

## ONLINE ANALYTICAL SOLUTIONS EXPERTS

### Turnkey Global Analytical Solutions for Gas and Liquid Analysis: A New Challenge for Instrumentation in the Energy Market

In the previous years the Oil and Gas industry has experienced important evolutions that have changed the needs in terms of analysis and control. Reinforcement in regulations, policies and compliance has led the industry to ask for more tailored applications dedicated to specific-compounds monitoring. Standard instruments are not fitted to answer all these new challenges and the instrumentation market has to be able to propose customized advanced solutions dedicated to unique analysis context.

Constant investment in research and development is then essential for manufacturers and providers to maintain focus on the accuracy of the analysis at low levels and the sustainability of the instruments. Working in collaboration with industrial R&D centers can help to design accurate dedicated solutions relying on new or emerging technologies.

Projects for major chemical and petrochemical industries have successfully been developed in the past two years, based on industrial automatic auto-GC solutions including online analysis and artificial intelligence. This includes for instance the development of transportable ATEX analyzers for monitoring the sulfurizing process of



### SPECIAL EDITION



**French Pavilion  
Hall 9 Stand #9231**

**Sulfur compounds monitoring in hazardous areas**

catalytic units used in the oil industry, the production of process GC for VOCs analysis in liquid matrices, GPC-UV analysis through compact liquid analyzer, biogas monitoring by miniGC TCD with integrated carrier gas generators for hazardous industrial areas or micro-portable instruments for VOCs, BTEX or Formaldehyde on-field analysis.

### Analysis of trace-level impurities in hydrogen



To achieve sustainable development goals related to climate change and to improve air quality, the reduction of carbon emissions due to transport and mobility

are fundamental. Transport is currently responsible for over a quarter of greenhouse gas emissions in developed countries and is worldwide the primary source of urban air pollution.

The deployment of hydrogen as a sustainable fuel has the potential to substantially reduce emissions of greenhouse gases and harmful air pollutants. In 2050, hydrogen may account for 32% of the fuel demand in Europe. The fuel cell system in a hydrogen vehicle requires very high-quality hydrogen because trace levels of impurities can adversely affect fuel cell performance and durability. For example, formaldehyde and formic acid at concentrations higher than 200 nmol/mol can cause significant fuel cell performance degradation. To ensure the hydrogen quality, a specification has been developed (ISO 14687), setting upper concentrations of a series of impurities.

To demonstrate the conformity with this standard it is required to validate by measurement that the levels of the impurities are below the required thresholds. Existing analytical methods suitable for measuring ISO 14687 impurities in fuel cell graded hydrogen mainly involve techniques based on gas chromatography. However, a combination of several analytical techniques and methodologies are necessary to perform the full scope of analysis required.

Chromatotec® propose a panel of analytical solutions allowing the best mix between high level of performance and cost-effective solution. Chromatotec® solutions for impurities in hydrogen are compliant with fuel cell energy norm EN17124. They are based on GC-FID and HPLC systems and use different analytical methods for the characterization of hydrogen impurities: Total Hydrocarbon measurement, CO and CO<sub>2</sub> measurement and formaldehyde and formic acid measurement.

This includes the following solutions:

- Humidity in pure H<sub>2</sub> with ou DET H<sub>2</sub>O range 0-10 ppm
- chromaTHC for CH<sub>4</sub> and NMTHC range 0-100 ppm
- CO and CO<sub>2</sub> with chromaCO
- Formaldehyde 0,2 ppm with airmoHCHO
- Total halogenated compounds 50 ppb (hydrogen bromide, hydrogen chloride and chlorine)
- Sulfur in hydrogen : H<sub>2</sub>S only by H<sub>2</sub>S MEDOR form 1 ppb to ppm range (with specific column and heart cut for H<sub>2</sub>), Total Sulfur by chromaS 1ppb
- N<sub>2</sub>, Ar, He and O<sub>2</sub> with chromaDID for range 0,1 – 10 ppm or higher, or with chromaTCD for range 5-10 000 ppm
- NH<sub>3</sub> by FTUV analyzer for 0 – 10 ppm range

So cost-effective and fully automatic turnkey solutions for the measurement of trace level impurities in hydrogen may be proposed. A combination of several analytical techniques and methodologies are necessary to perform the full scope but it can be done automatically using industrial automatic gas chromatograph systems.

