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Process Analytics in Gas-to-Liquid (GTL) Plants

oil & gas INDUSTRY

Case Study • December 2007

As premium-grade hydrocarbon feedstocks prices rise, synfuels and novel petrochemical processes are becoming increasingly valuable. Natural gas represents an abundant alternative hydrocarbon source to crude oil. It is distributed throughout the world and represents a cleaner fuel compared to crude oil.
Therefore, the method of converting natural gas to marketable liquid hydrocarbons (GTL) gets increasing interest worldwide. Large plants have been erected and are in the design phase with a tremendous need in process instrumentation including process analyzer systems.

Siemens, a leader in process analytical instrumentation, has proven over decades its capability to plan, engineer, manufacture, implement and service such analyzer systems.

This *Case Study* provides details about the GTL process and related analyzer tasks.

NG, FT and GTL

Natural Gas (NG) is a vital component of the world's supply of energy. It is one of the cleanest, safest, and most useful of all energy sources. NG is colorless, shapeless, and odorless in its pure form. It is combustible, and when burned it emits lower levels of potentially harmful byproducts into the air than other fuels. NG is a mixture of hydrocarbon gases. While it is formed primarily of methane, it can also include ethane, propane, butane, pentane and certain impurities. NG has been widely used to make commodity products such as methanol or ammonia. But in light of environmental and economic climate today it´s *conversion to synthetic liquid hydrocarbons* has become a most important objective worldwide.
It was already in 1923, when **Fischer and Tropsch (FT)** developed the process of converting coal into „syngas" and from there into gasoline. But it took many decades from this FT-process origin before the first commercial FT-based plant, using NG instead of coal, was put into operation. Meanwhile, new technologies have been and are being developed to convert NG to liquids in **Gas-to-Liquid (GTL)** processes.
Commercial interest in using these new technologies arise from e.g. increasing consumer demand for cleaner burning fuels or from the opportunity to develop gas reserves remote from existing markets.

Consequently, many GTL plants exist today, are under development or in design phase using different FT-process technologies (Sasol, Shell, Exxon, e.a.). Whatever technology is applied, the process steps require always to be monitored and controlled continuously.
Process analyzers play an important role for that. Hundreds of process analyzers, most of them process gas chromatographs, are in use in a typical GTL plant.

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The GTL process at a glance

Process chain

The GTL process chain consists of a number of fundamental processing steps each of which is important to achieve the final goal of producing high quality synthetic liquid hydrocarbons. The Fischer-Tropsch (FT) reaction is considered the heart of the process-chain. Its overall efficiency depends strongly on the type of reactor technology used as well as on the catalyst material applied.

The three main process steps and associated utilities include (Fig. 1):

Syngas generation
Syngas (Synthesis gas) is composed of hydrogen (H_2), carbon monoxide (CO) and carbon dioxide (CO_2), whereas the ration H_2/CO is important in view of the process efficiency using a certain catalyst material. Syngas is produced from natural gas (NG) through a reforming process. Various technologies are used for that, with or without air or oxygen, such as Steam Methane Reforming (SMR), Partial Oxidation (POX), Autothermal Reforming (ATR), e.a.

Syngas conversion
The conversion of syngas to hydrocarbons comprises the process of H_2 and CO molecules to form -CH_2- alkyl radicals and water in an exothermic reaction. The -CH_2- radicals then immediately combine in a preferably iron or cobalt based catalytic reaction to make synthetic olefin and/or paraffin hydrocarbons of various chain-lengths (high boiling point wax and olefinic naphta). This process is called the Fischer-Tropsch (FT) synthesis process.

Synthesis product upgrading
The longer straight-chain paraffins are pure solid waxes at room temperature with a limited market only. Therefore, to obtain a better usable scope of hydrocarbons, the waxy paraffins need to be upgraded to recieve products with shorter chain length and lower boiling points. This is realized through e.g. catalytic hydrocracking of the wax streams and hydrotreating of the naphta.

Utilities and by-product treatment
Utilities are pieces of equipment to provide services such as heat or electricity necessary to fulfill the plants main goal. By-products of the FT-process are the FT-tail gas and the FT water each of which is treated in order to improve plant efficiency.

