Ethylene is the largest volume industrially produced organic material and its majority is used in the production of polymers and derivatives. Between a variety of processes the thermal cracking of hydrocarbons in the presence of steam (steam cracker) is mostly used. Regardless of the process type, all plants require process analytical equipment to collect reliable and accurate process data for process control, product quality, and plant safety.

Siemens, a leader in process analytical instrumentation, has proven over decades its capability to plan, engineer, manufacture, implement and service analyzer systems for use in ethylene plants worldwide. This case study provides an overview of the steam cracking process and describes how Siemens, with its outstanding analyzer technology, application know-how and system integration expertise can provide remarkable user benefits.

Current worldwide production is about 95 MM tons/year and is projected to increase for the foreseeable future. A typical modern plant produces in excess of 800,000 tons/year. Feedstock to ethylene plants ranges from light Ethane/Propane mix to heavy naphta and vacuum gas oils. Most plants are designed with raw material flexibility in mind. Majority of ethylene produced is used in the production of polymers and ethylene derivatives such as ethylene oxide and glycol. A typical ethylene plant also makes a number of other important chemicals such as propylene, butadiene and pyrolysis gasoline.

In the past years, Ethylene plants have evolved into highly integrated, highly flexible processing systems that can profitably adjust to changing raw material availability and market demands for Olefins products. Advanced process control technologies are used in Olefins plants and have greatly improved products quality, plant efficiency and resulted in quick payback of the investment.

Typical process features of an ethylene process are short residence time in the furnace, high selectivity, feedstock flexibility, operational reliability and safety, easy start-up, and energy efficiency.

Process analytics is a key issue for process control by online monitoring the various process streams in ethylene and propylene production. Process analytics maximizes yields and ensures product quality specifications.
Ethylene
Ethylene, H₂C=CH₂, is the lightest olefin. It is a colorless, flammable gas, which is produced mainly from petroleum-based feedstocks by thermal cracking in the presence of steam. Ethylene has almost no direct end uses but acts almost exclusively as an intermediate in the manufacture of other chemicals, especially plastics.

Ethylene may be polymerized directly to produce polyethylene, the world’s most widely used plastic. Ethylene can also be chlorinated to produce 1,2-dichloroethane, a precursor to the plastic polyvinyl chloride, or combined with benzene to produce ethylbenzene, which is used in the manufacture of polystyrene, another important plastic. Smaller amounts of ethylene are oxidized to produce chemicals including ethylene oxide, ethanol, and polyvinyl acetate.

Ethylene quality depends on users requirements in downstream processes. No single chemical grade ethylene exists, but ethylene content normally exceeds 99.7%. Sulfur, oxygen, acetylene, hydrogen, carbon monoxide and carbon dioxide are the most troublesome impurities that must be controlled carefully.

Raw materials
Various feedstocks (liquid and gaseous) are used for the production of ethylene. The principal feedstocks are napthas, a mixture of hydrocarbons in the boiling range of 30 to 200°C. Depending on the origin, naptha composition and quality can vary over a wide range requiring quality control of the feed mixtures. Preferably in the US and the middle east light feedstocks (natural gas, ethane, propane, butan) are used. Gas oils (crude oil fractions) are also gaining importance as feedstocks in some areas of the world.

Chemical analysis of the feedstock is important to ensure the required product specification and even more when the production is based on varying feedstocks.

Production
The bulk of the worldwide production is based on thermal cracking with steam. The process is called pyrolysis or steam cracking. Production can be split into four sections (Fig. 1): The first three sections are more or less identical for all commercial processes, with the exception that primary fractionation is required only in case of a liquid feedstock.

A large variety of process routes, however, exist for the hydrocarbon fractionation section.

