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INSIGHTS

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Managing methane leaks in oil and gas

Measuring individual leaks vs overall emissions

Quick sensors overview

Ultrasonic gas leak detectors

Quantitative optical gas imaging

Laser scanning for methane by drone

Laser scanning via DIAL

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We offer truthful, professional opinion and advice; no playback of what you already know, and no spin.

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Managing methane leaks in oil and gas

The oil and gas industry is under pressure to demonstrate that the methane emissions from its operations are low, amid claims that methane leaks are so high that gas is barely better than coal for power generation. But providing a solid number is very difficult and expensive to do

The oil and gas industry is under pressure to demonstrate that the methane emissions from its operations are low.

There are numbers being circulated (some initiated by environmental groups) showing that the methane leaks from gas wells, and gas processing facilities, are so high, that, gas is scarcely better than coal for power generation, in environmental terms.

This is taking into account that methane has more powerful greenhouse gas qualities (in terms of absorbing infrared energy and emitting heat) than carbon dioxide does.

Although it is found in much lower concentrations than carbon dioxide, methane is around 25 times more potent, meaning that it still accounts for an estimated 28 percent of the amount of warming caused by carbon dioxide. The oil and gas industry is not the only source of methane leaks – there are large emissions from landfills and belching cattle.

Bob Dudley, CEO of BP, speaking at the Offshore Europe event in Aberdeen in September 2017, said that if the industry is going to be able to promote gas as a "natural transition fuel" (between coal and renewables), it needs to get away from criticism about methane leaks. "It is the Achilles Heel of a natural low carbon fuel."

But how do you count the methane leaks from a facility?

There are many gas detectors which directly sense gas molecules, which are used for safety purposes but are of little use in quantifying the size of a leak (or understanding more about it). Today we also have ultrasonic detectors (which hear leaks), and optical gas imaging (which can 'see' gas from the infrared absorption characteristics of the gas).

Laser detectors (which detect gas by how it changes a laser beam which passes through) are becoming smaller and more usable in industrial environments. Experiments are being made using infrared images from satellite to see if it is possible to pick out the heat caused from methane.

So far there is only one technology which we found which can measure emissions from an entire facility, the DIAL technology from the UK's National Physics Laboratory, but the systems fill an entire articulated truck, need its own generator, and cannot be taken offshore. Furthermore, there is only one system in the world available for industrial use.

Satellite infrared offers something of a silver bullet, if you could see methane clouds above different facilities around the world on satellite imagery, you could at least say that certain facilities were dirtier than others. But this image would not help you much to quantify the size of emissions.

In the past companies have operated on assumptions that all equipment was perfectly maintained and so leak free, and not corroded or with any manufacturing defects, and provided data on that basis. Some companies have discovered, on using optical gas imaging cameras for the first time, that they had about twenty times more leaks than they thought.

Another factor is that if a great chunk of your total leak emission comes from a few large leaks, then it makes sense to only focus on measuring and fixing large leaks and not bother measuring or fixing small leaks at all.

Forcing companies to measure all their leaks and publish leak rates could be commercially harmful unless the rule was applied internationally. Let's say there are many chemical and gas operations around the world which are held to lower safety and environmental standards than those in the US and Europe, with older and less well maintained equipment. These could be full of leaks which nobody knows about. They can claim that their emissions are very low. This casts companies that accurately measure gas emissions

in a poor light, even if actual emissions are lower than those of companies not subjected to the same environmental standards.

Generating a single number

Some oil companies are asking themselves, if they could get all the possible data from satellites, methane measurement sensors, and anything else, and compile that together somehow to show their total emissions.

On one hand, yes of course you can come up with an answer. Oil companies want to publish numbers in their annual reports about their emissions, and have a range of source data to make that number from. Consultants have ways of coming up with numbers and a justification for their credibility.

On the other hand, how useful could these numbers possibly be? A satellite image could potentially allow you to compare the heat (emitted by methane) in one part of the world to another, and 'prove' your facility is not emitting, although who knows where that methane cloud may have drifted from – a large herd of belching cattle in a neighbouring field.