Various technologies

Various technologies have been developed and are implemented worldwide in GTL plants:

- *Sasol* has developed various reactor types with the slurry phase distillate process being the most recent.
- *Statoil* uses a slurry reactor in which syngas is fed to a suspension of catalyst particles in a hydrocarbon slurry which is a product of the process itself.
- The *Shell* Middle Destillate Synthesis (SMDS) process focuses on maximising yields of middle distillates such as kerosene and gas oil.
- *Exxon* uses a slurry design reactor and propietary catalyst system. The process can be adjusted to produce a range of products.
- *Rentech* uses a molten wax slurry reactor and a precipitaded iron catalyst.

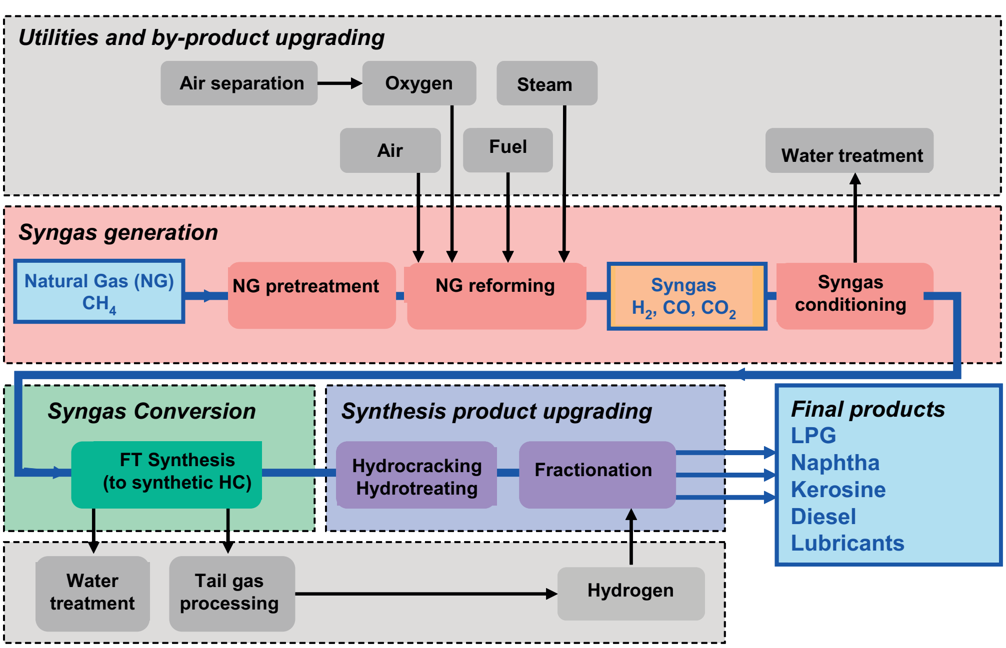

Fig. 1: Generic Gas-to-Liquids (GTL) process, simplified

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Syngas generation

NG pretreatment

NG is a mixture consisting primarily of hydrocarbons, but other gases are also present such as nitrogen, carbon dioxide and sulfur compounds. In order to avoid poisoning of the catalyst material in the conversion process, the NG is first purified, mainly from sulfur, in a hydrogenation reactor and a washing system. After purification the feed gas is pretreated (saturated with process condensate and process water and preheated) before being fed to the conversion process.

NG conversion

Syngas can be made by various technologies which require mostly steam and air or oxygen. During the conversion of NG (prereforming and reforming process), the hydrocarbon molecules in the NG are broken down and stripped of their hydrogen atoms. The carbon atoms together with oxygen, introduced as steam, air or as pure gas, form CO molecules. All reactions, independently of the technology applied, result in a gas consisting of H_2, CO and CO_2 called Synthesis Gas or Syngas.

Steam-Methane Reforming (SMR)

In steam-methane reforming, the most widely used technology for syngas production, natural gas and steam are mixed and passed over a catalyst located in a firebox. Heat for the reaction is supplied by burning some of the feedstock gas. SMR does not require a separate air or oxygen supply from a oxygen plant. However, the composition of the syngas produced shows a H_2/CO ratio > 4 which is higher than what is optimally required to produce liquid fuels.

Partial Oxidation Reforming (POX)

The partial oxidation process is a direct non-catalytic reaction between oxygen and the hydrocarbon gas. It uses no steam and requires no catalyst. It is operated at very high temperatures of about 1400 °C and oxygen is needed. It produces syngas with a H_2/CO ratio < 2 which is close to the optimum needed by the Fischer-Tropsch process.