A hydrocarbon feed stream is preheated, mixed with steam and further heated to 500 to 700°C. The stream enters a fired tubular reactor (known as cracker, cracking heater), where under controlled conditions the feedstock is cracked at 800 to 850°C into smaller molecules within a residence time of 0.1 to 0.5 s. After leaving the radiant coils of the furnace, the product mixtures are cooled down instantaneously in transfer line exchangers (TLE) to preserve the gas composition. This quenching time is a crucial measure for severity control of the final products.

The steam dilution lowers the hydrocarbon pressure, thereby enhancing the olefin yield and reducing the tendency to form and deposit coke in the tubes of the furnace and coolers. For details of the process steps, see Fig. 2 to 5. Cracking furnaces (capacity of modern units up to 150,000 tons/year) represent the largest energy consumer in an ethylene plant.

Other processes for ethylene production besides conventional thermal cracking include:

- Recovery from Fluid Catalytic Cracking (FFC) offgas
- Fluidized-bed cracking
- Catalytic pyrolysis
- Membrane reactor
- e.a.
Ethylene production

Feed Cracking
Pyrolysis furnace
The hydrocarbon molecules of the feedstock are cracked in the furnace (Fig. 2) in the presence of a catalyst at high temperatures. Typically more than ten furnaces are used in a single ethylene plant. Most feedstocks are naphta or a mixture of ethane and methane. The feed is mixed (diluted) with steam to minimize the side reaction of forming coke and to improve selectivity to produce the desired olefins by lowering hydrocarbon partial pressure. Cracking is an endothermic reaction with heat supplied by side-wall or floor burners or a combination of both, which use gaseous and/or liquid fuels.

The fundamental parameters of cracking furnaces are temperature and temperature profile, residence time of the gas during cracking, and partial pressure.

Transfer Line Exchanger
The reaction mixture exiting the radiant coil of the furnace contains a large spectrum of hydrocarbons. It is instantaneously cooled in quench coolers called transfer line exchangers (Fig. 2) to preserve the gas composition. Valuable high pressure steam is generated from the cracked gas during this process.

Cracked Gas Processing
Further processing of cracked gas, i.e. separation into the desired products or fractions, can be performed in many different sequences that depend on the feedstock type and the number and specification of the plant products. Many options are available with different plant designs for cracked gas derived from gaseous or liquid feedstocks. For example: With pure ethane as feedstock, the amount of C3 and heavier byproducts is small and their recovery is not economically feasible, or a significant content of propane in the feedstock makes a depropanizer necessary and butane feeds requires oil and gasoline removal from the cracked gas.

Therefore, plants will differ from each other and the following flow diagrams show only exemplary solutions!

Table 1: Process analysis data (selection) in the feed and furnace section

<table>
<thead>
<tr>
<th>Sampling point</th>
<th>Sampling stream</th>
<th>Measuring Component</th>
<th>Measuring Range</th>
<th>Measuring Task</th>
<th>Analyzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Fresh feed</td>
<td>C1, C2, C3, C4+</td>
<td>% range</td>
<td>Feed composition</td>
<td>MAXUM</td>
</tr>
<tr>
<td>1.2</td>
<td>Mixed feed (Fresh + recycle)</td>
<td>C1, C2, C3, C4+</td>
<td>% range</td>
<td>Feed composition</td>
<td>MAXUM or MicroSAM</td>
</tr>
<tr>
<td>1.3</td>
<td>Fuel gas to furnaces</td>
<td>N2, H2, C1, C2, C3, C4+</td>
<td>% range</td>
<td>BTU firing rate control</td>
<td>MAXUM or MicroSAM</td>
</tr>
<tr>
<td>1.4</td>
<td>Furnace convection section</td>
<td>O2</td>
<td>0 ... 8 %</td>
<td>Cracking control</td>
<td>ZrO2 probe</td>
</tr>
<tr>
<td>1.5</td>
<td>Cracked gas at TLE exit</td>
<td>CO, NO (NOx)</td>
<td>0 ... 200 ppm, 0 ... 250 ppm, 0 ... 8 ppm</td>
<td>Cracking control</td>
<td>ULTRAMAT 23</td>
</tr>
<tr>
<td>1.6</td>
<td>Boiler combustion control</td>
<td>O2</td>
<td>0 ... 10 %</td>
<td>Emission control</td>
<td>ZrO2 probe</td>
</tr>
<tr>
<td>1.7</td>
<td>Stack of steam boiler</td>
<td>CO, NOx, SO2, O2</td>
<td>0 ... 0.5 %, 0 ... 0.1 %, 0 ... 10 %</td>
<td>Emission control</td>
<td>ULTRAMAT 6</td>
</tr>
<tr>
<td>1.8</td>
<td>Flue gas from furnace</td>
<td>CO, NOx, SO2, O2</td>
<td>In compliance with regulations</td>
<td>Emission control</td>
<td>ULTRAMAT 6</td>
</tr>
</tbody>
</table>