The only sure way to make leak numbers is to know all of the leaks in your facility, when they started, and what the leak rate is roughly, measured using optical gas imaging. Or otherwise you need to use DIAL (explained later in this report).

Otherwise, the best that companies can do is install good detectors, find out what works best for them, keep an eye on technology development such as lasers and quantification techniques, and try things out.

Do regular surveys of all their facilities and pipelines with cameras and monitors which are handheld, on poles or on drones. Fix leaks as soon as they are identified, and survey regularly enough to get a good idea how long a certain leak has been active and so how much has been emitted.

Sensors overview

The strengths and weaknesses of basic gas sensors (including sniffers), gas imaging cameras, and laser / open path detectors – and projects from the oil and gas industry to encourage technology development

The basic gas sensor, around for many years, detects the gas molecules themselves. The gas physically needs to get to the gas sensor.

These are OK for safety purposes (is there dangerous levels of gas near a person). But not so useful for environmental monitoring – the gas might dilute between the leak and the sensor, or may get blown in a different direction. There are many gas sensors on any installation which handles gas, for safety reasons.

The basic "sniffer" is a version of this – it can tell you what the concentration of methane is at the sniffer's probe. If the probe is inserted right into a leak, it can determine a leak rate.

It is possible to install gas detectors along a pipeline every few metres detecting for gas, connected to a communication system.

A drawback with direct gas sensors is that if the gas is blown away from the sensor, the sensor will not detect anything, although it might be a few metres away from a leak.

If you know you have a leak, one simple way to measure the size of it is to put a bag over it and measure how much gas you collect in a certain time.

Gas imaging cameras rely on thermal contrast to detect gas leaks. Provided there are significant differences in the amount of infrared light produced by objects in the scene, the imager will identify the gas cloud.

Methane will absorb infrared energy at a certain wavelength, and by spectrally tuning the wavelength of the camera, you can detect whether or not it is from methane.

(For this reason, a gas imager detects gas clouds at night as well as daytime, in cold days as well as warm days.)

Gas concentration is determined by measuring the absorption of light at the particular wavelength of the target gas. Being able to "see" gas on a screen is a great way to help people understand what leaks they are dealing with.

OGI (Optical Gas Imaging) cameras show great potential in being able to quantify the leak, but it is a very complex calculation, extrapolating the 2D visual image of the gas cloud to make a 3D model of the size of the gas cloud, and then estimating the gas flowrate from that.

Laser or "open path" detectors make use of the way different gas molecules absorb light - some absorb some light wavelengths more than others. A laser, or another source of infrared light, needs to pass through the gas to a detector – perhaps using a mirror, or with light reflected by the ground. But this method can normally only measure the concentration of gas along the whole path of the laser or light beam, so you need to fire the light in many different directions through a plume to try to build up a 3D picture. Another option is to use a much more powerful laser, in the DIAL technology.

There have been experiments to detect leaks by detecting changes in gas pressure or flow in a pipeline, or by using fibre optics to 'listen' for sound of leaks.

"I'm not sure there's one technology that has become the pre-eminent, wholly effective in all situations," says Edward Naranjo, director of fire and gas systems with Rosemount Flame & Gas Detection, part of Emerson Automation Solutions, based in Shakopee, Minnesota. "If I look around – it is always a combination."

OGCI

The Oil and Gas Climate Initiative, a group of oil majors formed to "pool expert knowledge and collaborate on action to reduce greenhouse gas emissions" has announced a commitment of "up to $20m" to invest in "technologies and business ideas that have the potential to significantly reduce methane emissions across the energy value chain from well to point of use."

It says "Companies with promising technologies and/or business models in the areas of methane detection, measurement and mitigation along the energy value chain are invited to submit their proposals."

A number of companies were invited to present on a "venture day" held in Washington, DC, in June 2018.

Methane leaks at Gassco

Norwegian midstream oil and gas operator Gassco is seeking better technology for managing methane leaks, through its

participation in a program to try to develop new digital technology for improving process safety. The programme is led by risk services company Lloyd's Register, through its "Safety Accelerator" programme.

