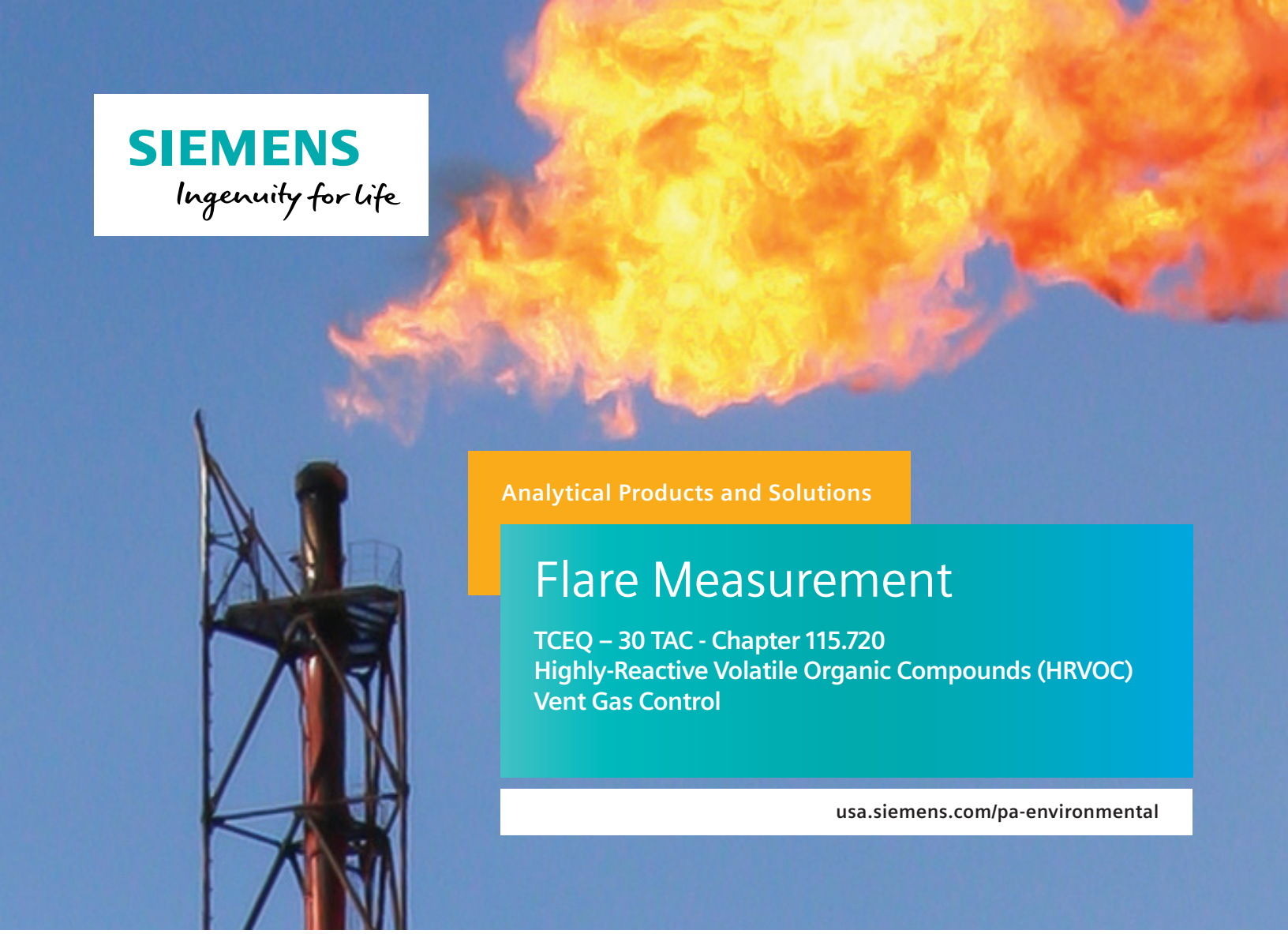

SIEMENS
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Analytical Products and Solutions

Flare Measurement

TCEQ – 30 TAC - Chapter 115.720
Highly-Reactive Volatile Organic Compounds (HRVOC)
Vent Gas Control

usa.siemens.com/pa-environmental

To reduce federal mandated ozone levels in non-attainment Houston and surrounding counties, the Texas Commission for Environmental Quality (TCEQ) implemented regulations to curb olefinic hydrocarbon emission. Elevated concentration of olefins, categorized as Highly-Reactive Volatile Organic Compounds (HRVOC), in the presence of sun light promotes higher ozone formation. One of the targeted emission sources are vents, specifically flares. Flares are a gas combustion device used to safely dispose of flammable gas released from various sources during unplanned over-pressuring of plant equipment or during plant startups and shutdowns. Flare combustion efficiency is very high, but small amounts of volatiles are released to the environment. The regulation requires the concentration measurement of defined olefin components as well as the total gas flow to quantify the consequential emission amount.