Autothermal Reforming (ATR)

Unlike POX, autothermal reforming uses a catalyst to reform NG to syngas in the presence of steam and oxygen. The reaction produces high temperatures and no additional heat source is needed („autothermal"). It produces syngas that is suitable for most conversion processes. But an air separation plant is required.

Process analysis in NG pretreatment and conversion

A great number of process analyzers are used in the NG pretreatment and NG conversion sections. Details regarding analyzers, sampling locations, measured components etc. will differ from plant to plant depending on the existing process technology and plant design. Therefore, Fig. 2 and Table 1 show *typical* measuring point locations and *typical* measuring tasks.
Real plant conditions may differ from that.

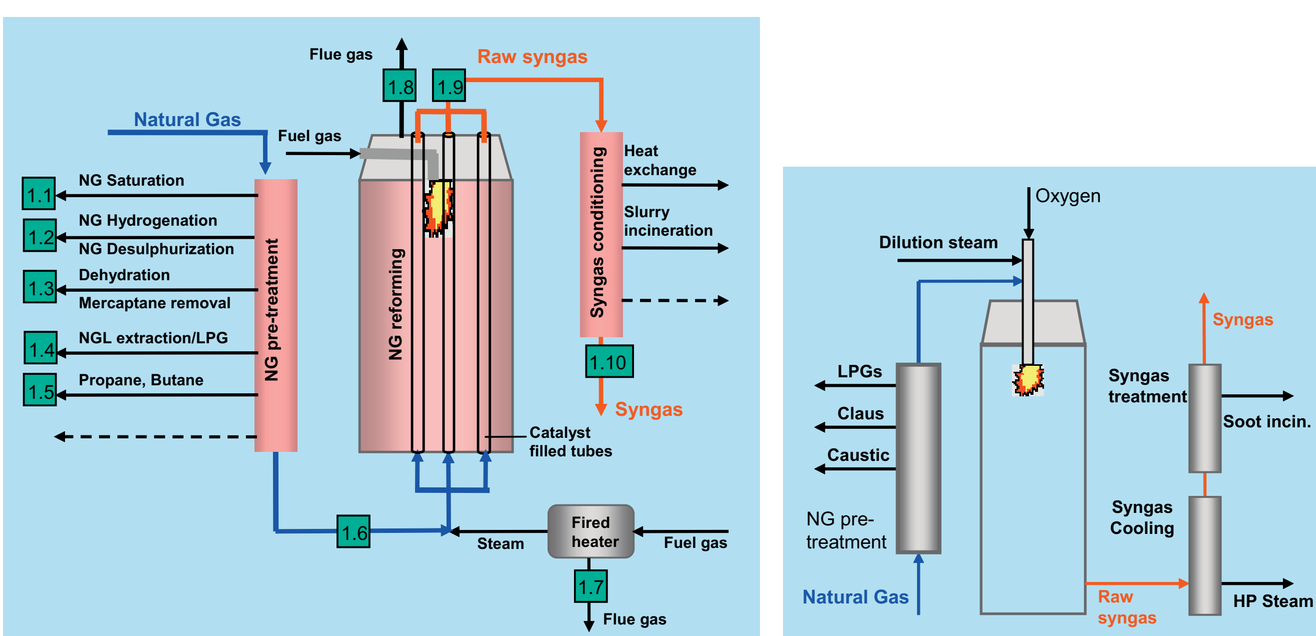

Fig. 2: Natural Gas conversion to syngas with Steam Reforming Reactor (left, see Table 1 for analyzer tasks) and Partial Oxidation Reactor (right)

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Syngas generation (ctd.)
Syngas conversion (FT Synthesis)

Sampling point Sampling stream		Measuring Components	Suitable Analyzer
1.1	Saturator Condensate stabilizer	Total S H_2S	MAXUM MAXUM
1.2	Hydrogenation/ Desulphurization Claus off gas	Total S, H_2S, CO_2 Mercaptans O_2, SO_2	MAXUM MAXUM OXYMAT 6, TPA
1.3	Dehydration/ Mercaptan removal	RSH, Total S, COS, H_2S	MAXUM
1.4	LPG	RSH, Total S, COS, H_2S, Mercaptans	MAXUM
1.5	Propane, Butane product	C2-C4, C3-C5+	MAXUM / MicroSAM
1.6	Treated NG	Total S (ppm/ppb)	MAXUM
1.7/1.8	Various furnaces flue gases and process off gases	O_2, SO_2, NO_x, H_2, ...	OXYMAT 6, ULTRA-MAT 6, CALOMAT 6
1.9	Raw Syngas	CH_4, CO_2	ULTRAMAT 6
1.10	Syngas	H_2, CO, CO_2, N_2, CH_4, COS, H_2S, TS	MAXUM
TPA: Third party analyzer			