Are Jacobsen, head of HSE with midstream oil and gas operator Gassco, says that one concern is reducing false alarms, which can lead to the entire plant being shut down at great cost. "Methods are not reliable enough," he said.

The company would also like a better way to measure its total emissions from a facility to check they are within limits.

The company does periodic 'campaigns', taking gas sniffing devices around equipment to look for leaks. But it takes a consultant about 6 months to compile a report based on the data, he said.

The company is considering using artificial intelligence to identify equipment which may be about to fail (perhaps using techniques tried in the rail industry), he said.

Gassco would like to start rolling out the improved methane leak detection systems on its most challenging assets, such as major oil and gas plant in Norway. Then it could be rolled out to other facilities and terminals.

Ultrasonic gas leak detectors

Ultrasonic gas detectors analyse the sound made by leaking gas

The ultrasonic gas leak detector picks up 'ultrasound' (high frequency sound) made when gas goes from a high pressure to low pressure – as it does when leaking from its containment system (pipeline or tank).

Ultrasonic gas leak detectors are extensively used on North Sea platforms.

The sensors do not require any calibration, and can detect leaks up to 20m away.

The systems are normally used on well ventilated outdoor environments. They are unaffected by weather, wind, leak direction, and gas dilution. This is because the sound being detected is made at the point of the leak, and unaffected by whatever happens to the gas after it leaks.

An ultrasonic handheld device can be used a like a sniffer, being carried around a plant looking for small gas leaks, a few grams a second. (Note – companies may also use ultrasonic tools to test for background ultrasound, which is something different).

But if the company is looking for numbers showing the total amount of emissions, it is very hard to calculate this based on some small leak data.

There are ways to estimate the volume of the leak by analysing the pitch (frequency) of the sound – The sound frequency is proportion to the log of the mass flow rate. The sound pressure level (amplitude) of ultrasound is proportional to the logarithm of the mass flow rate.

The tools cannot detect which gas it is, only the pressure level.

Optical gas imaging

Optical gas imaging is a version of thermal infrared cameras which we have seem used in search and rescue – and coupled with image processing, can provide the possibility of quantifying the size of a leak

Optical gas imaging (OGI) is perhaps best understood as a version of the thermal infrared cameras we have seen on TV, used in search and rescue efforts looking for warm bodies after an earthquake.

Methane in air absorbs infrared energy, warms up a couple of degrees more than the surrounding gas, and radiates this heat out at certain wavelengths which can be detected. The camera is 'tuned' to look for gases at a certain wavelength.

A big advantage of this technology is that it enables methane to be immediately seen on a screen, including a source of any leaks, which is something people can mentally process easily.

OGI carries the promise that you can actually evaluate the rate of a leak, using some analysis of the visual image of the gas cloud, and so work out how much is leaking. It isn't a straightforward method, as we will show, but it is perhaps the best way to quantify the size of a leak.

The camera can be handheld, mounted on a pole, mounted on a vehicle or truck, mounted on a drone or even (in one trial) mounted on a tethered drone. The tether was used to deliver power to the drone, so it was not reliant on batteries and so did not have a limit on flying time. This trial was to see if it would be possible to scan for leaks on an offshore platform, with a drone operated from a nearby vessel and tethered to it.

The cameras are used in oil refineries, natural gas processing plants, offshore platforms, chemical / petrochemical plants and power generation plants.

The filter on the camera is cryogenically cooled, which sounds like a big technical challenge on a handheld camera.

FLIR's OGI camera

The standard OGI camera from manufacturer FLIR, the GF320, can detect hydrocarbon and VOC (volatile organic compound) emissions. It has a viewfinder, LCD monitor and embedded GPS system. The camera has been available for about 10 years.

It can video record the gas and the motion of the gas.

The camera also has a 'high sensitivity mode', where it displays just the pixels which are changing (by subtracting the current frame from the previous frame) – which enables extra sensitivity to see moving gas plumes.

