

# METHANE FROM FLARING TOOLKIT



## Measure Efficiency: Aerial measurement of flare efficiency

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### Summary

Aircraft equipped with a methane sensor (with or without an additional carbon dioxide sensor) flown downwind of oil and gas processing sites can be used to measure flare efficiency.

### How it Works

Research-grade methane sensors are now routinely available that can be mounted on fixed wing aircraft.

The aircraft are flown downwind of oil and gas operating sites, adopting either a raster formation or perimeter flights.

Total methane emitted from the study area is calculated as the difference between signal intensity upwind and downwind of the study area or through the use of dispersion models that require additional data on wind speed.

A number of sensor technologies are available. For determining flare efficiency the primary choice is between a single methane sensor – which requires additional accurate information on flare flow rates from the operator and a plume inversion model to define the flux of methane originating from the flare, or dual sensor in which the carbon dioxide to methane ratio is used to determine efficiency.

#### Advantages

✓ Sensitivity - Aircraft mounted methane sensors are amongst the most sensitive of field-deployed instruments with detection thresholds below 1ppb

✓ Distance – Aircraft can cover large areas within a single survey, including flights that require long transit times (eg offshore)

✓ Integrated surveys: Can be used as part of a regional emissions survey – including analysis of all sources of methane

✓ Operates effectively over water

#### Limitations

✗ Not specific to flaring – the sensor will identify all sources of emissions within the field including venting and fugitives

✗ Requires an expert user to operate the equipment and back-calculate emissions. The majority of applications come from academic surveys, not routine or periodic inspections

✗ Specialist pilots and adapted aircraft are needed to perform the measurements, which may entail flying in close proximity to oil and gas facilities or other aviation constraints with associated permitting requirements

✗ Unless methane and CO<sub>2</sub> are measured simultaneously, the efficiency of the flare can only be inferred by reference to production data

## Go Deeper

- [Vendor website: - sensor systems - Picarro](#)
- [Vendor website: - sensor systems - Aeris](#)
- [Academic research: Caulton et al.](#)
- [Vendor website: Scientific aviation](#)
- [Research article on equipping aircraft with methane sensors: Conley et al.](#)
- [Research organisation: FAAM](#)
- [Research organisation: DLR](#)

## Case study

Awaiting copyright approval

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[Measure Efficiency: Predictive Feedback and Control](#)



[Measure Efficiency: Flare Simulations](#)



[Measure Efficiency: Drone equipped with single methane sensor](#)



[Measure Efficiency: Drone equipped with dual CH4 and CO2 sensors](#)



Measure Efficiency: Extractive method for determining flare efficiency