Table 1: Process analyzer measurging tasks in syngas generation section (corresp. to Fig. 2)

FT Synthesis

In the FT Synthesis, synthesis gas is converted into liquid hydrocarbon chains based on the famous „FT Chemistry“. In the chain growth reaction a wide scope of products is formed ranging from very light to heavy paraffins. The most important element of this reaction is the type of catalyst used. Two predominant formulations are in use, one based on iron and the other on cobalt. Both feature advantages and disadvantages and differ, amongst others, in their suitability with respect to feed composition and desired product scope.

Besides the catalyst, the design and operation principle of the conversion reactor is another key element. Various types of FT reactor systems are in use, which have in common the need to remove the exothermic heat of the reaction. But they show also fundamental differences.

Fixed bed reactor

This is a reactor that uses a catalyst packed in vertical tubes surrounded by a coolant medium and arranged in a vertical vessel. The syngas flows downwards through the tubes and heat is removed through the tube walls to produce steam.

Fluidized bed reactor

In fluidized bed reactors, the gas is blown up through the solid catalyst particles causing them to lift and separate. Thus the particles are „fluidized“ and the gas is converted by passing the fluidized bed of catalyst particles. Heat transfer coils within the reactor remove the heat and generate steam.

Slurry reactor

A slurry reactor contains a slurry of molten wax and FT liquid products with the powdered catalyst dispersed through it. The syngas is bubbled through this mixture and thus converted. Heat is recovered via cooling coils, which generate steam.

Process analysis in FT Synthesis

A great number of process analyzers are used in the FT synthesis section. Details will differ from plant to plant depending on process technlogy and plant design. Therefore, Fig. 4 and Table 2 show *typical* measuring point locations and *typical* measuring tasks.

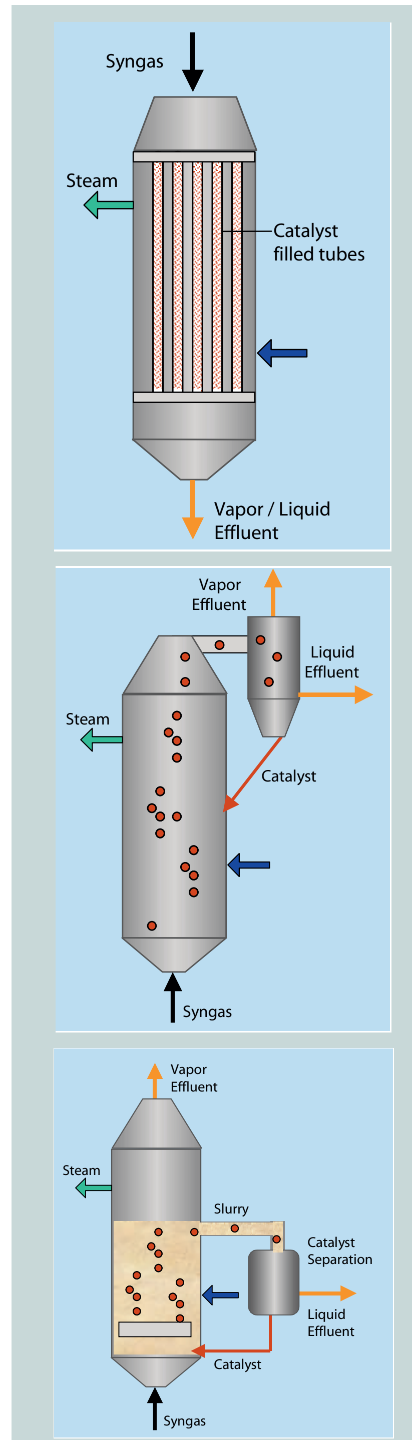

Fig. 3: Fixed-bed, Fluidized-Bed and Slurry reactor (from top)

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Product Upgrade and By-product Treatment

Product Upgrade

Conventional refinery processes can be used for upgrading of FT liquid and wax products such as fractionation,hydrocracking, isomerization, hydrotreating etc. (Fig. 4).
Final products from FT synthesis are of high quality due to a very low aromatics and almost zero sulfur content.