Tests from UK's National Physical

Laboratory determined that it could detect a leak of just 0.4g/hr leak, at a range of 65 feet (from the camera to the leak source) and wind speed of 10mph.

Other tests have shown the system was proven to be able to detect leaks of 1-20 litres per minute of methane and propane. The leaked gas has been tested against backgrounds of brick, concrete, metal and sky, at 2-10 metres.

The cameras can also see parts of the facility which detectors such as sniffers cannot reach. It can tell you if there are two leaks in close proximity, whereas with a sniffer it can be hard to detect if there are one or two.

The cameras can also see large plumes, such as 20m in size, if the camera is far enough away to capture it in one frame.

Quantitative optical gas imaging

Steve Beynon, Sales Manager North Europe with FLIR Systems

A big promise with OGI is that it is becoming possible to generate data about the leak rate, from analysis of the visual image. This is known as quantitative optical gas imaging, or QOGI.

FLIR is partnering with Providence Photonics which provides software for doing this, which works with FLIR's gas imaging camera.

You need data about the difference in temperature between the methane and the ambient air (the higher the difference, the darker gas will show on the image), the distance the camera is away from the gas cloud (the further away the smaller the gas cloud will look in pixels on the image) and wind speed (which will carry gas away faster).

Steve Beynon, Sales Manager North Europe with FLIR Systems, says many people ask about quantitative techniques, and "you have to explain to people about the challenges."

The Flir GFx320 Intrinsically Safe OGI Camera

For example, the contrast of the gas cloud on the screen can indicate both a higher concentration of gas, and a higher temperature difference between the gas and the ambient temperature, so you need to know what the temperature difference is.

A big gas movement can indicate both a high concentration of gas or a high wind, so you need to know the wind speed and direction. The assessment will also depend on what kind of gas leak it is – from a point or from a broad area (diffuse release).

In summary, it is possible to quantify gas leaks but it is not as simple as "point and shoot" and get your data, he says.

Using OGI in hydrocarbons

OGI cameras have been widely used in hydrocarbons for detecting leaks (not yet for so much for quantifying them).

One interesting example is where they were used by a crew inspecting an unmanned platform. They pointed the camera at the platform from the helicopter, before they had landed. The camera image indicated a large gas cloud on the platform. They were able to land the helicopter from a different direction, to avoid flying through it.

In another example, Flir was demonstrating the camera to a refinery operator, and asked if there were any leaks the refinery knew about, which they could use to demonstrate the camera. The refinery staff took Flir to a compressor station, which they were planning to shut down to fix a leak. The camera image revealed that the leak was actually coming from an isolation valve, not the compressor. The valve could be repaired in a few minutes, and the compressor repair was avoided, saving the company about $100k.

Another case study is with an unnamed oil company operating in the Denver-Julesburg Basin of Colorado, which has many oil wells near homes and schools. The company was visiting wells every few days to visually or audibly inspect for leaks and broken equipment.

Another example is Twin Eagle Consulting and Pixel Velocity, an industrial digital software company, which developed a leak detection system using an optical gas imaging sensor from FLIR combined with leak detection algorithms.

Software was developed which would use the data to detect, visualise, pinpoint and alert the oil company about leaks, giving the company ability to monitor leaks on a mobile device or PC. The camera was installed on a 40 foot telephone pole in the centre of the site. The system was detecting for 20 different hydrocarbons.

One OGI project looked at a ship to ship transfer of oil. One tank was not gas tight, and the gas plume could be seen hanging in the atmosphere.

Laser scanning for methane

Laser scan tools can detect methane by evaluating how much the beam is affected by gas that the beam passes through

Laser scan tools can detect methane by evaluating how much the laser beam is affected by the gas which it passes through.

The laser beam can have a wide variety of different light frequencies (different to a conventional laser, which is all of the same frequency). This is important because different gases affect laser light in different ways.

The technology is not commercially mature – we looked at two university spin-outs, QLM in Bristol, UK, and the University of Colorado, in Boulder, USA.

