

The background of the entire page is a photograph of an industrial facility, likely a refinery or chemical plant, during a bright sunset or sunrise. The sky is a deep orange and yellow. In the foreground, there are silhouettes of industrial structures, including a tall distillation column on the right and a flare stack on the left with a bright flame. The Siemens logo is in the top left corner.

**SIEMENS**

*Ingenuity for life*

Analytical Products and Solutions

Meet  $\text{Ja}$ ,  $\text{H}_2\text{S}$ , and BTU flare regulations while reducing your total cost of ownership

Maxum Flare Compliance Analyzer

[usa.siemens.com/analyticalproducts](http://usa.siemens.com/analyticalproducts)

As environmental regulations for flare emissions become more stringent, companies are facing immense investment and development challenges. Siemens understands that you may be searching for economical solutions to meet these objectives. The Siemens Maxum Flare Compliance Analyzer, with the industry-proven Maxum Analyzer and Siemens service built in, helps you to meet regulatory requirements and lower your total cost of ownership by providing key flare regulation results in a single analyzer.

Facilities affected by these provisions must determine Sulfur Dioxide (SO<sub>2</sub>) emissions from their flares. Additionally, Hydrogen Sulfide (H<sub>2</sub>S) determinations are required in order to limit the short-term concentration of H<sub>2</sub>S in the fuel gas sent to flares. Finally, rules regarding minimum BTU to the flare and determination of net heating value are now established.

Based on the published regulations, discussions with government regulators, and input from the refineries required to implement these regulations, the Process Analytics division of Siemens Industry, Inc. has defined an analytical system for the online and automatic measurement of the fuel gas to flares.

**Regulation Basis: Total Sulfur, Hydrogen Sulfide, Net Heating Value**

**40CFR60 subpart Ja – Total Sulfur**

On June 1, 2012, the Environmental Protection Agency issued final amendments to the new source performance standards (NSPS) for process heaters and flares at petroleum refineries. With these final amendments, EPA is lifting the stay of effectiveness of the process heater and flare requirements in these standards. For flares, the provisions apply to flares which commence construction, modification or reconstruction after June 24, 2008.

For flares, EPA is establishing a suite of standards that include work practice standards and monitoring requirements. As part of the Ja regulations, flare gas Total Sulfur determinations are required. (Flares that are configured such that they only receive inherently low Sulfur gas streams do not require continuous sulfur monitors. Other monitoring options may be available in certain circumstances.)

For modified flares, the flare management plan must be developed and implemented by no later than THREE YEARS FROM DATE OF PUBLICATION IN THE FEDERAL REGISTER or upon startup of the modified flare, whichever is later.

**40CFR60 subpart Ja – Hydrogen Sulfide**

Rather than eliminate the H<sub>2</sub>S concentration limit altogether, EPA is instead requiring that refineries limit the short-term concentration of H<sub>2</sub>S to 162 ppmv in the fuel gas sent to flares during normal operating conditions. The span value for this measurement is 300 ppmv H<sub>2</sub>S.

Alternatively, EPA has provided for the use of Total Sulfur monitors, provided the monitor can also meet the 300 ppmv span requirement. As the H<sub>2</sub>S concentration will always be less than the total reduced sulfur concentration, it is acceptable to

use the Total Sulfur monitor to verify that the fuel gas does not exceed the short-term H<sub>2</sub>S concentration. The owner or operator using this method must be able to demonstrate they can achieve a 162 ppmv total reduced sulfur concentration in the fuel gas.

Therefore, owners or operators of affected flares may use the direct output of a Total Sulfur monitor to assess compliance with the short-term 162 ppmv H<sub>2</sub>S concentration in the fuel gas, or they must install a continuous H<sub>2</sub>S monitor. The owner or operator of a flare may use the instrument required for Total Sulfur if the instrument has a dual span capable of accurately measuring concentrations between 20 and 300 ppmv. The Maxum Flare Compliance Analyzer has a Low Range of 5 – 300 ppm.

