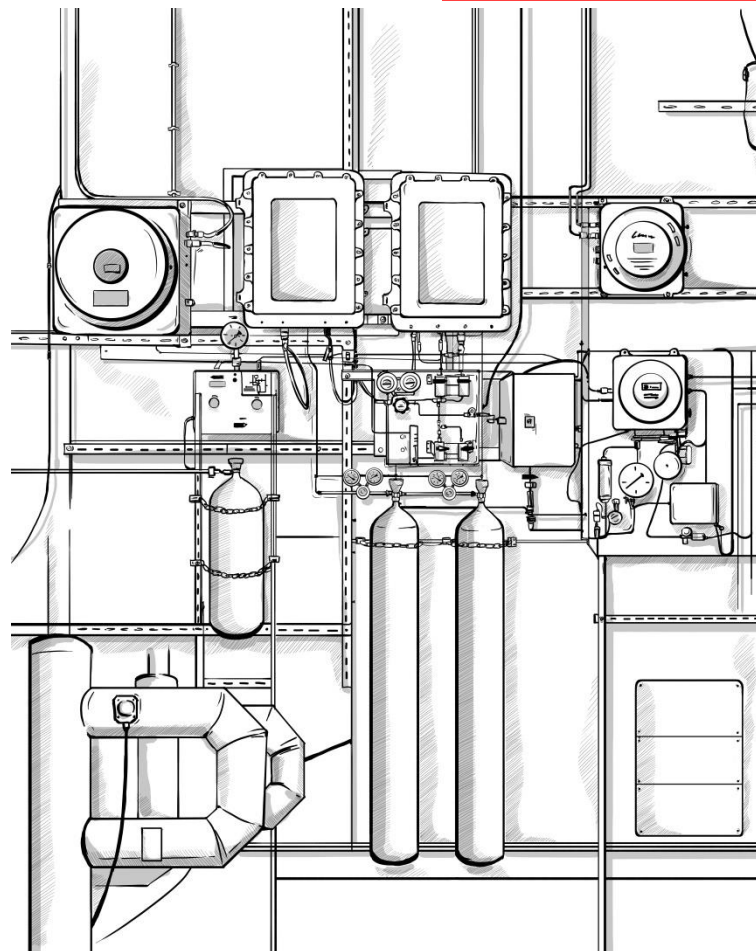


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ANALYTICAL COMPLEX SOLUTIONS FOR OIL AND GAS INDUSTRY

**B
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S**



Gas quality control unit

Intended for online determination of the following physicochemical parameters of natural gas:



Natural **gas composition** (ISO 6974) followed by calculation of calorific values, relative and absolute density, compressibility factor and Wobbe index (ISO 6976)



Mass concentration of hydrogen sulfide, mercaptans and total **sulfur** (ISO 19739)



Water dew point (ISO 18453, ISO 6327:1981)



Volume fraction of **oxygen** (ASTM D 7607-11)



Hydrocarbon dew point (ISO 23874 – GC calculation or ISO/TR 12148 – direct measurement)



Our solution for natural gas quality control unit



We manufacture the full range of **analytical instruments** for **complete** measurement of natural gas properties.



We perform **system integration** and supply a **turnkey solution** for quality control of natural gas.



Analytical instruments for natural gas quality control unit



MAG Process gas chromatograph

- ✓ Analysis of natural **gas composition** followed by calculation of calorific values, relative and absolute density, compressibility factor and Wobbe index
- ✓ **Hydrocarbon** dew point calculation
- ✓ Mass concentration of hydrogen sulfide, mercaptans and total **sulfur** analysis (*by separate GC with ECD*)



AnOx Process oxygen analyzer

- ✓ Volume fraction of **oxygen** measurement by electrochemical sensor



HygroScan Process moisture analyzer

- ✓ **Water** dew point measurement by sorption-capacitive sensor

Hydrocarbon dew point chilled mirror analyzer is under development for the moment

Application of ASG Complex

Process analysis of the component composition and physical and chemical parameters of **commercial LNG** and **tank return gas**, as well as stream monitoring of the composition of technological media in the LNG production process.



