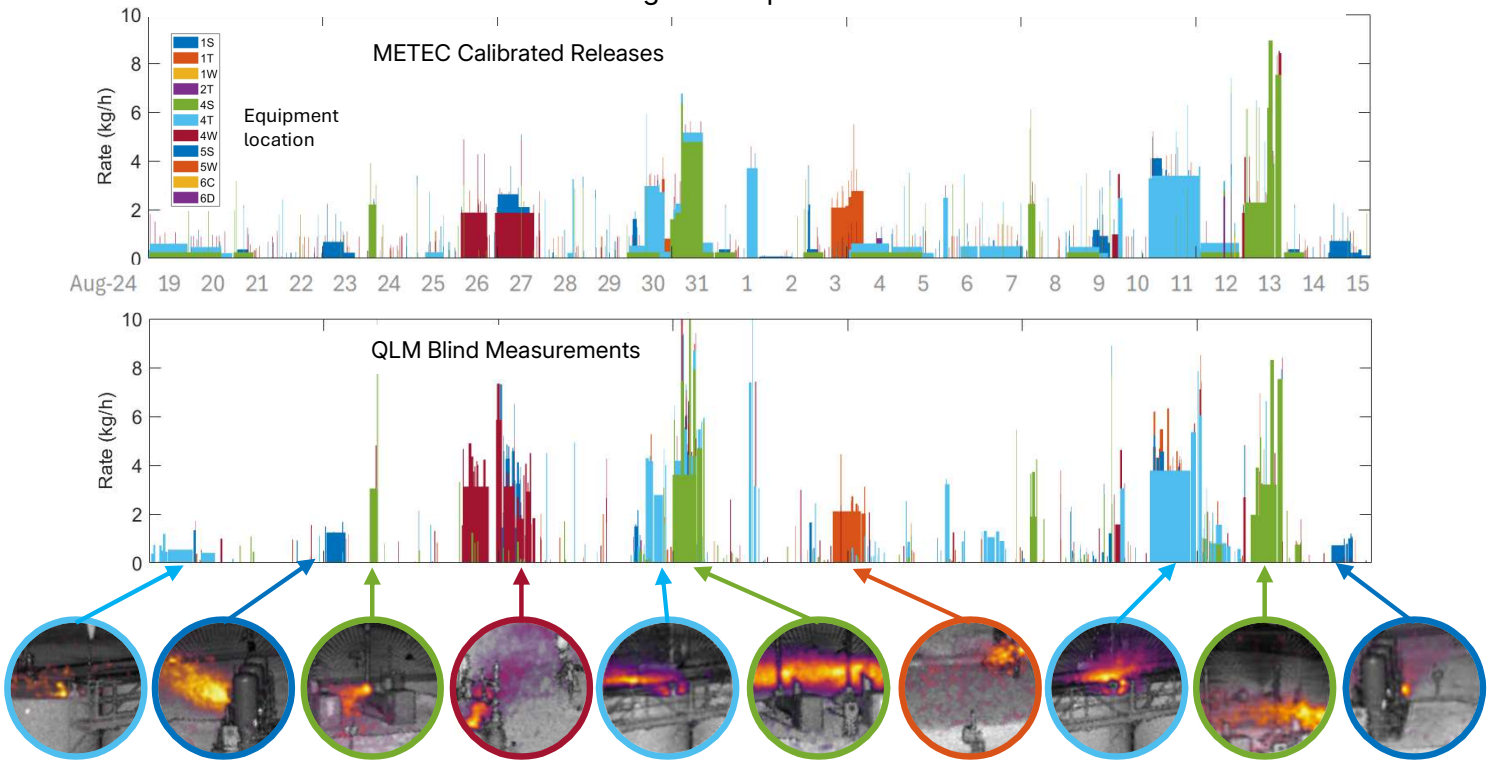
They compare methane concentration and range constantly to separate the background ambient gas from the direct emission.

And with the addition of local wind measurement mapping, they accurately quantify methane emission rates, for leaks or for sites.

Our superior accuracy and speed in measuring both leak location and size has been proved over multiple blind calibrated trials.