Primary separation

Primary separation occurs already within the FT block (Fig. 4) and basically separates from each other

- the straight-run synthetic hydrocarbon FT liquid streams.
- the non-converted FT tail gas,
- the FT water streams,
- the molten wax stream

Hydrocracking/Isomerization (HCI)

Hydrocracking is preferably used to convert the wax into lighter distillates with shorter chain length and lower boiling points. It uses fixed-bed reactors and suitable catalysts. Hydrogen is supplied either with PSA purity or as pure hydrogen made from a slip stream of syngas.

Hydrogenation

Hydrogenation is applied to the naphta to saturate straight-run product streams.

Fractionation

Liquid effluent from the hydrocracking/isomerizaton block is heated and then distilled. The separate products are withdrawn, cooled and sent to their storage tanks.

By-product treatment

FT Tail Gas

FT tail gas represents unconverted reactants and light hydrocarbons which are normally recycled to the syngas generation section. However, this is possible only to a certain limit due to the presence and build-up of gases such as Nitrogen and Argon. Therefore, the tailgas is partly purged out of the system and possibly used for combustion e.g. in a gas turbine. In the extreme case no recycle is possible and all tail gas is purged.

The tail gas contains components such as hydrogen, water, methane, carbon monoxide, carbon dioxide, nitrogen argon, and heavier hydrocarbons.

Typically hydrogen is removed from the tail gas for further use by a PSA (Pressure Swing Absorber).

FT Synthetic Water

FT synthetic water is co-produced and need to be removed from the reactor. Some of the contained components can be recycled to the syngas generation section, while other must be removed by a special water treatment procedure (stripping by steam, removing by mechanical means, converting through biological measures).

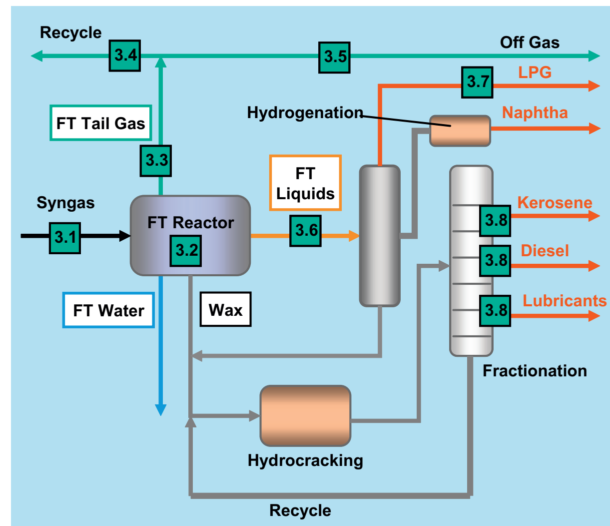

Fig. 4: FT Synthesis and Upgrade of FT products

Process analysis in product upgrade and by-product treatment

A great number of process analyzers are used in the product upgrade and by-product treatment section. Details will differ from plant to plant depending on process technlogy and plant design.

Fig. 4 and Table 2 show *typical* measuring point locations and *typical* measuring tasks.

Sampling point Sampling stream		Measuring Component	Suitable Analyzer
3.1	Syngas feed	H_2, CO, CO_2, N_2, CH_4, COS, H_2S, Total S	MAXUM
3.2	Syngas FT reactor	H_2S, COS, Total S	MAXUM
3.2	Syngas FT reactor	H_2, CO, CH_4, N_2, C2-C6+,H_2/CO ratio	MAXUM / MicroSAM
3.3	Tail gas, PSA unit	CO; CO/CO_2	ULTRAMAT 6 / MicroSAM
3.4	Recycle gas	CO, CO_2, CH_4, N_2,H_2, H_2/CO ratio	MAXUM
3.5	Off gas	H_2, CO, CH_4, N_2, C2-C5, H_2/CO ratio	MAXUM
3.6	FT liquids	Related components	MAXUM
3.7	LPG	C4, C5+	MAXUM / MicroSAM
3.8	Final products	Related components	MAXUM
	Various off/flue gases	O_2	OXYMAT 6/61
	Various off/flue gases	SO_2, NO_x	ULTRAMAT 6

Table 2: Process analyzer measuring tasks in the FT synthesis and product upgrade section

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Utilities

Steam and oxygen

Utilities are pieces of equipment to provide services such as heat or electricity necessary to fulfill the plants main goal.