Fig. 2: Feed and furnace section
Gasoline Fractionator

Heavy fuel oils cuts are separated from the bulk of the effluent stream in the gasoline fractionator (Fig. 3) by direct contact with circulating pyrolysis oil. Function is to make a sharp separation between the heavy oil fraction from the gasoline and lighter fractions. The gasoline fractionator is only used in case of a liquid feedstock (naptha).

Quench tower

Further cooling is performed in the quench tower (Fig. 3) by circulating water streams to minimize any further cracking. The quench tower operates as a partial condenser for the fractionator, condensing practically all of the steam and most of the pyrolysis gasoline components. In some designs, the gasoline fractionator and the quench tower are combined into one single structure.

Compression train

The gas from the quench tower is then compressed in a 4 or 5 stage compressor train (Fig. 4) to an optimum pressure for separating it into various components. Water and hydrocarbons are separated between stages and recycled. Acid gases (CO₂ and H₂S) are removed after the 3rd or 4th compression stage by scrubbing them with a dilute caustic soda solution. In case of higher sulfur content a separate gas removal system is used.

Refrigeration train

The pyrolysis gas is then partially condensed over the stages of a refrigeration system to about -165°C, where only the hydrogen remains in the vapor stage. The stage condensates are fed to the demethanizer while hydrogen is withdrawn from the lowest temperature separator.

Demethanizer

The DeEthanizer produces C₂ hydrocarbons as overhead (acetylene, ethane and ethylene) and C₃ and heavier hydrocarbons as bottoms.
Acetylene hydrogenation
The DeEthanizer overhead is heated and hydrogen is added to convert acetylene to ethylene and ethane (hyrogenation). The effluent contains less than 1 ppm of acetylene, and traces of methane and hydrogen.

Ethylene fractionator (C2 splitter)
After acetylene removal, the dried gas enters an ethylene-ethane separator (ethylene fractionator or C2 splitter). Ethylene product is gained here while ethane being recycled.

DePropanizer
The condensate stripper and the DeEthanizer bottoms are both processed in the DePropanizer for a sharp separation of C3 hydrocarbons as overheads and C4+ as bottoms.

Propylene fractionator (C3 splitter)
The overhead of the DePropanizer is sent to the propylene fractionator (C3 splitter) for further processing.

DeButanizer
The DePropanizer bottoms are further processed in the DeButanizer for separation of C4 product from light gasoline.

---

**Sampling point**  
**Sampling stream**  
**Measuring Component**  
**Measuring Range**  
**Measuring Task**  
**Analyzer**

