

METHANE FROM FLARING TOOLKIT



Measure Efficiency: Mobile Video Imaging Spectral Radiometry – (VISR)

Can I measure flare efficiency? > Measure Efficiency: Mobile Video Imaging Spectral Radiometry – (VISR)

Feature image courtesy of [Zeeco, Inc.](https://zeeco.com)® – all rights reserved.

Summary

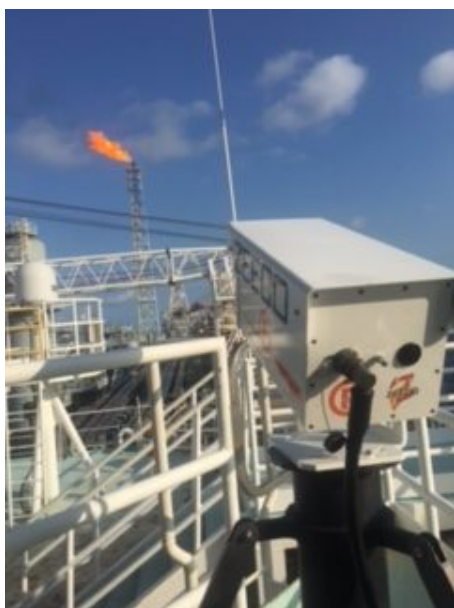
A spectrometer that provides direct and real-time measurement of flare combustion efficiency by measuring the ratio of methane to carbon dioxide. Energy radiated by the flare is used to measure CO₂ and CH₄ intensity in the . It has been tested against established reference methods including . VISR works for flares of all sizes and

locations provided the flame can be isolated within the field of view

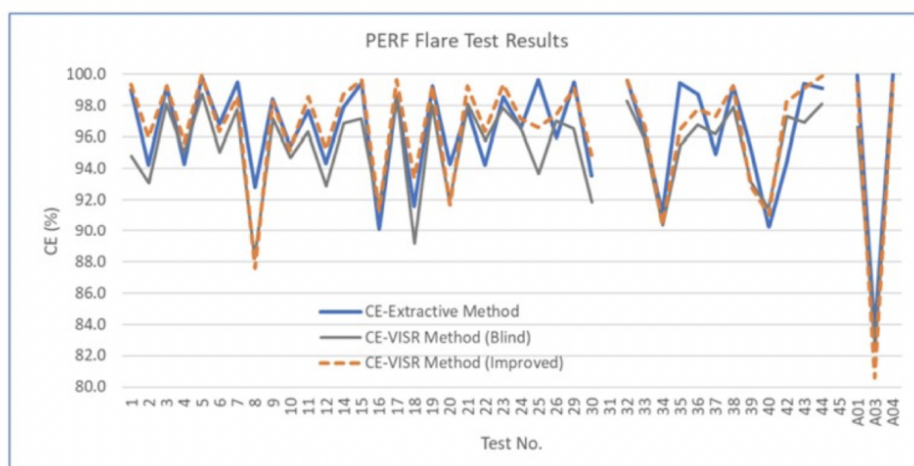
It can be deployed as a survey method or used as a permanently installed system (see separate entry).

How it Works

- A multi-spectral 2D imager measures radiance in the mid-wave spectrum to obtain the relative concentrations of CO₂ and unburnt hydrocarbons.
- Relative concentration measurement is based on spatial averaging of CO₂ & unburnt HC presence across the whole combustion zone.
- Provides a real-time direct measurement of CE and empirically derives DE












Mobile deployment in an offshore setting (Image courtesy of [Zeeco, Inc.](#)® – all rights reserved.)



Comparison of VISR and extractive sampling data under a range of full-scale experimental flow conditions and compositions. Research originally conducted by PERF.

Advantages

-  Results have been compared to US reference extractive method (see separate entry) with a mean difference - 0.07% in the 95-100% CE range
-  Cannot measure the concentration of CO, hence, DE has to be empirically derived
-  Tested against flares of variable size, design and with/without assist features
-  Some limitations in severe weather conditions (e.g. heavy fog)
-  Quick (~30mins) setup, can be mobilised to provide measurements both onshore & offshore
-  Can be run from outside process boundary, camera being positioned 100-1000ft from flare
-  Directly measuring CE eliminates the uncertainty of using surrogate parameters (e.g. NHVcz)
-  Operates in a range of environmental conditions, day & night
-  Provides data on other flare parameters, including temperature, smoke index and flow rates

Go Deeper

- [Vendor website: Providence](#)

- [Vendor website: Zeeco](#)
- [Press Release: Lockheed Martin](#)

Case study

VISR survey on an onshore gas processing facility and associated gas wells

VISR was deployed for testing of flare destruction efficiency alongside four other performance indicators in an onshore conventional gas production site. Three flares were tested, two in the central processing facility and one well pad flare. Tests were performed at ~1000ft distance to flare, conducted over two days with each flare measurement lasting approx. 1 hour. Tests done during daytime with calm wind.

Flare Types:

1. Permanently installed LP single-tip non-assisted flare – methane content >90%
2. Permanently installed HP flare with ultrasonic tips and air assist – methane content >90%
3. Temporary well pad clean-up flare – oil/gas mixed composition

Example data

Flare type	Indicative flowrate (MMSCFD)	VISR Destruction efficiency (DE) (%)	DE Standard Deviation (%)
LP	0.65	99.0	0.5
HP	1.6	97.0	0.8
Well pad	3.6	98.2	2.1

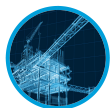
Observations

- It was identified that the HP flare would benefit from reduced air assist flowrates.
- Well pad flare was less stable during the tests, yet its destruction efficiency was at acceptable level.

Can I measure flare efficiency?



Measure Efficiency: Predictive Feedback and Control



Measure Efficiency: Flare Simulations



Measure Efficiency: Drone equipped with single methane sensor



Measure Efficiency: Aerial measurement of flare efficiency



Measure Efficiency: Extractive method for determining flare efficiency