**40CFR60.18 – Net heating value**

The following is taken from 40CFR60.18(c)(3)(ii): "Flares shall be used only with the net heating value of the gas being combusted being 300 Btu/scf or greater if the flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 200 Btu/scf or greater if the flare is non-assisted."

**Maxum Flare Compliance Analyzer**

The Maxum Flare Compliance Analyzer is built around a proven process gas chromatograph – the Maxum edition II. Since the Maxum Flare Compliance Analyzer is built upon the Maxum Analyzer, spare parts, training, service, and support are identical as well. The system is designed and certified to meet hazardous areas for Class 1 Div 2 as well as Class 1 Div 1 and ATEX Zone 1 with purge. The Maxum Flare Compliance Analyzer is available with either airbath or airless ovens, and is single stream in order to accommodate EPA analysis requirements. The analyzer comes in 2 available options:

	Total Sulfur Range 1	Total Sulfur Range 2	Total Sulfur Range 3	H <sub>2</sub> S (as Total Sulfur) Range	Net Heating Value (BTU)
Option 1	5-300ppm	200ppm – 1.2%	None	5-300ppm	C5+
Option 2	10-600ppm	450ppm – 2%	1.5– 50%	None	C3+

Siemens offers several other configurations to meet customer needs, depending on emissions to be measured and desired limits of analyzer complexity.

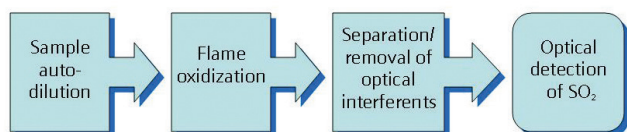
**Total Sulfur - Technology basis and description**

For Total Sulfur determination, the Maxum Flare Compliance Analyzer uses a vapor sample valve to deliver the sample to the burner. A Flame Photometric Detector then measures the resulting SO<sub>2</sub>. The sample amount introduced to the burner is matched to the analyzer operational requirements. To achieve a

specific sample dilution, the carrier flow that pushes the sample into the burner is adjusted for either range. The measuring range is determined and automatically controlled using software.

The response time for local calibration (i.e. introducing the calibration sample at the sample conditioning system) is a maximum of two cycles. The cycle time to results is 4 minutes. Minimum quantifiable levels are 5ppm. Extensive field beta evaluation and installed analyzer systems have proven efficacy, including linearity, stability, and repeatability.

**The methodology used by the Maxum Flare Compliance Analyzer for Total Sulfur determination is simple and fundamental:**



The Maxum Flare Compliance Analyzer relies on a fundamental method for total sulfur determination:

**Sample dilution -> Oxidation (via FID burn) to SO<sub>2</sub> -> Simple chromatography to separate SO<sub>2</sub> from any possible interferents -> Detection with FPD (i.e. optically).**

Using the same Maxum Analyzer as the BTU and H<sub>2</sub>S (as Total Sulfur) measurement, the Total Sulfur determination is accomplished with a single photomultiplier tube (PMT) and power supply to cover the entire Total Sulfur span requirement.