<table>
<thead>
<tr>
<th>Sampling point</th>
<th>Measuring Component</th>
<th>Measuring Range</th>
<th>Measuring Task</th>
<th>Analyzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Hydrogen rich tailgas</td>
<td>H₂, N₂, C₁, C₂, C₃, CO</td>
<td>% range</td>
<td>Tail gas composition</td>
</tr>
<tr>
<td>4.2</td>
<td>Methane rich tailgas</td>
<td>H₂, N₂, C₁, C₂, C₃, CO</td>
<td>% range</td>
<td>Tail gas composition</td>
</tr>
<tr>
<td>4.3</td>
<td>DeMethanizer bottoms</td>
<td>C₂/C₃=</td>
<td>% range</td>
<td>Process control</td>
</tr>
<tr>
<td>4.4</td>
<td>DeEthanizer bottoms</td>
<td>C₂/C₃=</td>
<td>% range</td>
<td>Process control</td>
</tr>
<tr>
<td>4.5</td>
<td>DeEthanizer overhead</td>
<td>C₁=</td>
<td>C₂</td>
<td>ppm</td>
</tr>
<tr>
<td>4.6</td>
<td>C2 split bottoms</td>
<td>C₂=, C₃=</td>
<td>% range</td>
<td>Process control</td>
</tr>
<tr>
<td>4.7</td>
<td>Ethylene product</td>
<td>C₂, C₃, C₄, CO, CO₂, NH₃, MeOH, PrOH, Carbonyl</td>
<td>0 ... 300/10/1000 ppm</td>
<td>Product quality</td>
</tr>
<tr>
<td>4.8</td>
<td>To DeButanizer</td>
<td>C₁, C₂, C₃, CO, CO₂, NH₃, MeOH, PrOH, Carbonyl</td>
<td>0 ... 1000/10/1000 ppm</td>
<td>Process control</td>
</tr>
<tr>
<td>4.9</td>
<td>DePropanizer overhead</td>
<td>C₂, C₃=, C₄, C₅=</td>
<td>% range</td>
<td>Process control</td>
</tr>
<tr>
<td>4.10</td>
<td>C3 split bottoms Propylene product</td>
<td>C₃, C₄, C₅, Propadiene (PD), Propine (MA)</td>
<td>% range</td>
<td>Product quality</td>
</tr>
<tr>
<td>4.11</td>
<td>Buten-1 product</td>
<td>C₂, C₃, C₄, C₅, C₆=</td>
<td>0 ... 500/100/3000 ppm</td>
<td>Process control</td>
</tr>
</tbody>
</table>

Table 3: Process analysis data (selection) in the hydrocarbon separation section

**Fig. 5: Hydrocarbon separation section**
Process analyzer application

Process optimization
Process optimization is critical for ethylene production because cracking reactions change as the run proceeds. Operation costs are high and, therefore, process control including online analyzers providing almost realtime process information has reached a very high level of importance. Models for different kinds of feedstocks have been developped to optimize production of certain amounts of ethylene, propylene and other products at maximum profit even with changing of feedstock quality or type.

Process analyzer tasks
Process analytical equipment is an indispensable part of any ethylene plant because it provides the operator and the control system with key data from the process and its environment.

Four major applications
Analyzer applications can be divided in four groups depending on how and where the analyzer data are used:

- Closed-loop control for process and product optimization
  This application helps to increase yield, reduce energy consumption, achieve smooth operation, and keep product quality according to the specification
- Quality control and documentation
  for ISO compliance
- Plant monitoring and alarms
  This application protects personnel and plant from possible hazard from toxic or explosive substances
- Environmental control
  This application helps to keep air and water emission levels in compliance with official regulations.

Analyzers and sampling points
More than 100 analyzers of different types are used in an ethylene plant ranging from simple sensor type monitors to high technology process gas chromatographs. The list typically includes:
- Process gas chromatographs
- Continuous gas analyzers (paramagnetic oxygen analyzers, NDIR analyzers, total hydrocarbon content analyzers)
- Analyzers for moisture and O₂ traces
- Low Explosion Level (LEL) analyzers
- Liquid analyzers for pH, conductivity, etc.

Analyzer installations
Analyzers are installed partially in the field close to the sampling location and/or in an analyzer house (shelter). In modern plants most of the analyzers are interfaced to a plant wide data communication system for direct data transfer from and to the analyzers. The total number of analyzers installed in a plant varies from plant to plant depending on the type of process, individual plant conditions and user requirements.

