PETROCHEMICAL INDUSTRY SOLUTIONS

SYFT TECHNOLOGIES

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PETROCHEMICAL INDUSTRY SOLUTIONS UTILIZING SIFT-MS

Most fuels and many modern products contain components that originate from hydrocarbons and other organic compounds occurring in crude oil. Since these crude oil-derived products form such an important part of modern life, there is an ongoing need to find and extract the raw material from Earth's crust, separate it into various fractions, and transform these fractions into usable forms.

Selected ion flow tube mass spectrometry (SIFT-MS) provides ground-breaking opportunities to the petrochemical industry across the entire spectrum of prospecting, extraction, and processing. SIFT-MS is the first technology that can quantify the full breadth of light to medium hydrocarbons and other volatile organic compounds (VOCs) in real time, at the required concentrations, and with wide linear and dynamic ranges. Syft

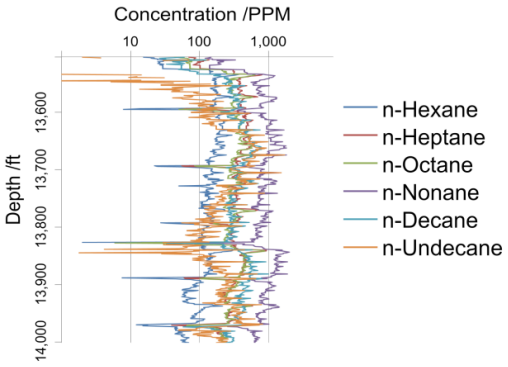
SIFT-MS instruments also deliver benefits in ease of use, ease of integration, remote operation and long-term calibration stability.

SIFT-MS presents a breakthrough in the detection, quantitation and tracing of petroleum hydrocarbons. This brochure outlines several SIFT-MS-based petrochemical industry solutions provided by Syft Technologies.

MUD LOGGING

High-penetration-rate drilling technologies present a challenge to current mud-gas analysis techniques: analytical tools are either too slow, or do not quantify a complete range of compounds. For example, gas chromatography (GC) analyses are often limited to 1 – 5 minutes per analysis cycle, and compounds containing less than six carbon atoms. Faster photometric and electrochemical techniques detect only a limited range of compound types.

SIFT-MS, however, provides comprehensive, quantitative C1 – C14 analysis of mud gas in less than 15 seconds to part-per-billion-by-volume concentrations (ppbv). The SIFT-MS technique also has high immunity to water and a wide dynamic range, which simplifies sample pre-treatment and delivery. Calibration requirements are also greatly reduced in SIFT-MS compared to GC and other methodologies.



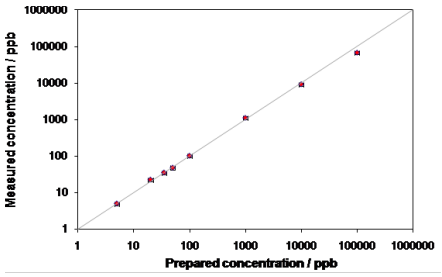
Linear C_6 – C_{11} hydrocarbon concentration vs. depth

SOUR GAS DETECTION

Hydrogen sulfide (H_2S) is a highly toxic and corrosive gas that is often present in oil and gas. For worker safety and corrosion prevention in drilling and refinery plant infrastructure, it is of very great importance to have a rapid, on-line measure of hydrogen sulfide content in natural gas.

The SIFT-MS technique is extremely effective at detecting and quantifying H_2S and other reduced sulfur compounds in natural gas and LPG.

Instruments are able to determine the degree of souring of these fuel gases, in addition to determining their light to medium hydrocarbon composition. The fuel gases are typically diluted 100-fold prior to analysis, but the high sensitivity of SIFT-MS to H_2S means that the crucial concentration of 3.5 ppm in neat natural gas (or 35 ppb in a 1% dilution) is easily measured. This dilution can be performed online.

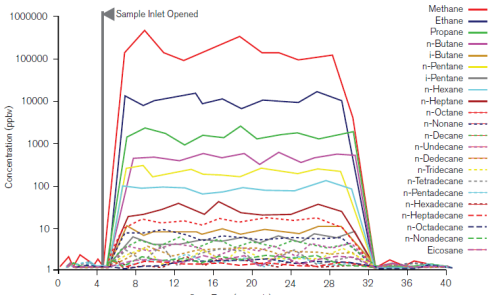


SIFT-MS quantitation of hydrogen sulfide in natural gas (1% in nitrogen) using the H_3O^+ reagent ion. Note that logarithmic scales are used

OIL AND GAS PROSPECTING (SURFACE GEOCHEMISTRY)

Near-surface hydrocarbon exploration exploits the seepage of hydrocarbons to Earth's surface after they are generated at greater depths. When combined with sub-surface geochemical analysis, near-surface hydrocarbon surveys help focus the target area for more expensive exploration techniques, such as 2D and 3D seismic surveys. This significantly reduces exploration cost and risk.

The detection of seeps using light hydrocarbon analysis has most commonly utilized GC-based techniques with inherently slow analysis and sample turnaround time. SIFT-MS is a cutting-edge technology that detects and resolves the critical hydrocarbons in seconds, making large-scale hydrocarbon surveys practical and economic. By applying SIFT-MS, decisions can be made while surveys are taking place, rather than days, weeks, or months later.