The technology could potentially be fixed to a drone, scanning in every azimuth (direction), and generate a 3D image of the size of any methane cloud, which could then be used to evaluate the size of every leak in an entire facility.

With the QLM technology, the laser beam is created on the drone, and passes through the air twice, being reflected by the soil or ground, and going back to a detector on the drone. With the University of Colorado technology, the laser is horizontal, and mirrors are used to reflect the laser back to a detector.

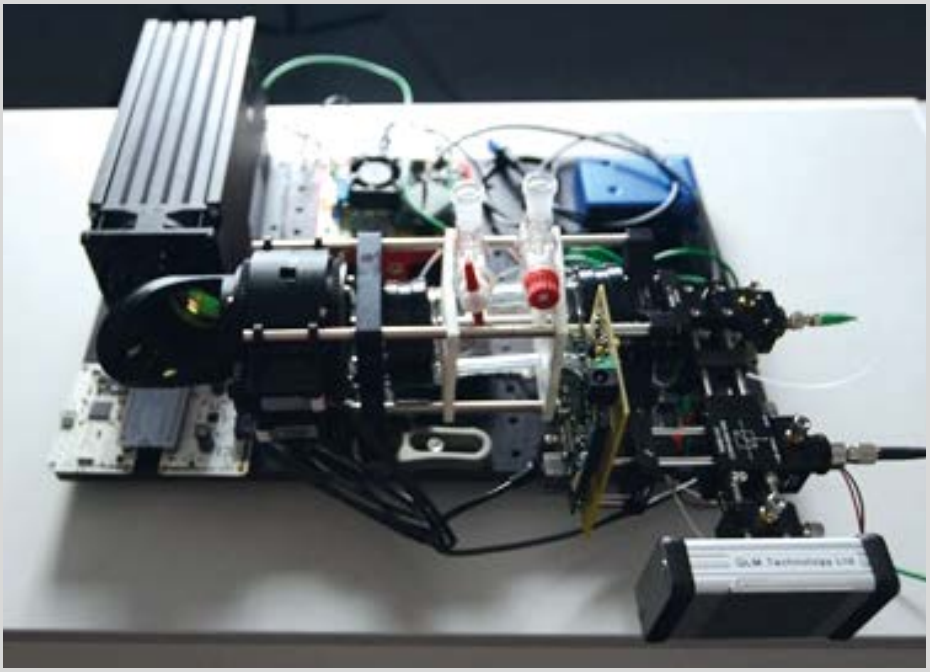
QLM

QLM, a start-up company in Bristol, UK, is developing a laser scanning technology for methane which can be mounted on a drone. It initiated a collaborative R&D project with £1.3m funding from UK agency Innovate UK with funding running until April 2019.

It can detect and quantify the lowest leak rate required by the oil and gas industry, at a distance up-to 150m. It can be mounted on a drone and survey at 10s of miles an hour.

The laser remote gas sensing technology itself is not new, but the company has developed ways to miniaturise it, so it can be carried on a drone, rather than a much more expensive helicopter. It could also be fixed to a pole, scanning constantly.

It was developed a way to use much lower powered lasers, enabling the total weight of the equipment to be reduced from 20kg to 2kg, which can be carried by drone.



A lab based prototype of QLM's technology

The company

The technology was developed by The University of Bristol's Quantum Enhanced Imaging group, through the national "QuantIC" technology hub, building on work which goes back to the 1980s.

Research was led by Professor John Rarity, who is known as the "father of quantum sensing" and continues as chief scientific officer of QLM. (See https://quantic.ac.uk/about-us/research-team/)

QLM is founded by Dr. Xiao Ai, formerly a post-doctorate researcher at QuantIC, where he looked at laser radar (LIDAR) for atmospheric sensing of CO2, using very small amount of light, at the "quantum" level.

Yuri Andersson is the interim CEO who has 20 years' experience in business.

QLM has an exclusive right to package the technology into a drone-based system and market it. The company has 3 full time engineers working on the detector.