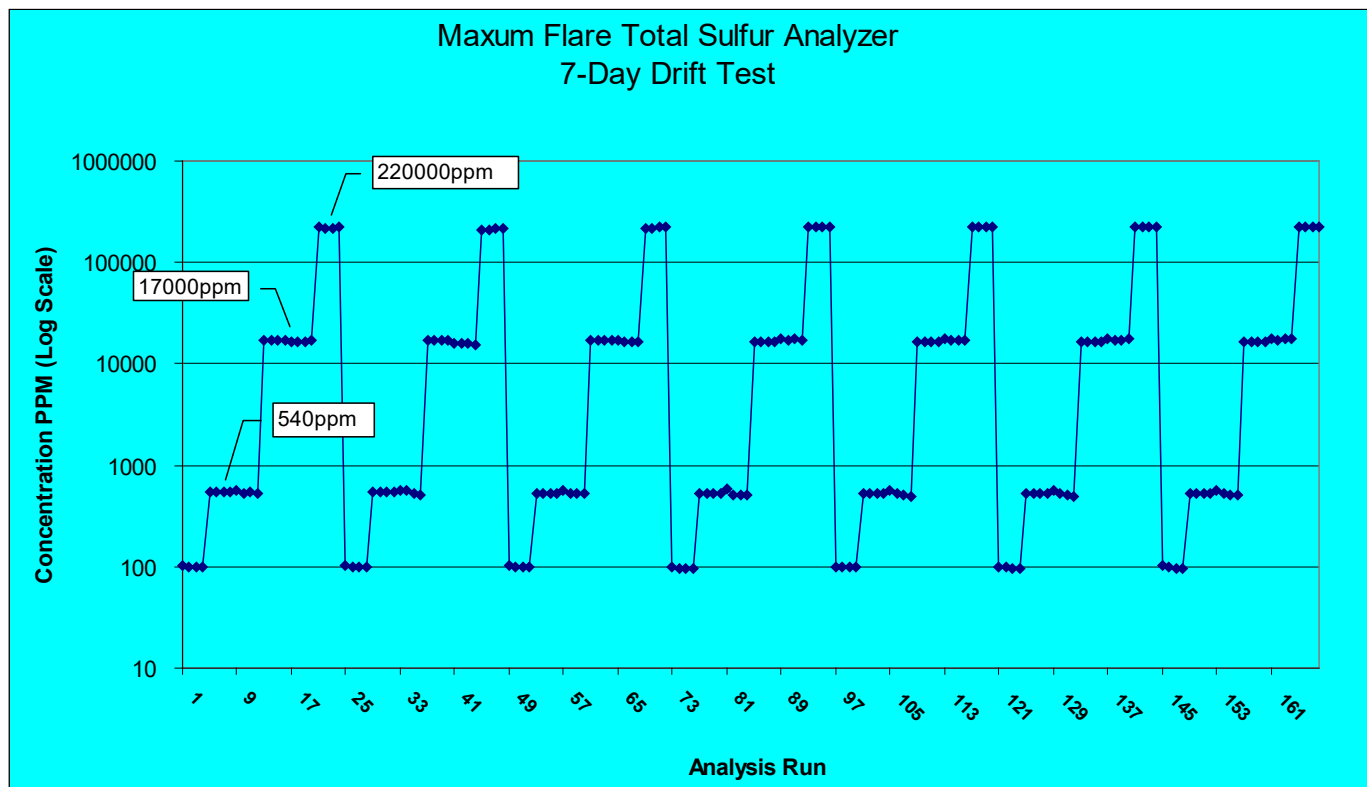
The unique, variable sample dilution scheme is based on a single sample valve and provides the separation of SO<sub>2</sub> from all possible optical interferents and signal quenching prior to optical detection.

The span value should be determined based on the maximum sulfur content of gas that can be discharged to the flare (e.g., roughly 1.1 to 1.3 times the maximum anticipated sulfur concentration), but may be no less than 5,000 ppmv. For units that use the Total Sulfur analyzer both to assess compliance with the short-term 162 ppmv H<sub>2</sub>S concentration requirement for the fuel gas and to assess excursions of the SO<sub>2</sub> root cause analysis threshold of 500 lb in any 24-hour period, a dual range monitor is necessary. The Maxum Flare Compliance Analyzer meets these requirements.