Safety and environmental impacts
Ethylene plants require special measures for protection of personnel and the environment. Despite national regulations, the following measures are considered as standard worldwide for any plant:
- Flue gas emission control
  NOx emissions are limited by use of Low NOx burners and/or integrated SCR technology for catalytic reduction. NOx limits are, in some regions, down to < 50 ppm.
- Particulate emission during the decoking process is reduced by either incineration or appropriate filter technology.
- Fugitive emissions and VOC control
- Explosion protection

Areas where inflammable substances in sufficient quantity can get in contact to oxygen (air) become a hazardous area. In this case, measures are necessary to exclude the danger of ignition.
- Water protection
  Liquid emission of the plant mainly results from quench water, dilution steam, caustic-stripping (acid gas removal) liquid and decoking water. These streams are treated properly before being fed to the wastewater plant.
- Waste disposal
  An ethylene plant produces a variety of waste materials that have to be treated according to the relevant regulations for disposal.

LEL Analyzers
Mixtures of combustible substances and air or oxygen are explosive in certain concentration ranges. For each concentration mixture, low (LEL) and high (HEL) explosion limits are specified that depend on the temperature and pressure of the gas. Special gas detectors are used to monitor substances such as hydrogen, ethylene, propylene, CO and O₂ to prevent the atmosphere inside or outside the analyzer house from reaching the LEL.

Gas detectors are typically part of the safeguarding system of the analyzer house to minimize the exposure of personnel to flammable or toxic hazards.

Associated operations
A number of associated plant units and processes with the need of using process analyzers are required to run an ethylene plant, including e.g.
- Furnace decoking
- Flue gas emission control
- Flue gas cleaning
- Air separation
- Waste water treatment
- Waste incineration
- Explosion warning
Siemens Process Analytics
Siemens Process Analytics is a leading provider of process analyzers and process analysis systems. We offer our global customers the best solutions for their applications based on innovative analysis technologies, customized system engineering, sound knowledge of customer applications and professional support. And with Totally Integrated Automation (TIA). Siemens Process Analytics is your qualified partner for efficient solutions that integrate process analyzers into automation systems in the process industry.

From demanding analysis tasks in the chemical, oil & gas and petrochemical industry to combustion control in power plants to emission monitoring at waste incineration plants, the highly accurate and reliable Siemens gas chromatographs and continuous analyzers will always do the job.

Siemens Process Analytics offers a wide and innovative portfolio designed to meet all user requirements for comprehensive products and solutions.

Our Products
The product line of Siemens Process Analytics comprises extractive and in-situ continuous gas analyzers (fig. 6 to 9), process gas chromatographs (fig. 10 to 13), sampling systems and auxiliary equipment. Analyzers and chromatographs are available in different versions for rack or field mounting, explosion protection, corrosion resistant etc.

A flexible networking concept allows interfacing to DCS and maintenance stations via 4 to 20 mA, PROFIBUS, Modbus, OPC or industrial ethernet.