Complex function

- ✓ Representative **LNG** sampling in accordance with the requirements of **ISO 8943** using a Stream Sampler;
- ✓ Analysis of the component composition of **LNG** in the stream in accordance with **ISO 6974** with the subsequent calculation of physical and chemical parameters of LNG in accordance with **ISO 6976**;
- ✓ Measurement of the concentration of hydrogen sulfide and mercaptans in **LNG** in accordance with **ISO 19739** in the stream and/or in laboratory;
- ✓ Analysis of the composition of the **tank return gas** in the flow with the subsequent calculation of physical and chemical parameters in accordance with **ISO 6976**;
- ✓ Measurement of the oxygen concentration in **LNG** and in **tank return gas** according to **ASTM D 7493**, **ISO 19739** continuously in stream and / or with a portable oxygen analyzer in a laboratory or on site in a periodic mode;
- ✓ Measurement of the concentration of elemental Hg.



PARTS OF THE COMPLEX

- ✓ Stream sampler for taking and evaporation of LNG samples (corresponds to ISO 8943)



- ✓ Process Gas Chromatograph «MAG» for online analysis:
 - Composition of LNG according to ISO 6974;
 - Composition of tank return gas;
 - Concentration of sulfur-containing compounds in LNG according to ISO 19739, or:

- ✓ Laboratorial chromatograph "S-Chrome" for analysis of sulfur-containing compounds in LNG in the laboratory;



- ✓ Process gas analyzer «AnOx» for measuring the volume fraction of oxygen in LNG according to ASTM D 7607 in the process mode, or:



- ✓ Portable gas analyzer for measuring the volume fraction of oxygen in LNG in a laboratory or on site in a periodic mode.

















- ✓ Process Mercury Analyzer «MERC» for measuring concentration of elemental Hg



Application

The automated process analytical system based on gas chromatography is designed for online measurement and control of pyrolysis process.

The system provides continuous automatic analysis of gaseous products of pyrolysis and calculation of its physical and chemical properties.

H_2 2.016		Hydrogen	C_2H_6 30.068		Ethane
CH_4 16.042		Methane	H_2S 34.076		Hydrogen sulfide
CO 28.01		Carbon monoxide	C_3H_6 42.078		Propylene
C_2H_4 28.052		Ethylene	C_3H_8 44.094		Propane
H_2O 18.016		Water	C_4H_8 56.104		Butenes
N_2 28.02		Nitrogen	C_4H_{10} 58.12		i-Butane
O_2 32		Oxygen	C_4H_{10} 58.12		n-Butane
CO_2 44.01		Carbon dioxide	C_{5+} >60.05		Pentanes+



Key benefits

- ✓ Accurate analysis of gaseous **pyrolysis products**;
- ✓ Determination of **H₂O** and **H₂S** concentration in gas;
- ✓ Advanced **Calorific value** and **Methane number** calculation algorithm based on fuel specs of the leading gas engine manufacturers;
- ✓ **Fast and accurate analysis** for online process control, gas mixing and averaging, allowing most efficient fuel consumption in pyrolysis power generation;
- ✓ Automatic analysis of **up to 6 gaseous streams** according to preset sequence;
- ✓ Opportunity of manual injection and analysis of samples;
- ✓ **Variety** of the data **transmitting interfaces**;
- ✓ Custom-built WEB-based software for remote access, settings and data acquisition;
- ✓ **Large LCD touch screen** with user-friendly interface for easy control and interaction with the system;
- ✓ Advanced sample conditioning system for various pyrolysis products;
- ✓ Digital **pressure sensors** for carrier gas help to replace cylinders on time;
- ✓ Low operating and maintenance cost owing to low power and gas consumption.

Configuration features

Modular configuration

Pyrolysis Products Analysis System consists of 3 parts:

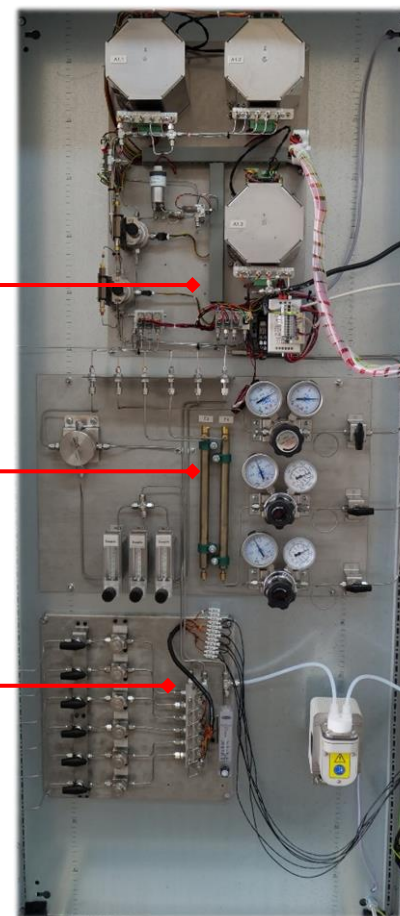
- ✓ Process Gas Chromatograph MAG
- ✓ Sample Conditioning System
- ✓ Stream Switching System