Syngas generation requires, depending on the technology, steam, compressed air, and oxygen.
While steam production simply requires a fired boiler, the production of oxygen is a more complex process. Large-scale oxygen production uses cryogenic air separation processes, which rely on differences in boiling points to separate and purify products. Cryogenic air separation plants are referred to as an Air Separation Unit (ASU) or Oxygen Plant.

Numerous different process configurations are in use, but all of them include the following steps Fig. 5):

- Filtering and compressing air
- Removing contaminants, including water vapor and carbon dioxide (which would freeze in the process)
- Cooling the air to very low temperature through heat exchange and refrigeration processes
- Distilling the partially-condensed air to produce desired products
- Warming gaseous products and waste streams in heat exchangers that also cool the incoming air

The units of the ASU that operate at very low temperatures (distillation columns, heat exchangers and cold interconnecting piping sections) must be well insulated to minimize energy consumption. Therefore, these components are located inside insulated "cold boxes".

Fig. 5 and Table 3 present typical measuring point locations and related measuring tasks in a ASU.

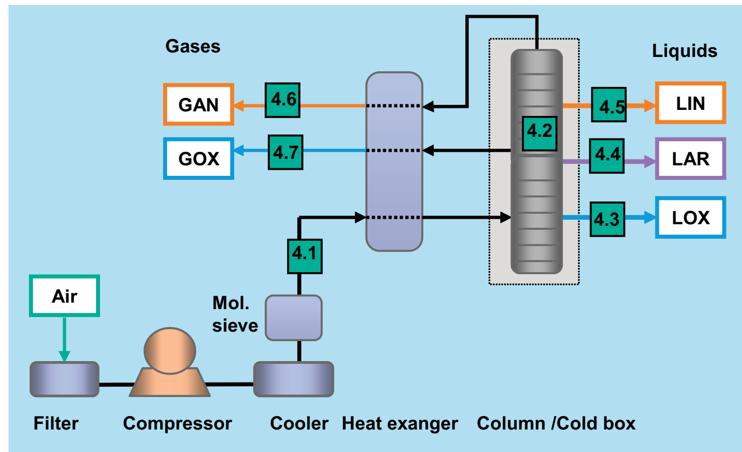

Fig. 5: Oxygen production throug air separation (G: gaseous; L, LI: liquid)

Sampling point Sampling stream		Measuring Component	Meas. Range [ppm]	Suitable Analyzer
4.1	Air downstream compressor and filter	CO_2 Acetylene H_2O	0 ... 10 0 ... 5 0 ... 10	ULTRAMAT 6 MAXUM TPA
4.2	Upper column, liquid phase	O_2 CO_2 THC	98 ... 100% 0 ... 10 0 ... 300	OXYMAT 6 ULTRAMAT 6 FIDAMAT 6
4.3	Liquid Oxygen to tank	O_2 Argon	99 ... 100% 0 ... 10 ppm	OXYMAT 6 MAXUM
4.4	Liquid Argon to tank	O_2	ppm range	TPA
4.5	Liquid Nitrogen to tank	O_2	ppm range	TPA
4.6	Nitrogen (gas) to pipe	O_2	ppm range	TPA
4.7	Oxygen (gas) to pipe	O_2	98 ... 100%	OXYMAT 6
TPA: Third party analyzer				

Table 3: Process analyzer measuring tasks in the oxygen production unit

Prozess analytics at Utilities

For steam generation units, typically, analyzers are used to optimize the combustion process (O_2)as well as to monitor the flue gas for polluting components (SO_2, NO_x, ...) according to the local regulations.

At air separation plants numerous analyzer are used. Fig. 5 and Table 3 display typical measuring point locations and related measuring tasks.

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Siemens Process Analytics at a glance
Products

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 analysers into automations 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 analysers 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.

Fig. 6: Series 6 gas analyzer (rack design)

Extractive Continuous Gas Analyzers (CGA)	
ULTRAMAT 23	The ULTRAMAT 23 is a cost-effective multicomponent 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.
CALOMAT 6/62	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.
OXYMAT 6/61/64	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 analyser for standard applications. The OXYMAT 64 is a gas analyzer based on ZrO_2 technology to measure smallest oxygen concentrations in pure gas applications.
ULTRAMAT 6	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.
ULTRAMAT 6 / OXYMAT 6	Both analyzer benches can be combined in one housing to form a multi-component device for measuring up to two IR components and oxygen.
FIDAMAT 6	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.
In-situ Continuous Gas Analyzer (CGA)	
LDS 6	LDS 6 is a high-performance in-situ process gas analyser. 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 pro-active control of dynamic processes and allows fast, cost-saving corrections.