The Siemens on-line process gas chromatograph provides speciated olefin concentrations as part of an integrated turn-key measurement solution. Based on many installations implemented and utilized, its track record over the last 15 years, functionality and ability to maintain ensures you can comply with the regulation and report accurate data with confidence.

Regulation Objective:

Reduce olefin emission
- Quantification
- Minimum waste gas heat value
- Reduction of emission site cap

Focus
- Plants manufacturing or processing olefins
- Within HGB (**H**arris, **G**alveston, **B**razoria, Chambers, Fort Bend, Liberty, Montgomery and Waller Counties)

Regulatory Measurement Requirements:

- Continuous flow
- Quantification of specified olefins
- Minimum waste gas heat value

Targeted components
- Harris County: Ethylene, Propylene, 1&i-Butene, trans-2-Butene, cis-2-Butene, 1.3 Butadiene
- Surrounding Counties: Ethylene, Propylene
- Additionally, main contributing Heat Value components such as H_2, N_2, CO, CO_2, Paraffins, C5+

Sample Transport and Sample Preparation
- Minimum 60° C (non-condensing)
- 3 Validation Standards

Analytical Validation
- Individual olefins
- Main contributing heat value components

Analyzer Performance
- Continuous update ≤ 15 minutes
- Measurement system uptime >95%
- Validation according Performance Spec 9
  - Validation focus is analyzer
  - Initial 7-day drift performance test
  - Weekly validation at mid-point
  - Quarterly validation at low-, mid- and high point
  - Validation based on average of 3 consecutive analysis (≤ 5%)
  - Drift <10%/week
  - Linearity ≥99.5%

The HRVOC flare rule has specific analytical requirements. The measurement requires the interference free separation of the indicated olefins among a wide variety of components of which each can vary over wide concentration ranges. Hence the separation must be exceptional.

The Siemens MAXUM is utilizing parallel chromatography to ensure complete separation, simplicity in analytical separation setup with the additional benefit of shorter cycle time. Consequently, the cycle time of 7.5 minutes permits twice the analysis, or if necessary, the analysis of two flare feed lines sequentially. Each component's concentration can vary over the entire concentration range without impacting adjacent components. Thorough analytical testing and documentation of the design happened and has been the basis of reproducible production.

Emphasis must be given to the possible process units feeding a specific flare with waste gas. To prevent sample condensation and possible loss of olefins, waste gas boiling point ranges and possible steam condensate impacting sample transport and sample conditioning design have to be known.

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Continuous Speciated Monitoring On-line Process Gas Chromatograph

Utilities:	Carrier Gas Helium or Hydrogen Nitrogen for measurement of H_2
Control:	Instrument Air
Design:	MAXUM II or Maxum Modular
Analytics:	3 Backflush trains to TCD 4 column trains to TCD with direct measurement of H_2
Measuring Ranges:	0-100% (0-20% / 0-100% for H_2)
Minimum Sensitivity:	100-200 ppm (component dependent) 0.5% /100ppm for H_2
Linearity:	$>10^3$
Repeatability:	+/- 1% (+/-2% for CO, +/- 3% for H_20)
Cycle Time:	7.5 min.
Related Measurements:	H_2S, Benzene, C5+ speciation
Sample Temperature:	Typical 60° C from heated sample cabinet
Communication:	AO, Ethernet Modbus, OPC
Uptime:	Typical > 98.5%
Validation:	Auto Validation for min. 3 external vapor standards

Sample Conditioning System (Probe, Transport, Blowback)

Design:	Traditional or Smart
Temperature:	Typical 60° C (max 120° C)
Validation:	Auto, typical 3 inlets
System Integration	3-sided, Cabinet, Shelter
System Monitoring	Analyzer System Management

With more than a hundred of analyzer measurement systems on petrochemical flares, the MAXUM process gas chromatograph and Siemens sample system provide proven, reliable, maintainable, and repeatable turn-key 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 can provide expert support from remote or on site to assist you to meet regulatory compliance.

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