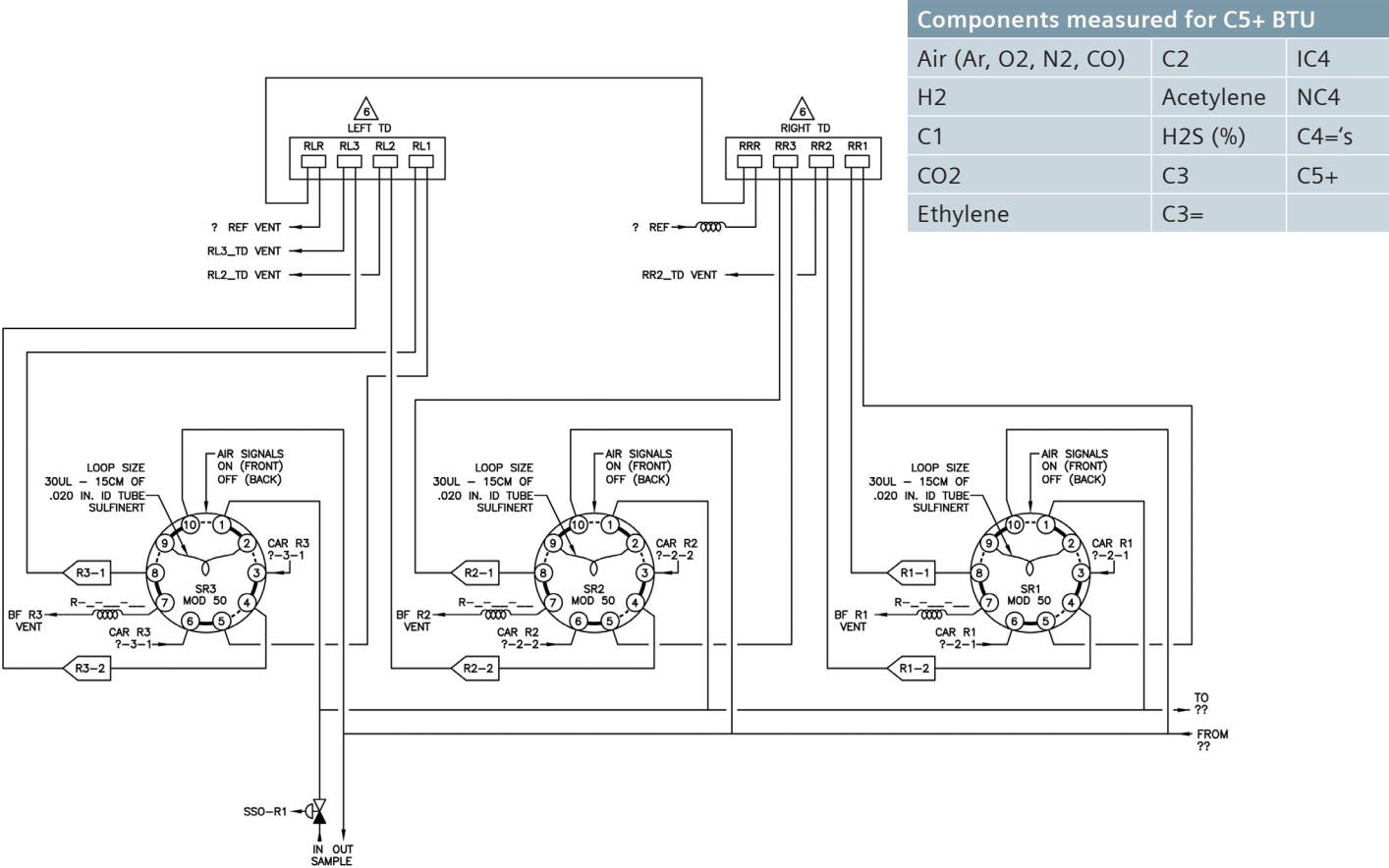
## Net Heating Value – Technology basis and description

The Maxum Flare Compliance Analyzer includes the portion of the system that separates and detects organic and inorganic analytes and generates an output proportional to the gas concentration as necessary for calculating Net Heating Value (NHV) to meet 40CFR60.18.

