

The background of the top half of the page features a large, bright orange and yellow flame from a refinery flare against a clear blue sky. On the left side, a dark metal structure of a flare stack is visible. The Siemens logo is positioned in the top left corner within a white rectangular box.

SIEMENS

Ingenuity for life

Analytical Products and Solutions

Flare Measurement

40CFR63.670 Refinery Sector Rule

usa.siemens.com/pa-environmental

The US EPA rule 40CFR63.670 specifically targets petroleum refinery flares. The objective is to increase and ensure high combustion efficiency and minimize visible smoke. To ensure the minimum required net heating value in the combustion zone needed for proper combustion, the heat value of the waste gas into the flare must be determined. For a specific flare design, together with flow measurements of waste and auxiliary fuel gas and assisting steam or air flow, the net heating value as well as the gas velocity in the combustion zone can be monitored and controlled. The Siemens online process gas chromatograph provides heat value based on compositional speciation as part of an integrated turn-key measurement solution. Based on many installations, its long track record of functionality and ability to maintain ensures you can comply with the regulations report accurate data with confidence.

Regulation Objective:

Improved combustion efficiency

- Destruction efficiency >98%
- Combustion efficiency >96.5%

Limit visual smoke

- <5 minutes per 2 hour period

Achieved by controlling

- Flare tip velocity <60/400 ft/sec
- Net Heating Value in combustion zone >270 BTU/scf
- Auxiliary steam or air addition

Regulatory Measurement Requirements:

Continuous Parameter Monitoring Systems (CPMS)
Measurement objective is Net Heating Value (NHV)
Results in 15 min. blocks, start at midnight

Analytical options

- Continuous speciation, ≤ 15 min.
- Composite Grab Sampler, ≤ 8 hrs.
- Continuous Calorimeter
- Continuous H₂ measurement (optional)

Continuous speciated measurement of

- H₂, Methane, Ethane, Ethylene, Propane, Propylene, i-Butane, n-Butane, Butylene, C₅+ plus components reasonably expected such as CO, Acetylene, Propadiene, H₂S

Sample Transport and Sample Preparation

- Minimum 60° C
- Min. 2 (Calorimeter) or 3 (GC) validation standard standard inlets

Analytical Validation

- Calorimeter according manufacturers recommendations
- Process GC validation of every contributing component individually, n-Pentane for C₅+
- Process GC alternative validation method with H₂, C₁-C₅ n-Paraffins, other components assigned to closest n-Paraffin response and heat value
- H₂ Analyzer according manufacturers recommendations

Cont. Regulatory Measurement Requirements:

Analyzer Performance

- Calorimeter +/- 2% of span
- H₂ Analyzer +/-2% over concentration measured or 0.1%v/v whichever is greater
- Process GC according 40CFR60 Part B Performance Spec 9 (PS 9) except
 - Validation focus is analyzer
 - Standard introduction at analyzer
 - Initial 7 day drift performance test
 - Mid-level, single daily analysis
 - Low, Mid and High level quarterly
 - Drift repeatability ≤10%
 - Linearity ≥99.5%

The refinery sector rule provides several analytical options. Calorimeter providing continuous waste gas heat value are fast. Together with flow data it permits short reaction time to optimize flare performance. However, steam or air addition needed not only depends on flow and heat value it also depends on the type of component mixture to be combusted. There is a significant difference in flare operation between presence of Paraffines, Olefins or Aromatics. Over steaming to reduce flare visibility dramatically reduces combustion efficiency which is detrimental to the objective. Hence, speciation is necessary to be able to adjust auxiliary steam and air flow and ensure destruction and combustion efficiency.

Process gas chromatographs provide that needed speciation. Either by separating and quantifying each individual component or by applying the alternative method and grouping the various constituents according their carbon number, steam or air addition can be optimized accordingly. Analytical simplicity for ease of understanding and ease of maintenance is achieved by utilizing parallel chromatography. Furthermore, compared to traditional gas chromatography it shortens the cycle time significantly.

Siemens Flyer
March 2019

Published by
Siemens Industry, Inc.

Process Automation
Process Industries and Drives
100 Technology Drive
Alpharetta, GA 30005

1-800-964-4114
info.us@siemens.com

Subject to change without prior notice
Order No.: PIAFL-00079-0319
Printed in USA
All rights reserved
© 2019 Siemens Industry, Inc.

The technical data presented in this document is based on an actual case or on as-designed parameters, and therefore should not be relied upon for any specific application and does not constitute a performance guarantee for any projects. Actual results are dependent on variable conditions. Accordingly, Siemens does not make representations, warranties, or assurances as to the accuracy, currency or completeness of the content contained herein. If requested, we will provide specific technical data or specifications with respect to any customer's particular applications. Our company is constantly involved in engineering and development. For that reason, we reserve the right to modify, at any time, the technology and product specifications contained herein.

Continuous Speciated Monitoring On-line Process Gas Chromatograph

Utilities:	Single Carrier Gas H ₂
Control:	Instrument Air
Design:	Modular with Parallel Chromatography
Cycle times:	
H ₂	≤ 1min
N ₂	1-1.5 min
Air, C ₁ -C ₃ +	1 min
Air, C ₁ -C ₄ +	2 min
H ₂ ,N ₂ ,CO ₂ ,C ₁ -C ₅ +	3 min
H ₂ ,N ₂ ,CO ₂ ,H ₂ S,C ₁ -C ₅ +	7.5 min (Speciated Paraffin & Olefin)

Related measurements:	
H ₂ S (0-300ppm)	3 or 5 min (FPD or TCD)
Total Sulfur	3 min
Benzene	4 min

Sample Temperature:	60° C up to 110° C
Communication:	AO, Ethernet Modbus, OPC
Measuring Ranges:	up to 0-100%
Linearity:	> 99.9 over 5 Magnitudes
Repeatability:	RSD 0.2-0.6% (6 days)
Uptime:	Typical >98.5%
Validation:	Auto Validation

Sample Conditioning System (Probe, Transport, Blowback)

Design:	Traditional or Smart
Temperature:	60° C or 120° C
Auto Validation:	Typically 3 inlets

System Integration 3-sided, Cabinet, Shelter

System Monitoring Analyzer System Management

With hundreds of analyzers on flares, the MAXUM process gas chromatograph provides a proven, reliable, maintainable, and repeatable turn-key analytical flare monitoring system for satisfying the most rigorously regulatory requirements. Furthermore, assisting with in depth training enables you to support your installed measurement systems with confidence. And by having the largest dedicated analytical support group, we are able to provide expert support from remote or on site to assist you to meet regulatory compliance.

For more information, please contact:

Siemens Industry, Inc.
5980 West Sam Houston Parkway North
Suite 500
Houston, TX 77041
Phone: 713-939-7400
Email: ProcessAnalyticsSales.industry@siemens.com
usa.siemens.com/pa-environmental