The company is working with industrial drone operator Sky Future to test out the device in an industrial implementation, and it is looking to set up trial inspections with an oil and gas company.

The company imagines a business model where it leases the sensor to service companies for a fee.

There is also scope to expand the technology to include 3D mapping by drone, with the laser scan data (like LIDAR / point cloud).

How QLM works

The laser beam scans around geographically and its wavelength and intensity is modulated, the spectral absorption of gas is measured by looking at the weak (single photon level) scattered signal for the ground.

The data can be recorded under 10 milli-seconds per point, compared to 0.1 to 1 second for existing laser detectors. The output is an image which shows the gas concentration measurement quantitatively.

For a typical methane leak, the gas concentration close to the leak will be orders of magnitude higher than it is at just a few metres away. Hence imaging capability is critical for detecting small leaks.

From the images, the devices can calculate leak rate to the lowest amount required by the industry, at greater than 50m stand-off distance.

The computer generates a picture of methane concentration based on 1m2 "cells". The image has a resolution of 1m2

grids, working out the concentration of methane in every square of the grid. QLM also plan to extend the technology to produce 3D maps using the time-of-flight of the light.

The drone is also fitted with a normal camera, so you can see the methane picture superimposed on a visual picture. This makes it easier to see where the source of the leak is.

QLM envisages that the drone can be operated regularly, e.g. flying over a facility once a week, identifying and assessing leaks and collecting data about how much may have been emitted since the previous survey (or the date the leak occurred, if it can be traced back to a cause).

QLM's data management

UK company Dashboard (www.dashboard.net), a sensor data management company, is exploring partnership options with QLM. Dashboard provides a cloud based system for storing sensor data of various types from pipelines and industrial applications, and doing analytics on it.

Dashboard sees potential business opportunities providing a service to store the data gathered by QLM's device, process it where necessary, perhaps analyzing data to estimate a leak rate, and make it easily accessible for customers.

"It doesn't matter how clever your sensing technology is, you have to put the insights of whatever it is you're measuring in the hands of someone who is able to do something with it," says Piers Corfield, CEO of Dashboard.

University of Colorado

A team of researchers from the University of Colorado, CIRES (Cooperative Institute for Research in Environmental Sciences), NOAA (National Oceanic and Atmospheric Administration) and NIST (US National Institute of Standards and Technology) are developing a portable laser tool to measure methane concentration and find leaks in oil and gas facilities.

The research was funded by an ARPA (Advanced Research Projects Agency) "E" grant focussing on "high risk / high reward" science.

The device promises to be able to quantify methane leaks with gas quantity equivalent to a quarter of a human exhalation, from nearly a mile way.

The work started with research in 2005 when researchers at CU Boulder won a Nobel Prize in Physics for a "Frequency Comb Laser", which would identify the concentrations of different molecules in air, from their light absorption fingerprint.

The University of Colorado Technology Transfer Office is now supporting a start-up company to commercialise the technology. It will be called Longpath Technologies.

The system uses a laser beam composed of light from over 100,000 different wavelengths (so different to a conventional laser, which just has one wavelength).

When the beam passes through a gas plume, gases in the plume absorb some of the light in the beam, before it gets to a detector.

Different gases have a different absorption 'fingerprint' which can be detected.

The system was tested using leaks from metal cylinders full of methane which were rolled down hills.

The system was previously only available as a room sized collection of instruments – now it can all fit in a 19inch portable unit, which can be carried to a wellsite. It sits on a mobile platform and can be swivelled 360 degrees. The light reflects off small mirrors placed a mile or more away.

The next sage is a "blind test", where the device will be tested to see if it can find and identify previously unknown leaks.