Calibrated Release Trials Results

Methane Emissions Technology Evaluation Center (METEC) - Colorado
ADED 2.0 Trial Releases : August & September 2024



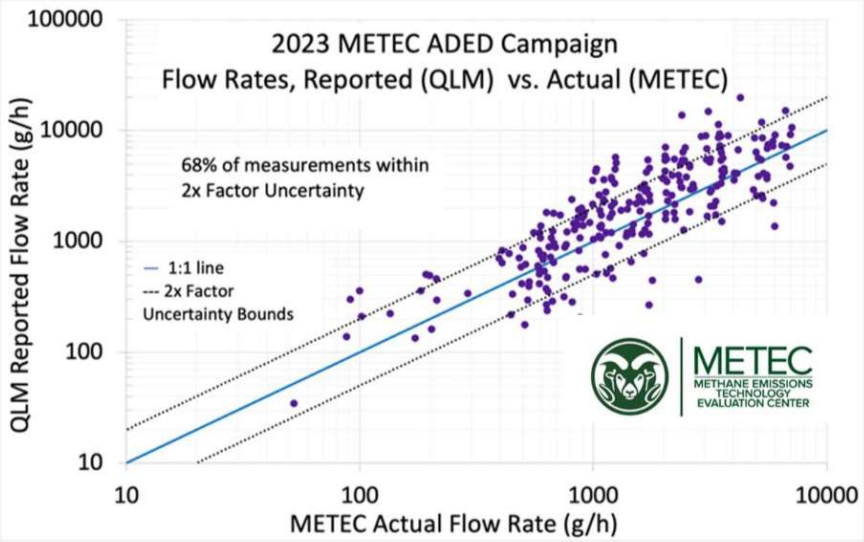
Methane measurement that gives you all the facts

INDEPENDENT TRIAL validation of performance

Methane Emissions Technology Evaluation Center (METEC)

ADED Campaign Feb-May 2023

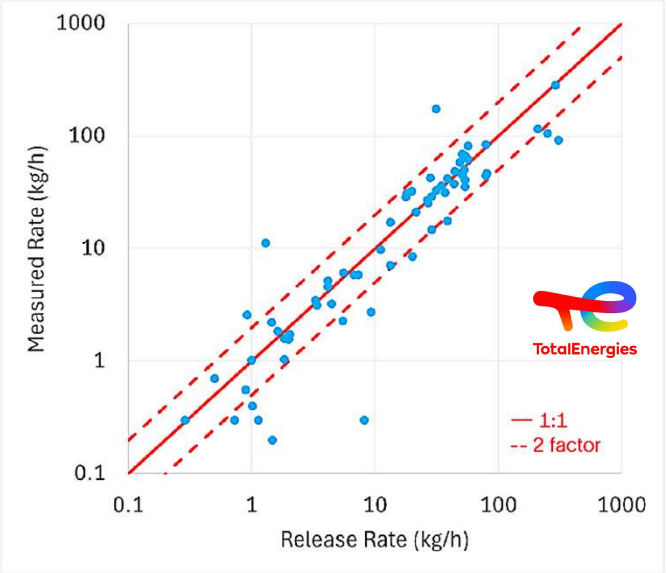
- Continuous 24/7 blind trial, 574 releases, 11 weeks
- -20C to +30 C, snow, wind, rain
- 10 competitors
  - QLM 1st in Quantification Accuracy
  - QLM 1st in Source Location Accuracy
  - QLM 1st in Time to Detection
  - QLM Limit of detection <0.5 kg/hr with 90% confidence



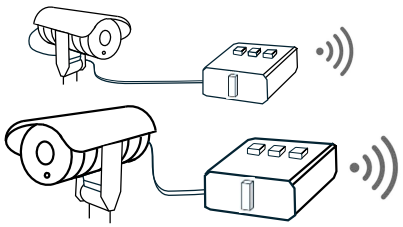
TotalEnergies Anomaly Detection Infrastructure (TADI)

Stanford Methane Controlled Release Campaign Sept 2024

- Blind trial 78 releases



COMPREHENSIVE & FLEXIBLE service solutions



QLM Cameras & Edge Controllers

QLM Cloud

User Systems

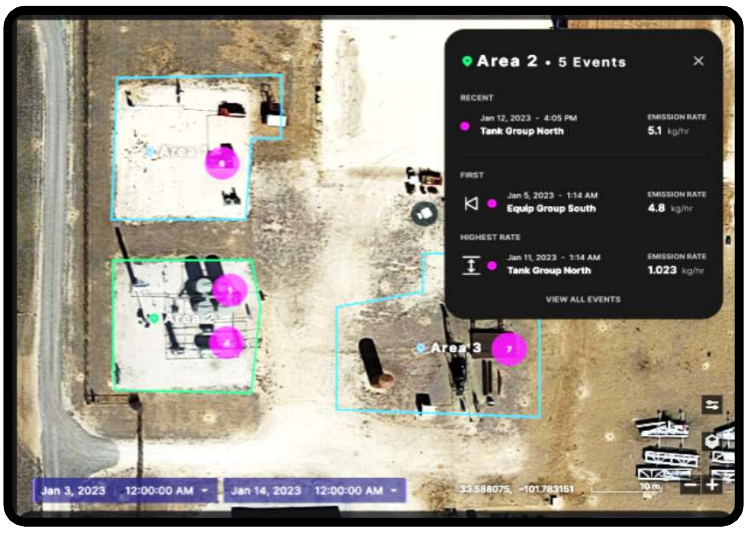
A QLM Camera system includes user selectable mounting, a pan-tilt stage for direction control, a sonic anemometer to measure wind, and an on-site QLM Edge Controller that securely collects data and acts as a gateway to the internet and our QLM Cloud data management application.

