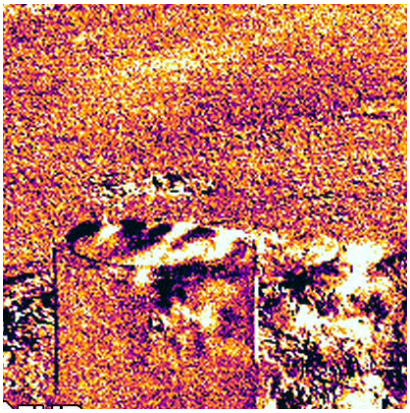
CLEAN AIR TASK FORCE

CATF's Gas Analyser Kit

A field tool for methane emission detection and mitigation

Methane is a potent greenhouse gas, responsible for nearly half a degree Celsius of the warming we've seen since pre-industrial times. Due to its relatively short atmospheric lifetime, methane reduction is one of the fastest and most impactful ways to slow near-term climate change. However, methane is an invisible and odourless gas, and this has allowed this climate threat to remain unnoticed for too long.

A gas analyser, and hidden methane emissions detected by Clean Air Task Force experts using an optical gas imaging camera

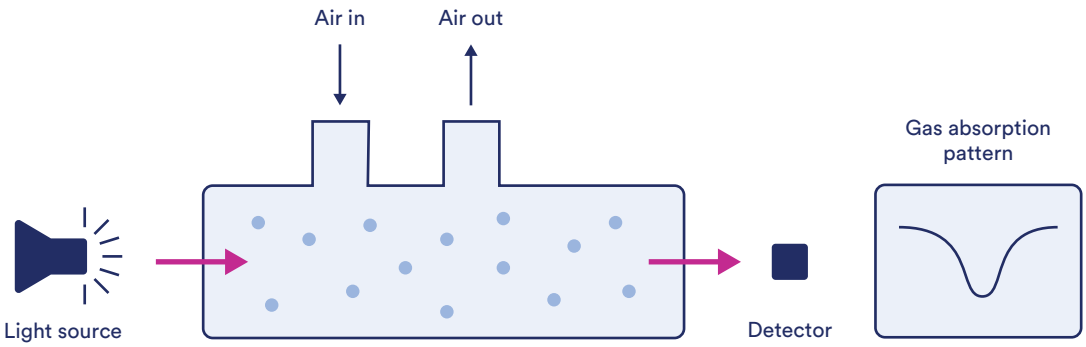
CATF is pioneering the use of state-of-the-art equipment to raise awareness of methane pollution and push for urgently needed reduction action. CATF's gas analyser, which can detect tiny concentrations of methane and carbon dioxide in the air, is the latest such tool, allowing for the reliable detection of emissions even from methane sources that are spread over large surface areas, such as landfills. Together with CATF's optical gas imaging cameras, it can detect climate-warming emissions from different types of sources (e.g., gas capture wells, anaerobic digesters, flare or vent stacks), highlight issues detrimental to worker safety, and help improve practices that can benefit community health. This factsheet is meant to be an introduction to the capabilities of the gas analyser. For technical questions, please contact us at methaneinfo@catf.us.

What is a gas analyser?

Gas analysers measure gas concentration in the atmosphere. They can be constructed to measure a wide range of gases. These analysers can detect tiny concentrations of these gases, enabling the study of emissions even far away from their source. Due to their precision, sensitivity, and dependability, gas analysers have become essential tools in scientific research and monitoring within the oil and gas, waste, and other sectors.

Gas analysers typically operate using a technique called laser absorption spectroscopy. All gases absorb specific colours (or frequencies) of light; these absorption patterns can be used to identify them, much like a fingerprint with a person, and quantify their concentration in the air. Gas analysers continuously sample air, pass laser light through it, and measure which specific frequencies are absorbed. Just as your phone unlocks only with your fingerprint, the gas analyser detects and signals only when the specific gases it's calibrated for are present. For our purposes, the analyser has been calibrated to detect methane. By comparing detected patterns to known signatures and their expected strengths for specific gases, the analyser can determine very accurately how much of the specific gas is in the air.

