METHANE FROM FLARING TOOLKIT

Control strategies: Predictive Feedback and Control

What control strategies can I deploy? > Control strategies: Predictive Feedback and Control

Analytics that calculate flare combustion efficiency based upon system design, gas composition and environmental factors such as wind speed can be used to track emissions.

Where this computation can be done in near real-time it creates the opportunity to moderate parameters in the flare to optimize the system including management of methane emissions.

How it Works

A flare system is designed to have an optimal combustion efficiency – generally in the 96.5% range or more – in order to transform all hydrocarbon gases post combustion into CO_2 and other pollutants. However, it is also known that changes in the flow or composition of the flared gas, or changes to the environment can lead to reductions in the flare performance – as documented elsewhere in this tool.

Modern flares are often equipped with advanced analytical systems – tracking flow, temperature and composition (see earlier sections of the toolkit for details). By tracking these parameters in near real-time and combining the data with models it is possible to moderate the flare to maintain effective combustion.

While the average combustion efficiency in the Upstream assets tend to be high thanks to the relative stable hydrocarbon gas mixture with a high net heaving value, it can be different for Downstream assets. Indeed, the gas composition is subject to changes as well as its temperature with a much larger spectrum of . To ensure an optimal combustion under these circumstances flare systems are often assisted using supplemental gas when the gas going to the flare is too lean and steam (or air) when the it is too rich. The key is to keep the optimal combustion also called the stoichiometric combustion where there’s the required mixture of fuel and oxygen. Flare systems that have access to supplemental gases therefore have a greater range of options for mechanisms.

To ensure a stochiometric combustion it is critical to have a permanent monitoring of the net heating value of the gas being flared in order to adjust the just needed amount of fuel gas and steam. With this information fed in the customer SCADA (or DCS) or calculated by predictive systems, smart software can live compute the data collected and determine the amount of fuel gas and steam required and send the set points to the respective flow control valves to get the needed mix. This can be illustrated as follow.

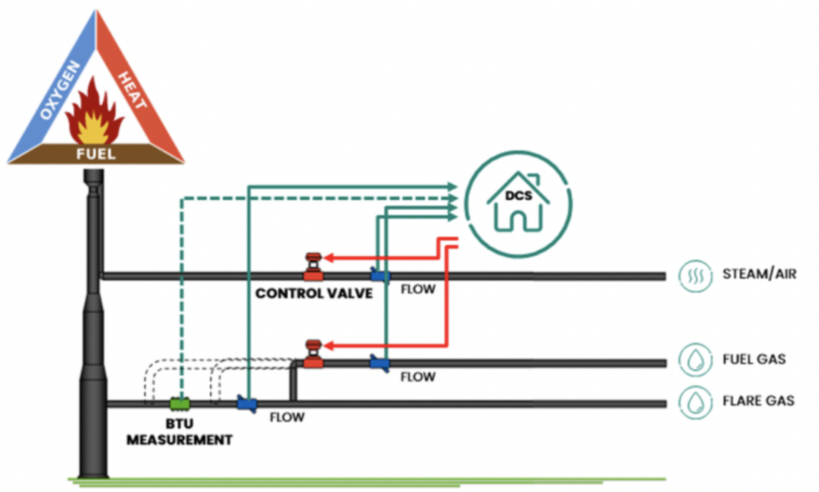


Image Courtesy of Baker Hughes

This set up allows the flare system to stay in compliance with the required high combustion efficiency and destruction and removal efficiency.

Advantages

- Allows for short-term adaptations to the flare to accommodate changeable variables including core parameters such as composition or environmental effects such as wind speed
- Maintains a constant and permanent record of interventions

- ☑ Reduces the need for operator-led interventions or judgement-based decisions
- ☑ Highlights long-term issues early and can be used to support maintenance programmes

Limitations

- ☒ Can only operate where other advanced measurement systems are already installed – such as in-line composition analysis
- ☒ Requires access to computation resources, either on the site itself or though sufficiently fast network links and cloud-computing
- ☒ Validation of adaptations

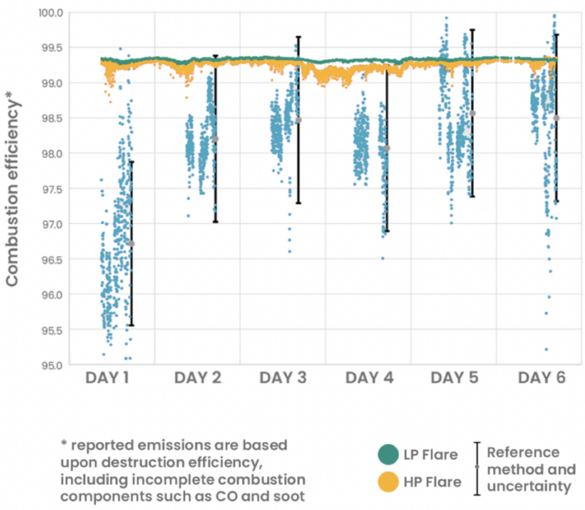
Go Deeper

- Vendor Website

Case study

Abridged from ‘Measurement up, methane down: innovative flare management’ written by Baker Hughes

Measurement up, methane down: innovative flare management | Baker Hughes



Sample flare measurement data, showing combustion efficiency over a 6-day period

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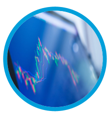
What control strategies can I deploy?



Measure Efficiency: Predictive Feedback and Control