Rapid, broad-spectrum hydrocarbon analysis using SIFT-MS

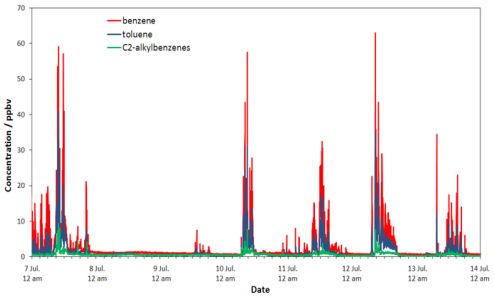
LEAK DETECTION AND FENCE-LINE MONITORING

SIFT-MS is the premium analytical technique for providing diverse protection measures for petrochemical facilities, employees, and the environment. SIFT-MS offers a unique set of characteristics:

- High-sensitivity detection of a wide range of compounds (e.g. hydrocarbons, halocarbons, reduced sulfur compounds, amines, and aldehydes) in one simple analysis
- Direct, real-time analysis enabling instantaneous action to be taken
- Wide dynamic range and high selectivity of three rapidly switchable reagent ions, enabling one instrument to perform different analyses at multiple sample points.

SIFT-MS provides a consistent, quantitative analysis of VOCs. Industrial applications include:

- Leak detection, protecting both workers and plant
- Fence-line monitoring to assure compliance with emissions regulations.



Fence-line monitoring of BT(E+X) emissions from a storage tank over a one-week period. Westerly winds result in high levels at the eastern boundary where measurements were made

SUMMARY

Syft Technologies' SIFT-MS instruments offer unparalleled opportunities for highly sensitive, selective and non-discriminatory analysis of hydrocarbons and other VOCs in diverse petrochemical industry applications, including:

- Real-time, selective analysis of hydrocarbons in high penetration rate mud logging
- Enhanced protection of infrastructure through detection of 'sour' compounds such as hydrogen sulfide
- Greatly increased sample throughput for oil and gas surveys
- Faster detection of leaks that cause product losses, pollution, and pose a hazard to workers
- Assuring the public that there is good air quality at your fence-line in real time, and correlated with meteorology.

Syft Technologies' is committed to its customers' success, delivering fully integrated solutions, user-friendly software, product reliability and extensive after-sales support.

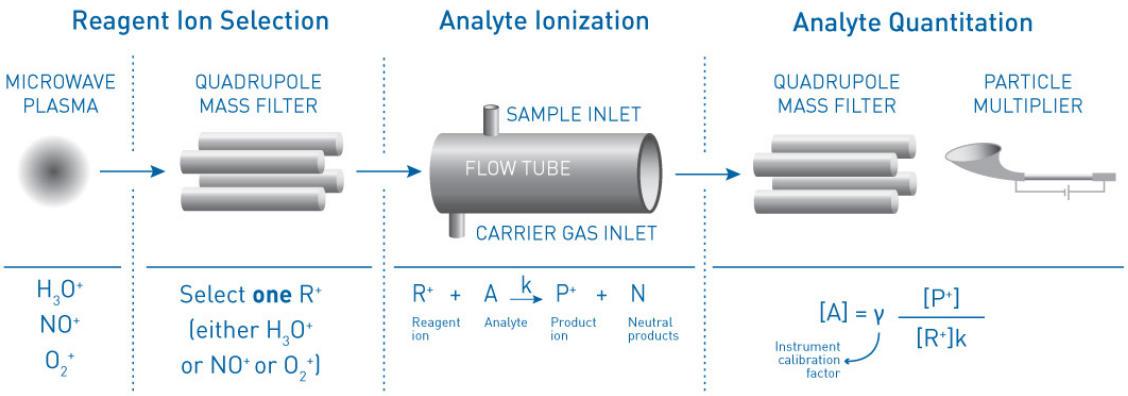
SELECTED ION FLOW TUBE MASS SPECTROMETRY (SIFT-MS)

Syft Technologies' SIFT-MS instruments take real-time volatile organic compound (VOC) analysis to a new level.

SIFT-MS uses ultra-soft, precisely controlled chemical ionization coupled with mass spectrometric detection to rapidly quantify VOCs in gases to low part-per-trillion levels (by volume; pptv).

Three standard chemical ionization agents (reagent ions or precursor ions) are applied in SIFT-MS: H_3O^+, NO^+ and O_2^+. These reagent ions react with trace VOCs in very well controlled ion-molecule reactions but do not react with the major components of air, enabling SIFT-MS to analyze whole air for trace VOCs to low part-per-trillion levels (by volume; pptv) without preconcentration.

The reagent ions are switched within 10 milliseconds, providing unsurpassed selectivity among direct MS techniques.



BENEFITS OF SYFT SIFT-MS INSTRUMENTS

- Instantaneous identification and quantitation of VOCs and inorganic gases using a fully integrated, extensive chemical ionization library
- Real-time air analysis to low part-per-trillion by volume (pptv) concentrations with class-leading selectivity, no preconcentration, and high robustness to humidity
- Analysis of chemically diverse VOCs in a single analysis (e.g. aldehydes, amines and organosulfur compounds)
- Ease of operation with push-button simplicity (including smartphone access), no sample preparation, and comprehensive LabSyft data analysis software
- Designed and engineered for use in commercial, industrial and research environments, with easy integration into sample delivery systems and IT infrastructure
- Reliable, low maintenance instruments and accessories, with market-leading after-sales support

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