Extractive Continuous Gas Analyzers (CGA)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULTRAMAT 23</td>
<td>The ULTRAMAT 23 is a cost-effective multi-component analyser for the measurement of up to 3 infrared sensitive gases (NDIR principle) plus oxygen (electrochemical cell). The ULTRAMAT 23 is suitable for a wide range of standard applications. Calibration using ambient air eliminates the need of expensive calibration gases.</td>
</tr>
<tr>
<td>CALOMAT 6/62</td>
<td>The CALOMAT 6 uses the thermal conductivity detection (TCD) method to measure the concentration of certain process gases, preferably hydrogen. The CALOMAT 62 applies the TCD method as well and is specially designed for use in application with corrosive gases such as chlorine.</td>
</tr>
<tr>
<td>OXYMAT 6/61/64</td>
<td>The OXYMAT 6 uses the paramagnetic measuring method and can be used in applications for process control, emission monitoring and quality assurance. Due to its ultrafast response, the OXYMAT 6 is perfect for monitoring safety-relevant plants. The corrosion-proof design allows analysis in the presence of highly corrosive gases. The OXYMAT 61 is a low-cost oxygen analyzer for standard applications. The OXYMAT 64 is a gas analyzer based on ZrO2 technology to measure smallest oxygen concentrations in pure gas applications.</td>
</tr>
<tr>
<td>ULTRAMAT 6</td>
<td>The ULTRAMAT 6 uses the NDIR measuring principle and can be used in all applications from emission monitoring to process control even in the presence of highly corrosive gases. ULTRAMAT 6 is able to measure up to 4 infrared sensitive components in a single unit.</td>
</tr>
<tr>
<td>ULTRAMAT 6 / OXYMAT 6</td>
<td>Both analyzer benches can be combined in one housing to form a multi-component device for measuring up to two IR components and oxygen.</td>
</tr>
<tr>
<td>FIDAMAT 6</td>
<td>The FIDAMAT 6 measures the total hydrocarbon content in air or even in high-boiling gas mixtures. It covers nearly all requirements, from trace hydrocarbon detection in pure gases to measurement of high hydrocarbon concentrations, even in the presence of corrosive gases.</td>
</tr>
</tbody>
</table>

In-situ Continuous Gas Analyzer (CGA)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDS 6</td>
<td>LDS 6 is a high-performance in-situ process gas analyzer. The measurement (through the sensor) occurs directly in the process stream, no extractive sample line is required. The central unit is separated from the sensor by using fiber optics. Measurements are carried out in real-time. This enables a proactive control of dynamic processes and allows fast, cost-saving corrections.</td>
</tr>
</tbody>
</table>

Fig. 6: Series 6 gas analyzer (rack design)
Fig. 8: Series 6 gas analyzer (field design)
Fig. 9: LDS 6 in-situ laser gas analyzer
Siemens Process Analytics at a glance
Products (continued) and Solutions

Our solutions
Analytical solutions are always driven by the customer’s requirements. We offer an integrated design covering all steps from sampling point and sample preparation up to complete analyzer cabinets or for installation in analyzer shelters (fig. 14). This includes also signal processing and communications to the control room and process control system.

We rely on many years of world-wide experience in process automation and engineering and a collection of specialized knowledge in key industries and industrial sectors. We provide Siemens quality from a single source with a function warranty for the entire system. Read more in “Our Services”.

Process Gas Chromatographs (Process GC)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXUM edition II</td>
<td>MAXUM edition II is very well suited to be used in rough industrial environments and performs a wide range of duties in the chemical and petrochemical industries and refineries. MAXUM II features e.g. a flexible, energy saving single or dual oven concept, valveless sampling and column switching, and parallel chromatography using multiple single trains as well as a wide range of detectors such as TCD, FID, FPD, PDHID, PDECD and PDPID.</td>
</tr>
<tr>
<td>MicroSAM</td>
<td>MicroSAM is a very compact explosion-proof micro process chromatograph. Using silicon-based micromechanical components it combines miniaturization with increased performance at the same time. MicroSAM is easy to use and its rugged and small design allows mounting right at the sampling point. MicroSAM features drastically reduced cycle times, provides valveless sample injection and column switching and saves installation, maintenance, and service costs.</td>
</tr>
<tr>
<td>SITRANS CV</td>
<td>SITRANS CV is a micro process gas chromatograph especially designed for reliable, exact and fast analysis of natural gas. The rugged and compact design makes SITRANS CV suitable for extreme areas of use, e.g. offshore exploration or direct mounting on a pipeline. The special software &quot;CV Control&quot; meets the requirements of the natural gas market, e.g. custody transfer.</td>
</tr>
</tbody>
</table>

Fig. 10: MAXUM edition II Process GC
Fig. 11: MicroSAM Process GC
Fig. 12: SITRANS CV Natural Gas Analyzer
Fig. 13: Product scope “Siemens Process Gas Chromatographs”
Fig. 14: Analyzer house (shelter)
Siemens Process Analytics at a glance
Solutions (continued) and Services

Our solutions ...
Analyzer networking for data communication
Engineering and manufacturing of process analytical solutions increasingly comprises “networking”. It is getting a standard requirement in the process industry to connect analyzers and analyzer systems to a communication network to provide for continuous and direct data transfer from and to the analyzers.