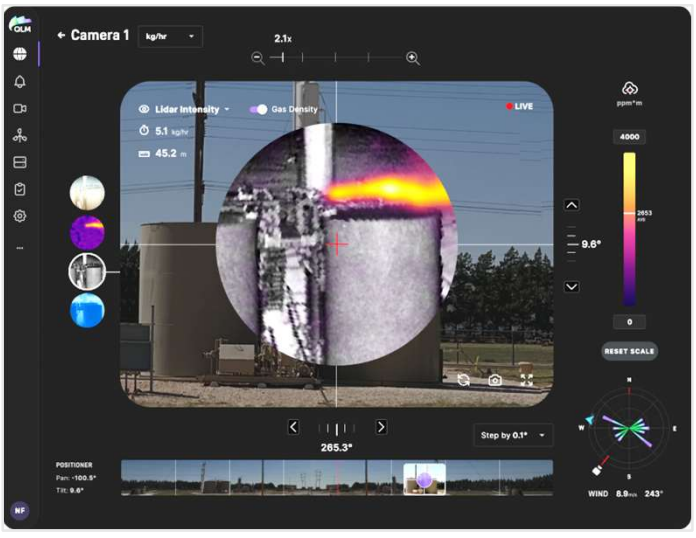
User access is via any web browser.

Camera control can be live or fully autonomous.

Data is encrypted both during transmission and in storage.

Dashboards provide complete camera control, data visualization, multiple analysis tools, and generate user-customizable reports.





The methane data you need, with the security you demand, exactly the way that you want it.

DATE SECURITY
Privacy & resilience

Cyber security

QLM Cameras are offered as completely stand-alone systems with 4G cellular connectivity to the internet and to Amazon Web Services (AWS) where the QLM Cloud application is hosted and where the data resides. Customers interact with QLM Cloud via a web browser. Each Customer, via their QLM Cloud, has secure access to their own virtual machine (VPC) and database within AWS with no need to be directly connected to a customer's internal network or on-site systems. The lidar data is owned stored and controlled by the end-user, not QLM.

The data is stored in Private AWS buckets with Two Factor Authentication access All data is encrypted in transit between all components and at rest with MQTTS and HTTPS via TLS. Industry standard security is validated with SonarQube SAST and CIS-CAT Testing. The QLM camera system is SOC2 and IACS compliant but not yet certified.

QLM cameras do not store lidar images and only transmit these to the local Edge computer via one-way secure cable transmission. Wireless transmission and AWS can be avoided completely by running the QLM Cloud app on a local computer. Customized APIs can be provided for transfer of data to any customer endpoint.

Privacy

The lidar takes minutes to build up clear point cloud gas and object images. The lidar images have a roughly 10-cm spatial resolution. People moving during the exposure time appear as blurs. The lidar unit contains an RGB camera for use in aiming the lidar during system provisioning and to give visible context imagery along with the lidar imagery. It is not used for video data and only takes still images once every few minutes at the beginning of every lidar measurement.

Data Backup

Data from the system is transferred to the QLM Cloud immediately upon capture, unless there is an internet connection failure in which case the data is buffered onto the on-site server for immediate transmission upon resumption of internet connectivity. The Edge cellular router is equipped with multi-carrier SIM cards providing failover connections.

NATURAL GAS PRODUCTION partnership with SLB

- SLB is a global multinational oilfield services company and a gas production technology leader with more than 100,000 employees.
- SLB is QLM's largest shareholder and QLM & SLB have a Collaboration Agreement that guarantees support and sales as our exclusive channel for up-stream and mid-stream oil and gas markets.
- We retain full access to our downstream and non-O&G business

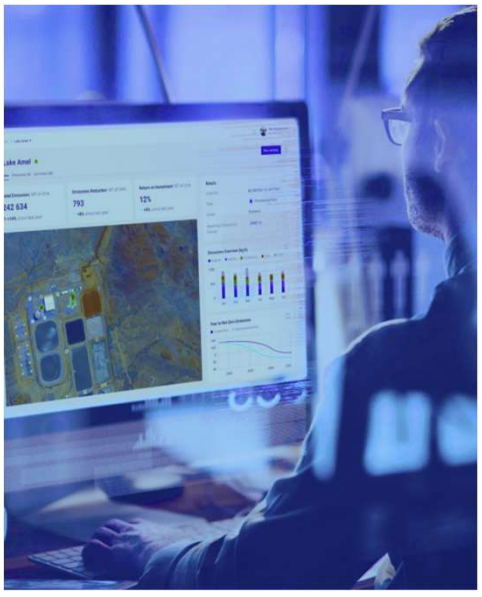
We know methane.