Fig. 7: Product scope „Siemens Continuous Gas Analyzers“

Fig. 8: Series 6 gas analyzer (field design)

Fig. 9: LDS 6 in-situ laser gas analyzer

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Siemens Process Analytics at a glance
Products (continued) and Solutions

Fig. 10: MAXUM edition II Process GC

Fig. 11: MicroSAM Process GC

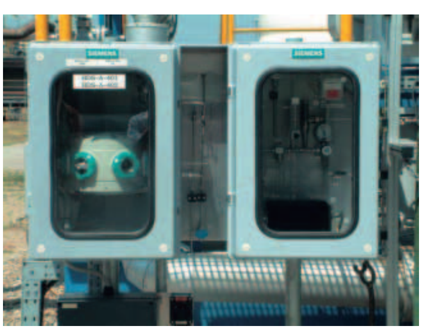

Fig. 12: SITRANS CV Natural Gas Analyzer

Process Gas Chromatographs (Process GC)	
MAXUM edition II	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.
MicroSAM	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.
SITRANS CV	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 "CV Control" meets the requirements of the natural gas market, e.g. custody transfer.

Fig. 13: Product scope „Siemens Process Gas Chromatographs“

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 analyser cabinets or for installation in analyser 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“.

Fig. 14: Analyzer house (shelter)

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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 analysers.

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).

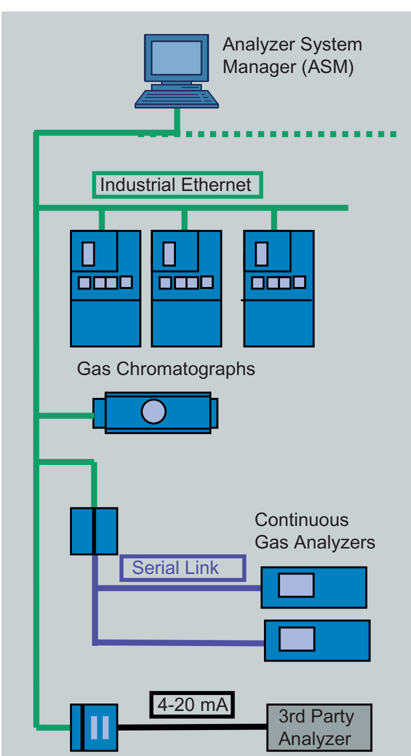

Fig. 15: Communication technologies

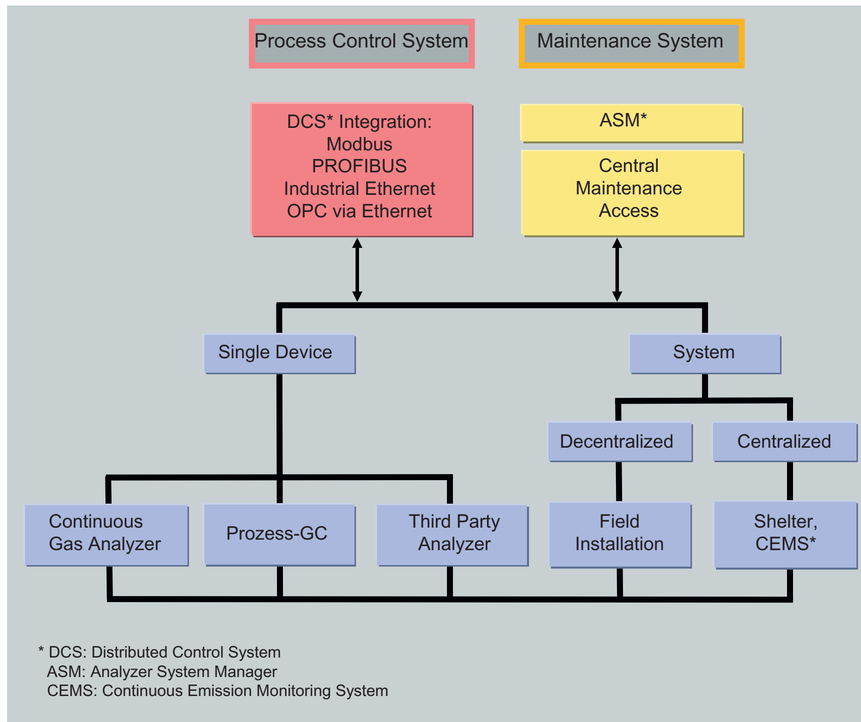

Fig. 16: Networking for DCS integration and maintenance support

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

Our Services

Siemens Process Analytics is your competent and reliable partner world wide for Service, Support and Consulting.