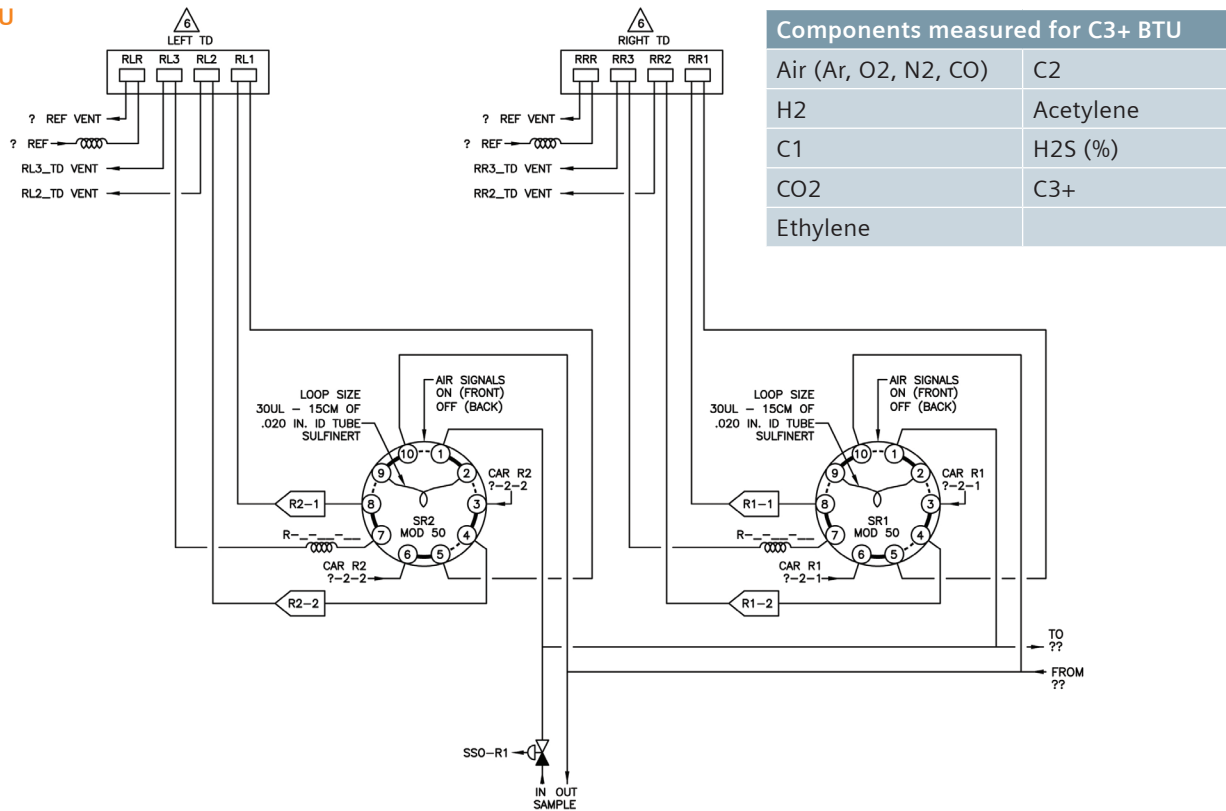
The analytical columns and detection system chosen are capable of separating the analytes of interest. On-board software and electronics allow the analyzer to quantify the area under a particular sample peak generated by the analyzer. Data recording is accomplished using an on-board computer capable of recording all readings within the instrument's calibration range.