Figure 1



Thanks to their accuracy, reliability, and portability, gas analysers are increasingly used by academia and industry to understand methane emissions. For example, gas analysers are often used in mobile platforms to detect and quantify methane emissions from oil and gas sites, as well as waste sites in the United States and Europe. Networks of such instruments, permanently installed in representative locations, are helping to study regional and continental emissions. Installed on a car, gas analysers are shedding light on urban emissions from gas distribution networks and wastewater management. Gas analysers are also helping to understand diffuse emissions from landfill surfaces and wetlands around the world.

CATF's gas analyser kit

CATF's specialised gas analyser kit includes the analyser itself, a tablet equipped with GPS for real-time mapping, and dedicated analysis software. This setup empowers stakeholders to reliably detect and document methane emissions from solid waste sites.

Figure 2

CATF's state-of-the-art gas analyser can detect tiny variations of methane and carbon dioxide in the atmosphere, allowing the study of emissions even without direct access to the site (when positioned downwind from the source). Its reliability has been confirmed against reference instruments. CATF's analyser is small, lightweight, and ruggedised for field use, suitable for both portable use on foot and installation on vehicles.

Table 1: CATF's Gas Analyser Key Characteristics

Model	ABB GLA – 131
Target gasses	Methane, Carbon Dioxide, Water Vapor
Measurement rate	Typically, every second, up to 10 per second
Detection precision (1σ) / linear range	
Methane	< 1ppb / 0 – 100 ppm
Carbon Dioxide	0.35 ppm / 0 – 20000 ppm
Wate Vapor	200 ppm / 0 – 30000 ppm
Physical characteristic	
Size	12 cm × 34cm × 30 cm
Weight	6 kg

When it comes to methane detection in the field, the gas analyser is an ideal complement to CATF's existing optical gas imaging (OGI) cameras. While the OGI camera excels at detecting high concentrations of methane near the source, the analyser can detect diffused emissions even kilometres away from the source. The OGI will create compelling images of emissions but requires a direct line of sight to do so, whereas the gas analyser may detect the emissions as the wind carries them away. Finally, while the OGI camera might occasionally have ambiguity about the gas being observed, the gas analyser can unambiguously confirm that the emitted gas is methane. In total, the two instruments provide complementary information and together offer a much more complete view of the hidden world of methane that surrounds us.

Observations vs Quantification

Gas analysers measure gas concentrations accurately but do not directly provide the emission rates of a methane source. Imagine that the analyser measured a slight increase in methane concentrations downwind from a suspected source: the increase could be slight because the source is not emitting much, or strong winds could have dispersed methane from what is actually a highly emitting source.

Gas analysers can be used to calculate emission rates, but the process requires sophisticated calculations based on additional scientific equipment that takes highly precise measurements of the local meteorological conditions. Moreover, the analysis requires significant scientific expertise and resources. Due to this, CATF does not use the gas analyser kit to quantify emissions.

The following table summarises key differences between concentration and emission rate estimates, as used for methane mitigation.

Table 2

Quantity	What it answers	How to estimate	When to use
Concentration [ppm]	How much methane is in the atmosphere at a particular location and point in time?	Directly measured using the gas analyser.	Examine if a source is emitting methane. Qualitative information on magnitude and source location.
Emission rate [kg CH_4 per h]	How much methane is a source emitting at a particular moment in time?	Combine analyser concentration measurements with precise wind information to understand dispersion.	Estimate whole site emissions rate at a point in time. Validate measuring techniques.
Annual emission rate [kg CH_4 per year]	How much methane does a source emit on average throughout the year?	Perform multiple emission estimates at different times of the year to account for varying emission rates and estimation errors.	Evaluate model emission estimates and reported emissions.