Solar Occultation Method

www.fluxsense.se/

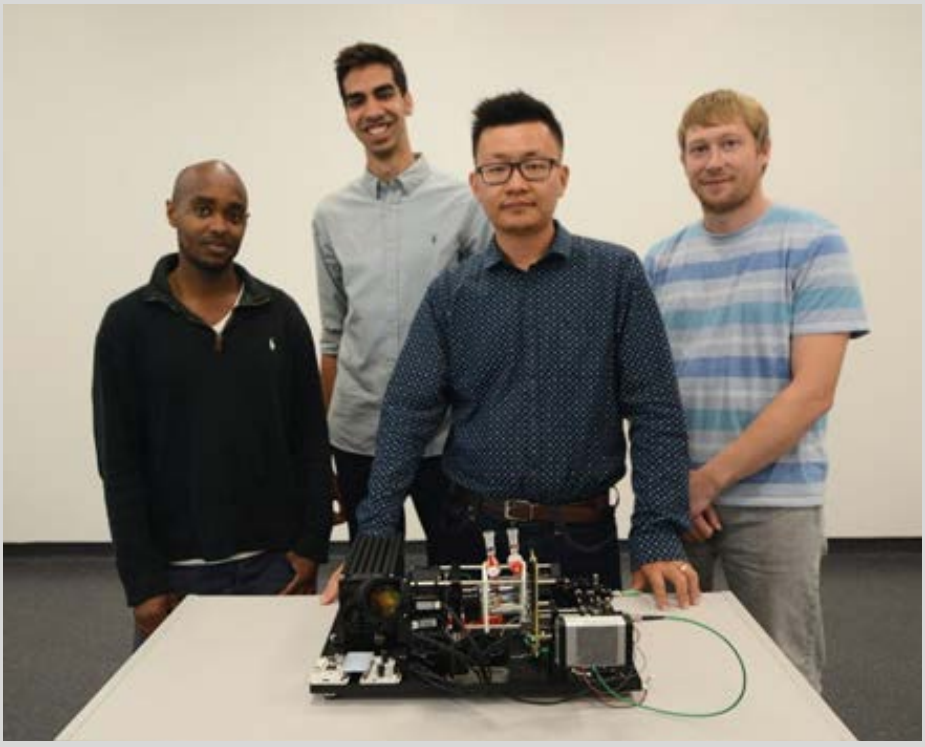
The Solar Occulation Method is an academic research project from Chalmers University of Sweden, being commercialised by a company called FluxSense.

The basic idea is that you measure the infrared intensity spectra of the sun from a moving vehicle. The vehicle is driven in such a way that the detected solar light moves across the emission plume.

It has been trialled in refineries and storage depots,

A project was carried out in 2002 to 2004 monitoring 3 refineries and an oil harbour in Sweden. It showed that 0.06 per cent of throughput in a typical refinery was lost due to vaporisation. Of the emitted gas, 26 per cent emitted from the process, 31 per cent from crude oil tanks, 32 per cent from product tanks, 8 per cent from the water treatment facility and 2 per cent from transport related activities.

The measurement errors are estimated to be around 25%. Other applications include farming, volcanoes (Mt Etna and Popocatepetl) and Megacities (Milano, Mexico City).



QLM's research and development team – James Kariuki, Manan Vaswani, Xiao Ai and George Harrison

DIAL – sophisticated laser analysis to quantify a facility's emissions

The UK's National Physical Laboratory (NPL) has developed a technology which can be used to quantify emissions from an entire facility

The UK's National Physical Laboratory (NPL) has developed a technology which can be used to quantify emissions from an entire facility. The device fills an entire articulated truck and comes with its own generator. It is currently the only system available in the world for industrial use.

The technology, called DIAL (Differential Absorption Lidar), uses specialised lasers, sent into the air above a facility. A tiny fraction of the laser energy is reflected or 'back scattered' by the gases and aerosols in the atmosphere. The detection system back on the truck is so sensitive that it can measure this scattered light.

The technology is similar to radar used on ships, but radar uses radio waves whereas lidar technology uses lasers, says Rod Robinson, Principal Research Scientist in the Emissions and Atmospheric Metrology Group, Chemical, Medical & Environmental Sciences Department of the UK's National Physical Laboratory.

It's also similar to smaller laser based systems, such as the drone mounted technology. The difference is that the smaller technologies rely on a laser reflected off the ground or a mirror back to a detector, and can only measure the concentration of gas across the entire journey of the laser.