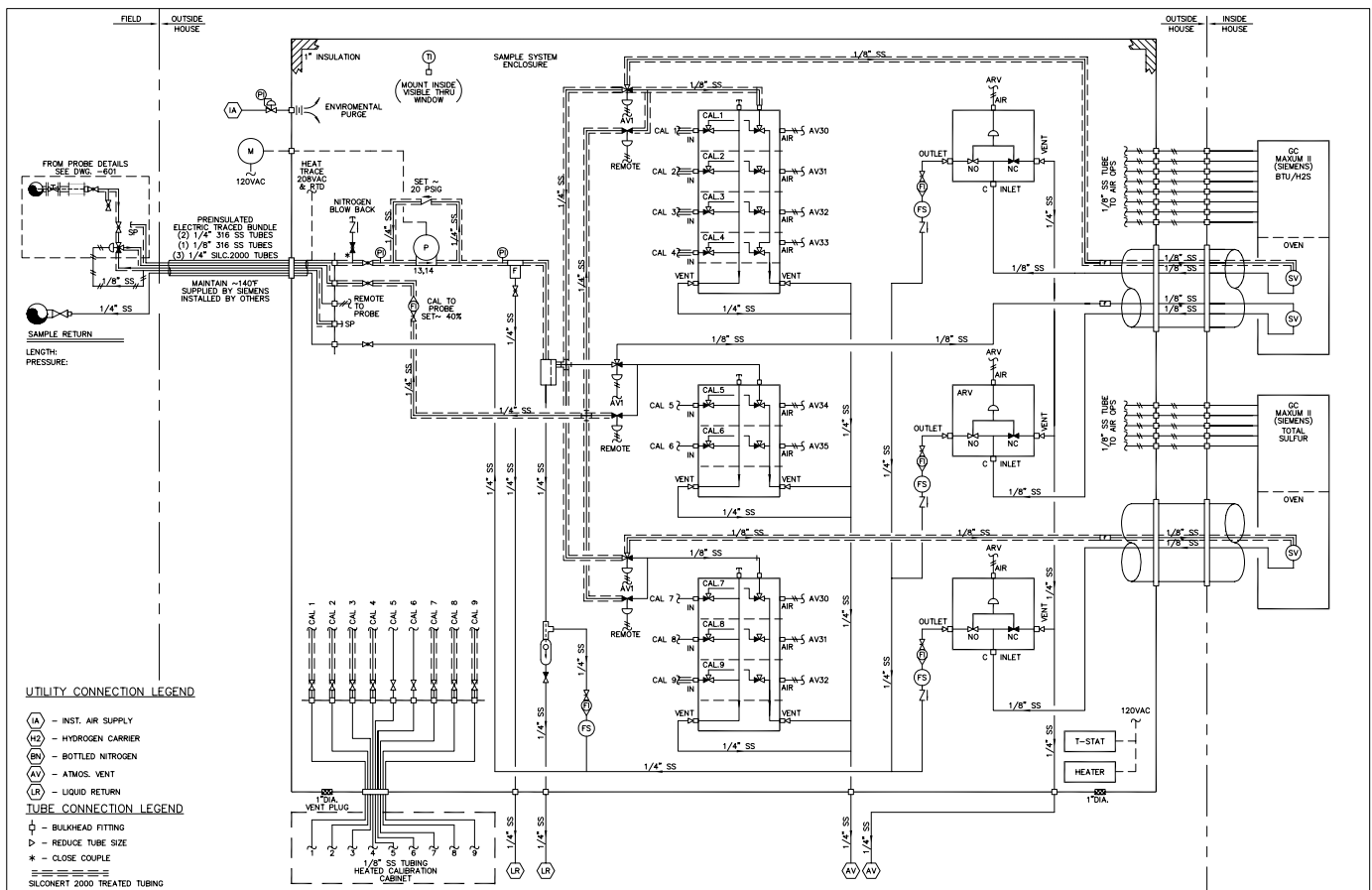
Option 1: C5+ BTU



Option 2: C3+ BTU



## Example Sample Conditioning System for Maxum Flare Compliance Analyzer



## Installation and measurement location recommendations

The Maxum Flare Compliance Analyzer should be installed in a location where the measurements are representative of the source emissions. Other factors should be considered, such as ease of access for calibration and maintenance purposes. The preferred sampling location would be at least two equivalent duct diameters downstream from the nearest control device, point of pollutant generation, or other point at which a change in the pollutant concentration or emission rate occurs. The location should not be close to air in-leakages. The location should be at least 0.5 diameters upstream from the exhaust or control device. To calculate equivalent duct diameter, see Section 12.2 of Method 1 (40 CFR Part 60, Appendix A).