How to detect it, locate it, measure it, interpret it. And act on it.

Measuring methane emissions is important. It helps identify leaks and is needed for transparent and compliant emissions reporting. Both are prerequisites to any reduction effort.

Many measurement technologies are available today, from handheld devices to satellites. The best measurement setup for your asset is the right combination of the right tools. Finding that combination is key. That's where we come in.

- We have a full suite of top-down, bottom-up and continuous methane measurement technologies. Constantly evolved and expertly designed; digitally enabled and ready to connect.
- Our instruments and technologies have been validated as best in class by controlled release testing. We do this in collaboration with university partners and publish our findings in peer-reviewed literature.
- Our tech lineup includes instruments developed in-house at SLB, by specialist start-ups, or in partnership with other players—ensuring you have access to the very latest in methane measurement.
- All our technologies are designed, selected, and combined to support Oil & Gas Methane Partnership (OGMP) 2.0 Framework Levels 4 and 5 required for OGMP 2.0 Gold Standard.



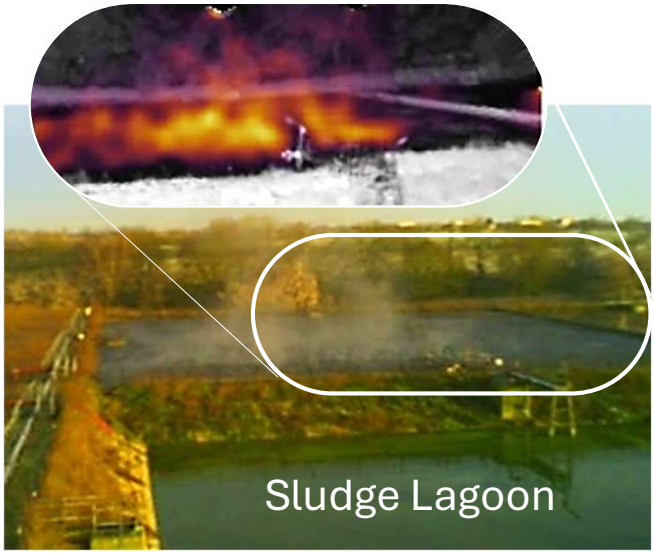
Methane lidar camera

Confidently and unambiguously identify methane leaks

Global partnerships that give us scale and impact

BIOGAS TO ENERGY PLANT
case study Severn Trent Water

- STW is one of the UK's largest water companies
- They use sewage in anaerobic digestion facilities to produce methane-rich biogas as a renewable energy source
- STW generates and self supplies more than 50% of its energy needs. Finding, quantifying and fixing methane emissions is a vital part of improving energy efficiency
- STW have trialed multiple QGL/Edge/Cloud systems on 10-meter masts
- These have operated 24/7 deployment throughout 2024
- Full coverage of all 28 STW sites has been approved by their regulators



Methane measurement that pays for itself

Environmental & regulatory QUALIFICATION

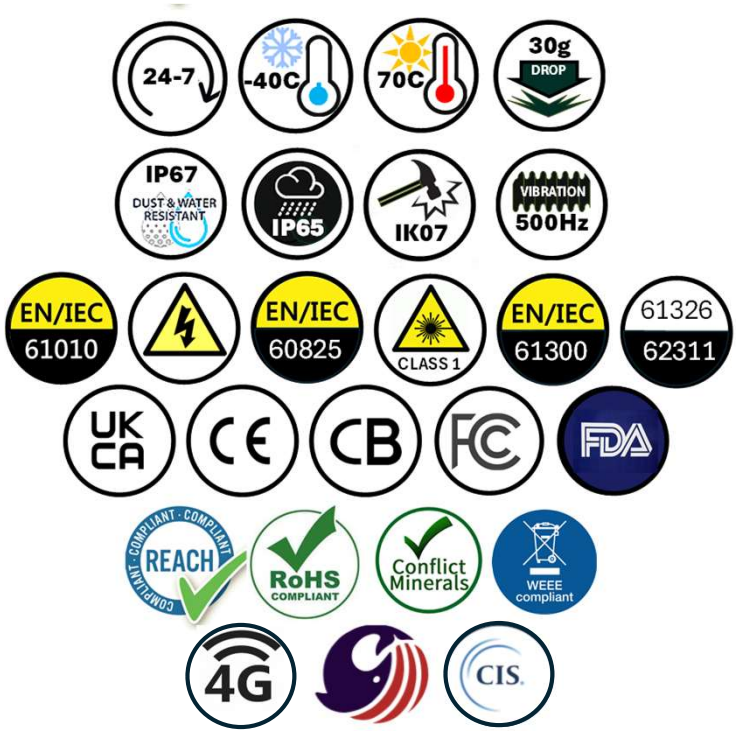
QLM Camera systems are designed for reliability and scale and are qualified for operation across a wide range of environments and applications worldwide.