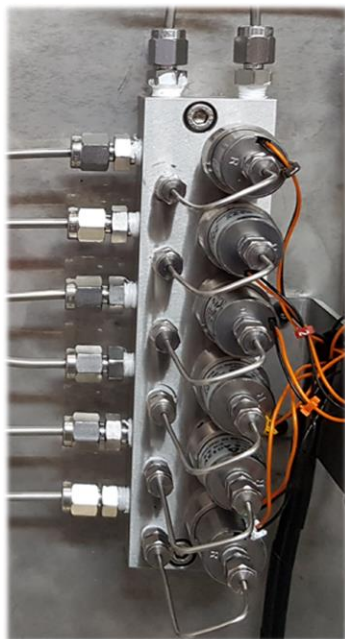


Analytical
GC channel

Process Gas Chromatograph

- ✓ Contains three analytical channels with TCD used for parallel analysis of gaseous sample. Flexible modular configuration of the system allows to equip it with additional modules for extended analysis.
- ✓ Includes the electrochemical sensor for precise measurement of **oxygen** content of pyrolysis gas.





Sample switching valves

Sample conditioning system

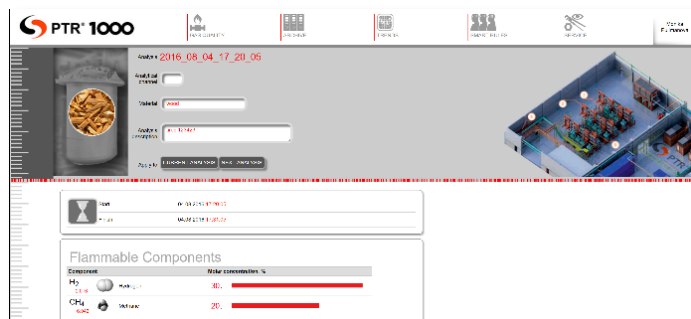
Used for the sample intake by pump, separation of the water from the gaseous sample, filtration, bypass purging, delivering the sample into the Gas Chromatograph and forwarding the sample to the waste.

Stream Switching System

The Stream Switching System is equipped with **6 solenoid valves** for automated switching and selection of analyzed gas stream supplied to the analytical system according to preset sequence.