## Total Cost of Ownership

Siemens reduces your total cost of ownership (TCO) by addressing the utility and maintenance costs of long-term monitoring. We optimize our designs for multiple stream sample conditioning systems. We ensure that they efficiently use analyzer utilities (air and power) while delivering outstanding analyzer measurement density per footprint. The Maxum Flare Compliance Analyzer is capable of operation using our unique airless oven technology. We further reduce your TCO by improving such critical areas as system installation, project execution, project costing, single-point responsibility, and

factory acceptance test inspection. As with other regulatory measurements, Maxum reliability performance easily satisfies the 95% uptime requirement (18 days per year of allowable downtime, cumulative). Additionally, we optimize TCO by deploying well-designed sample conditioning systems, stable applications with proven analyzers, and proven hardware. We minimize significant analytical hardware or application adjustments by controlling analysis drift, relying on automated calibration and validation when appropriate, using monitoring parameters to predict failure, and including standardized GC separation systems for quick and easy maintenance.



Turnkey packages are becoming the standard for environmental monitoring, as the same application is frequently required in different plant sectors and taking this approach can reduce overhead on implementation and support. Furthermore, turnkey systems help to minimize the risk of technical problems associated with regulation monitoring. Siemens uses its wealth

### Typical Probe for Ja



## Customer Service

Siemens offers field-proven approaches for process instrumentation and analytics support from a single source, providing you with development continuity and a high level of security. We recognize that plants must function reliably at all times. Efficient and effective process instrumentation and analytics are an indispensable prerequisite for this, but you also need to be certain of fast and competent service from your supplier. Siemens is a global company that reacts locally. Our specialists are available whether you require consulting or quick delivery and installation of new devices. Our online support system provides a 24 hour/365 days free technical hot line with a response time of less than 30 minutes. Our services include:

- 25+ field service technicians across the US
- Remote support via www for fast troubleshooting assistance
- Maintenance service and support contracts
- Training on-site or at our central location
- 24 hours/365 days spare parts delivery
- Installation, testing and commissioning
- Comprehensive global after-sales service

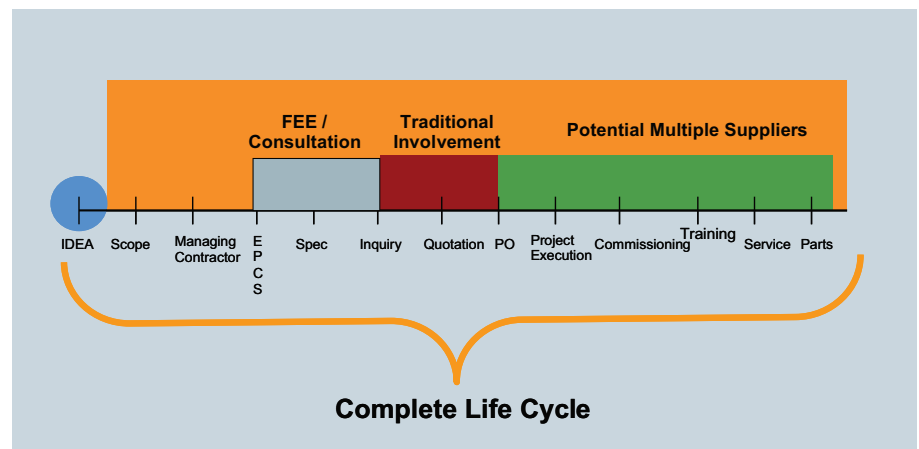
The Siemens FEED program reduces project cost and schedule times by:

- Optimizing system configuration for specific site requirements
- Completing definition and specification of monitoring system requirements to eliminate delays
- Assuring advantages of duplicate design for all similar systems
- Ensuring timely delivery of information that is required for submittal of test and quality-assurance plans
- Defining complete installation requirements up front
- From FEES to FEED to Solution, customers choose when to proceed
- Assessment, best measurement solution, predictable schedule, predictable budget

## Front End Engineering Design (FEED)

For an optimum, cost effective and functional analyzer system solution, one should involve the analyzer vendor with their comprehensive analyzer and system knowledge expertise early on and consider life-cycle cost such as utilities, maintenance and simplicity when deciding technology, system solution and life-cycle support.

This diagram depicts how the Siemens FEED approach compares to traditional approaches between the vendor and customer interaction.



To find out how you can meet regulatory requirements economically, contact your local account manager.

**For more information, please contact:**

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