Operational Reliability

- Day and Night
- Harsh Conditions

Product Compliance for

- Safety
- International Export
- Sustainability
- 4G Connectivity
- Cyber Security & Data Privacy



US EPA Qualification as an Alternative Test Method for Methane Detection Technology is pending in Q1 2025.

Globally Patented Proprietary Technology

QLM's technology combines infrared semiconductor laser lidar with gas spectroscopy using time correlated single photon avalanche detection. We have deep IP in hardware and software, 12 patents granted, and more pending.

Region	Patent #	Issue Date
UK	GB2586075	28-Jul-21
USA	US 11,644,576	09-May-23
USA	US 11,714,047	01-Aug-23
UK	GB2607646	10-Oct-23
USA	US 12,099,007	23-Sep-24
USA	US 12,111,335	08-Oct-24
EU	EP3956677	18-Oct-24
USA	US 12,123,830	22-Oct-24
USA	US 12,158,419	03-Dec-24
EU	EP4291872	04-Dec-24
UK	GB2617370	11-Dec-24
USA	US 12,253,466	18-Mar-25

Camera & system SPECIFICATIONS

Parameter	Min	Max	Units	Comments
METHANE DETECTION & QUANTIFICATION				
Methane Concentration Pathlength Accuracy	<+/- 10%		ppm.m	For calibrated methane cell at STP
Methane Leak Rate Accuracy	Within a factor of 2 (1 sigma). dependent on accuracy of wind measurement at the leak.			
Methane Leak Detection Limit	<0.1	>10,000	kg/hr	Dependent on windspeed and range
Lower Limit of Detection vs Wind Speed	< 1	< 10	m/s	Windspeed
LOD for< 100m range	0.2	2.0	kg/hr	90% probability
LOD for <200m range	0.4	4.0	kg/hr	90% probability
Methane Detection Range	10	>200	m	
False Positive Reports	Zero with recommended settings for customer configurable leak rate thresholds			
Lidar Field of View	<1	18	Degrees	Circular images, >20x optical zoom
Methane Imaging Exposure Time	30	>600	s	Fast images have lower resolution
Methane Image Resolution	2	10	cm	Dependent on range and image time
Laser Output		<10	mW	Class 1, 1651nm, completely eye safe
Visible Camera	1080 x 1920, RGB, auto focus, auto exposure level			
Pan Range	355		degrees	Allows full 360 degrees visibility
Tilt Range	-60	+60	degrees	Range centre can be adjusted
ENVIRONMENTAL				
Operating Temperature	-20	+50	ºC	Qualifying -40 to +70ºC
Storage Temperature	-40	+70	ºC	
Humidity	0	95	%	Noncondensing
Environmental Conditions	Day or night, unaffected by thermal contrast, sunlight or moderate winds			
Precipitation	Moderate rain, fog and snow			
Altitude	-400	+3000	m	
ELECTRICAL INTERFACE				
Edge Controller Supply Voltage	85	270	VAC	115/240, 6A fuse nominal
Edge Controller Power Consumption		<50	W	
Connectivity	Global 4G, wifi, or ethernet			
Anemometer Cable	10	25	m	RS485 with 24V 1 A
Lidar Cable	10	25	m	Ethernet with 24V 3A
DIMENSIONS				
Lidar size	18cm diameter by 43cm long			
Lidar weight		4	kg	
Lidar on Pan/tilt stage weight	8	10	kg	
Edge size	23cm deep by 50 x 47 cm square			
Edge weight		20	kg	
Mast Height	1.5	30	m	Typical 15m

All specifications are subject to change without notice
Revision date 18 February 2025

www.qlmtec.com

QLM is dedicated to customer support and continuous innovation to help you stay ahead of regulations and meet environmental targets.

Visit our website for regular updates