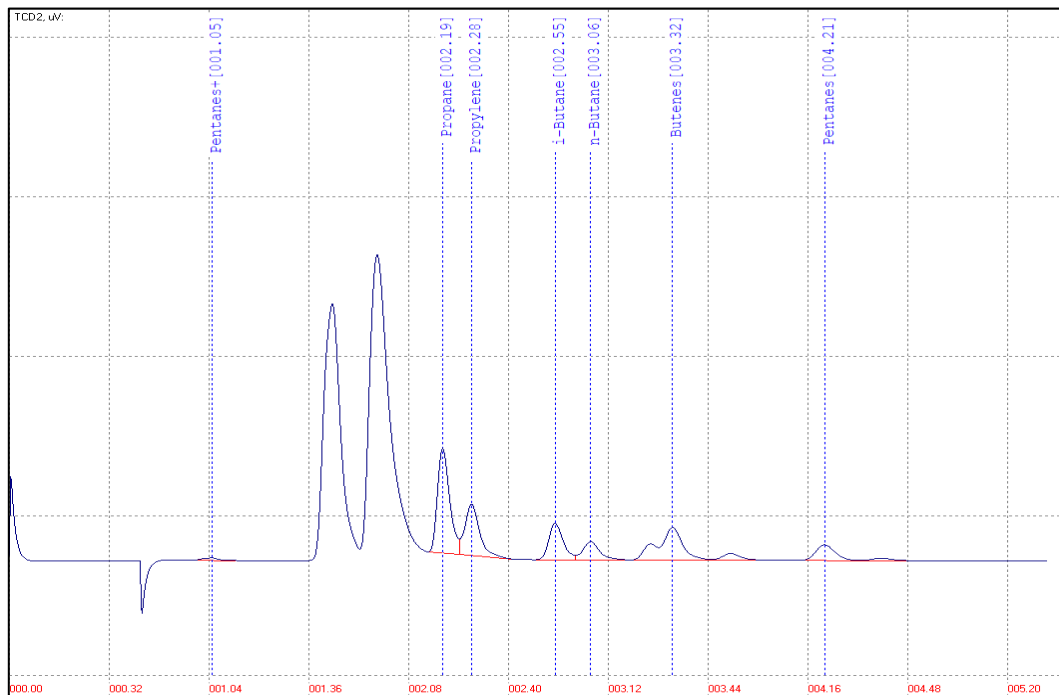
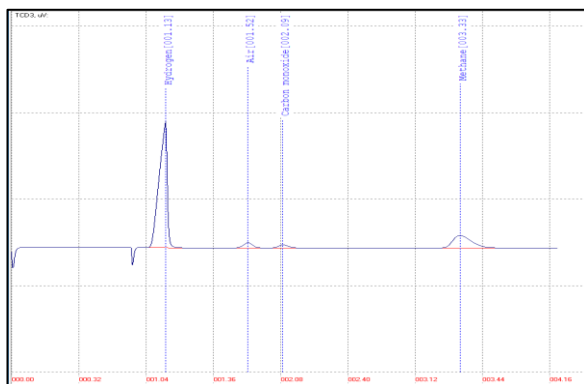
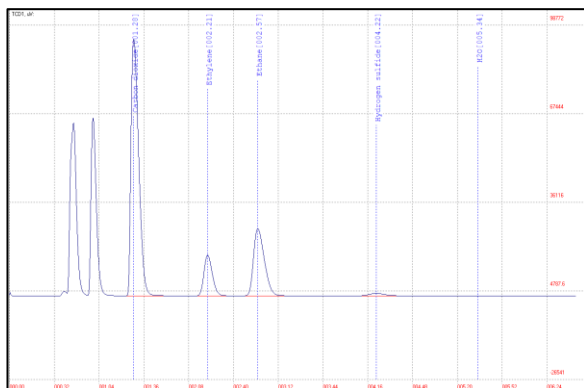
Web interface

- ✓ Cloud-based storage of analysis reports and trends
- ✓ Secure web-authorization
- ✓ Multiple users, multi-level access
- ✓ XML-based remote data storage
- ✓ Accessible from any mobile device
- ✓ SMART Rules for operation and maintenance



Application details

Online analysis of composition of gaseous products of pyrolysis process followed by calculation of its **physicochemical properties** including water dew point, calorific values, relative and absolute density, compressibility factor and Wobbe index in accordance with **ISO 6976** and methane number using an SAE based Methane Number (MN) calculation (SAE 922359 Eqn. 4) by Cummins Westport.



Chromatograms of pyrolysis gas analysis

PROCESS ANALYTICAL SYSTEM FOR PYROLYSIS PRODUCTS ANALYSIS



Technical characteristics	
Number of the analytical GC channels	3
Type of detector	Thermal conductivity detector (TCD), Electrochemical oxygen sensor
Carrier gas types	Helium, not worse than 4.5 Grade (99,995%) Argon, not worse than 4.5 Grade (99,995%)
Carrier gas consumption	Helium: 16 sccm (total) Argon: 9,5 sccm
Oven type	Airless, isothermal
Type of chromatograph columns	micropacked
Carrier gas pressure regulator	Mechanical, 2 pcs.
Number of analyzed streams	up to 6
Analysis time	No more than 9:00 min
Chromatograph calibration	Automatic (by test gas mixture)
Data input-output device	12" LCD sensor display
Communication interfaces	RS 485 (ModbusRTU) – 1 pcs., Ethernet (ModbusTCP/) – 1 pc., Discrete inputs (NAMUR) – 4 pcs.
Power voltage	220V and with frequency (50±1) Hz
Power consumption	at the warm-up – not more than 570 W; after the warm-up – not more than 80W.
Ingress Protection Marking	IP65 as per IEC 60529:2013
Ambient conditions	from -10 to +50 °C at atmospheric pressure 84.0-106.7 kPa, at atmosphere relative humidity not more than 95% without humidity condensation
Dimensions (length×width×height)	800×400×1800 mm
Weight	Not more than 100 kg



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