The two objectives are (fig. 16):

- To integrate the analyzer and analyzer systems seamless into the PCS / DCS system of the plant and
- To allow direct access to the analyzers or systems from a maintenance station to ensure correct and reliable operation including preventive or predictive maintenance (fig. 15).

Siemens Process Analytics provides networking solutions to meet the demands of both objectives.

Our Services
Siemens Process Analytics is your competent and reliable partner worldwide for Service, Support and Consulting.

Our resources for that are

- Expertise
As a manufacturer of a broad variety of analyzers, we are very much experienced in engineering and manufacturing of analytical systems and analyzer houses.

We are familiar with communication networks, well trained in service and maintenance and familiar with many industrial processes and industries. Thus, Siemens Process Analytics owns a unique blend of overall analytical expertise and experience.

- Global presence
With our strategically located centers of competence in Germany, USA, Singapore, and Dubai, we are globally present and acquainted with all respective local and regional requirements, codes and standards. All centers are networked together.
Siemens Process Analytics at a glance

Our Services ...

Service portfolio
Our wide portfolio of services is segmented into Consulting, Support and Service (fig. 17 to 18). It comprises really all measures, actions and advises that may be required by our clients throughout the entire lifecycle of their plant. It ranges from site survey to installation check, from instruction of plant personnel to spare part stock management and from FEED for Process Analytics (see below) to internet-based service Hotline.

Our service and support portfolio (including third-party equipment) comprises for example:

- Installation check
- Functionality tests
- Site acceptance test
- Instruction of plant personnel on site
- Preventive maintenance
- On site repair
- Remote fault clearance
- Spare part stock evaluation
- Spare part management
- Professional training center
- Process optimization
- Internet-based hotline
- FEED for Process Analytics
- Technical consulting

FEED for Process Analytics
Front End Engineering and Design (FEED) is part of the planning and engineering phase of a plant construction or modification project and is done after conceptual business planning and prior to detail design. During the FEED phase, best opportunities exist for costs and time savings for the project, as during this phase most of the entire costs are defined and changes have least impact to the project. Siemens Process Analytics holds a unique blend of expertise in analytical technologies, applications and in providing complete analytical solutions to many industries.

Based on its expertise in analytical technology, application and engineering, Siemens Process Analytics offers a wide scope of FEED services focused on analyzing principles, sampling technologies, application solutions as well as communication system and given standards (all related to analytics) to support our clients in maximizing performance and efficiency of their projects.

Whether you are plant operators or belong to an EPC Contractor you will benefit in various ways from FEED for Process Analytics by Siemens:

- Analytics and industry know how available, right from the beginning of the project
- Superior analyzer system performance with high availability
- Established studies, that lead to realistic investment decisions
- Fast and clear design of the analyzer system specifications, drawings and documentation
- Little project management and coordination effort, due to one responsible contact person and less time involvement

- Additional expertise on demand, without having the costs, the effort and the risks of building up the capacities
- Lowest possible Total Costs of Ownership (TCO) along the lifecycle regarding investment costs, consumptions, utilities supply and maintenance

Fig. 18: Portfolio of services provided by Siemens Process Analytics
Siemens Process Analytics Operations — Your Global Partner

With our strategically located centers of excellence in Germany, U.S.A., Singapore, Dubai and Shanghai, we are present globally and acquainted with all the respective local and regional requirements, codes and standards. Siemens Process Analytics is also integrated as a unified operation for efficient project execution where elements of the project are located in multiple regions.

For more information, please contact:

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