"The DIAL technology uses back scatter. By using time data (when the laser pulse was created and when the return 'back scatter' arrives) it is possible to calculate the gas concentration at different points along the laser's path", Mr Robinson says.

"The primary purpose is to get a 'quantification of emissions', and also to pick up leaks which might have been missed using a sniffer or optical gas imaging survey", he continues.

Currently, NPL has two such systems, one is kept at NPL and used for R&D. The other is used for measuring industrial emissions.

How DIAL works

The laser can be 'tuned' to the right frequency to get absorbed by certain gases. If you send lasers at 2 wavelengths, so one gets absorbed by the gas and the other doesn't, you can calculate the concentration of gas from what comes back.

By using two very similar wavelengths, the only difference between the two signals is the absorption by the target gas. This is the differential absorption lidar.

If the beam points in different directions whilst scanning the gas, a 3D map of concentration of gas in the atmosphere can be built.

Once the shape of a gas plume in 2D vertically and wind speed horizontally is understood, you can measure how fast the wind will carry gas away horizontally, and so how fast the gas must be feeding into the plume. The data is gathered at 10m resolution.

The system can work at a range of 50m to 500m for hydrocarbons, and up to a kilometre for other gases, making it possible to scan a facility 500m across from a single point.

The measurement takes 10-20 minutes. NPL will typically do repeat measurements and report the average. Making measurements of all of the emissions from a large complex site can take between a few days and a few weeks.

The measurement does not require any assumptions to be made, or dispersion modelling.

The technology is designed to be campaign based, making measurements for a short period of time, say once a year, not continuous measurements.

DIAL and Oil and gas

The technology development started in the late 1980s, as a means to monitor all kinds of hydrocarbon emissions (there was less interest in methane then). It was developed with involvement from oil companies, BP, and Shell, and British Gas. Oil industry interest waned in the early 2000s, perhaps as oil companies found other methods more suitable for their needs in monitoring hydrocarbon emissions.

Interest in DIAL is now returning owing to the growing interest in finding better ways to monitor hydrocarbon emissions from a site. Part of this interest also comes from increasing legislation, and increasing interest in methane emissions - due to

Photo credit NPL management 2018

its importance as a greenhouse gas. DIAL is being used on landfill sites as well as within the gas industry.

The system has been used for a number of varying measurement requirements across Europe and the USA, including on sites where methane issues have caused the local authorities to intervene, and seek more clarification on the issue.

DIAL is currently engaged in a study with the Oil and Gas Climate Initiative (OGCI) program to try to find better ways for the industry to address and understand methane emissions, looking specifically at the liquefied natural gas sector. It will do measurements using DIAL and use that to understand the 'emission factors' (amount emitted per amount produced).

NPL does not have a version of the system which can be mounted on a vessel, so it is not possible to do offshore surveys, but there is no technical reason why it could not be done, and there has been some development work done for an offshore design.

DIAL and Best available technology

Use of the technology is supported by documents published together with the European Union's Industrial Emissions Directive, specifying the best available technique for managing methane emissions from refineries.

The document, known as a "BREF" (Best Available Technique Reference Document), states that best practise for "control of fugitive and diffuse emissions" includes a leak detection and repair program, and OGI cameras. It also says it is recommended to do surveys of the whole site to understand what the overall emissions are on a periodic basis, using techniques such as DIAL.

DIAL's Commercial model

NPL is a research organisation, part of the British government and has a remit from government to commercially exploit the capability it has, based on its core research work.

The company does not have standard pricing as this is very dependent on the specific work, but notes that a large amount of the cost is the cost of shipping the trailer to the facility, particularly if it is in another country, and associated staff costs. It is operated by just 2 people.

The company is open to the idea of licensing the technology to other service providers, so they could then operate their own DIAL system, perhaps with smaller units, but with NPL providing quality control over the resulting data.

In his work at NPL, Mr Robinson is also involved in developing a European standard for different emission monitoring techniques, including Optical Gas Imaging and DIAL.