## Continuous monitoring of natural gas and permanent gases

Permanent gas analysis covers a wide range of applications in the petrochemical, chemical, and energy industry fields. For example, permanent gases such as O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, Ar, CH<sub>4</sub> or ethane are common in pure gas manufacturing, refinery gases, natural gas, fuel cell gases, and many other industrial processes.

Automatic identification and quantification of the concentration of these components can be important for the control of manufacturing processes and production quality. Chromatotec® has developed a method for the measurement of C1-C6+ in natural gas (H<sub>2</sub>S can be measured as an option)

The system uses N<sub>2</sub> (produced by our Nitroxychrom Nitrogen generator) as its carrier gas and a thermal conductivity detector (TCD).

To run the analytical system, only an electric supply is necessary. The analytical columns are manufactured at Chromatotec® and ensure the good and repeatable separation of the analytes.

The system operates in a manner which enables the detection of the analytes, while other possible interferences are not injected in the main column thanks to a timely commutation.

It is available with a custom configuration for safe and hazardous areas: ATEX, IECEx, CSA and CSA international certifications for its application in refineries and petrochemical plants.



ChromEnergy Analyzer  
in rack and wall-mounted box

## Turnkey solutions for biogas quality control

Chromatotec® proposes an autonomous, robust and reliable solution aimed at biogas quality control produced in continuous.

This solution is based on a reference technology, gas chromatography with TCD detector (GC TCD), allowing to obtain precise results

without interferences. It integrates a hydrogen generator which provide the carrier gas that the GC-TCD needs, making the instrument completely autonomous since it does not need electricity to operate.

It can analyze from 1 to 32 ways of analysis in automatic with a single system allowing multiple points of control.



The miniaturization and the hardening of this technology offers a compact analyzer that can be installed in an industrial environment with small footprint and low level of maintenance. It can be installed in a 19" rack, in a cabinet or in wall-mounted box with a protection index from IP54 to IP66. This mounted box can be temperature-regulated in order to ensure optimum performances even in outdoor. An ATEX version until Zone1 allow to install the instrument in hazardous areas.

This solution has already been deployed on household waste methanation sites to monitor levels of CH<sub>4</sub>, CO<sub>2</sub> and H<sub>2</sub>S for example: this in order to follow in continuous the biogas conformity produced and alert in case the concentration limit is exceeded.

## Analysis and quantification of VOCs and sVOCs emitted from plastic samples

Bottled water consumption has been growing up the last decades and is often perceived as pure and safe. Nevertheless, the Natural Resources Defense Council has shown that one third of the bottled water contained chemical pollutants such as chloroform or benzene in levels that exceed the regulatory limits. Therefore, there is a need for an industrial monitoring system that can analyze plastic samples before it is used for making bottles.

Chromatotec has designed a turnkey solution for the measurement of VOCs and sVOCs in plastic. The samples are heated at high temperature (typically between 200 and 300°C) to release the VOCs and sVOCs from the plastic. The emitted compounds are first collected in a pre-concentrator and then injected in a chromatograph equipped with Flame Ionization Detector and a Mass Spectrometer.

The results from both detectors are automatically processed with Vistachrom Software and provide automatically complete characterization of the sample. This analytical solution is perfectly suited for complete characterization of plastics but also for analysis of VOCs and sVOCs emitted from any solid samples such as rubber or soil samples.

Turnkey solution for complete  
characterization of VOCs and sVOCs  
emitted from solid samples



EUROPE  
SAINT-ANTOINE - FRANCE

USA  
HOUSTON - TEXAS

ASIA  
BEIJING - CHINA