Our rescources 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 pro cesses 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, Dubai and Shanghai, we are globally present and acquainted with all respective local and regional requirements, codes and standards. All centers are networked together.

Fig. 17: Portfolio of services

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Siemens Process Analytics at a glance
Services, continued

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 optimisation
- Internet-based hotline
- FEED for Process Analytics
- Technical consullting

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.

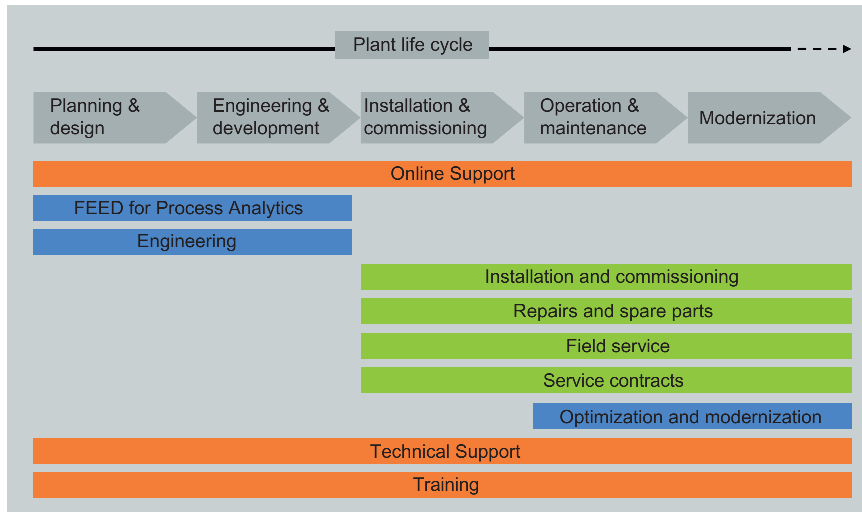

Fig. 18: Portfolio of services provided by Siemens Process Analytics

Based on its expertise in analytical technology, application and engineering , Siemens Process Analytics offer a wide scope of FEED services focused on analysing 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.

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Case Study

Siemens Process Analytics - Answers for industry

If you have any questions, please contact your local sales representative or any of the contact addresses below:

Siemens AG
A&D SC PA, Process Analytics
Östliche Rheinbrückenstr. 50
76187 Karlsruhe
Germany

Phone: +49 721 595 3829
Fax: +49 721 595 6375
E-mail:
processanalytics.automation@siemens.com
www.siemens.com/prozessanalytics

Siemens Energy & Automation Inc.
7101 Hollister Road
Houston, TX 77040
USA

Phone: +1 713 939 7400
Fax: +1 713 939 9050
E-mail: saasales.sea@siemens.com
www.siemens.com/processanalytics

Siemens Pte. Limited
A&D SC PS/PA CoC
60 MacPherson Road
Singapore 348615

Phone: +65 6490 8728
Fax: +65 6490 8729
E-mail: splanalytics.sg@siemens.com
www.siemens.com/processanalytics

Siemens Ltd., China
A&D SC, Process Analytics
7F, China Marine Tower
No.1 Pu Dong Avenue
Shanghai, 200120
P.R.China

Phone: +86 21 3889 3602
Fax: +86 21 3889 3264
E-mail: xiao.liu1@siemens.com
www.ad.siemens.com.cn

Siemens LLC
A&D 2B.
PO Box 2154,
Dubai, U.A.E.

Phone: +971 4 366 0159
Fax: +971 4 3660019
E-mail: fairuz.yooseff@siemens.com
www.siemens.com/processanalytics

Siemens AG
Automation and Drives
Sensors and Communication
Process Analytics
76181 KARLSRUHE
GERMANY

www.siemens.com/processanalytics

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