

Liquid Propane Gas (LPG) Odorization Monitoring Applications

Analysis of odorants (Mercaptans and DMS) and other sulfur species in LPG with energyMEDOR®

Context & Challenges

LPG is usually odorized with dimethyl sulfide (DMS) and tert-butyl mercaptan (TBM) to alert in case of leakage. The effectiveness of the odorization process must be done by accurate and objective methods.

Gas Chromatography can provide the quantitative speciation of these odorants in LPG, as well as other sulfur impurities such as tetrahydrothiophene (THT) and methylmercaptan (MeSH).

However, this technique is limited by the non-uniformity of the odorized liquid vapors due to the different boiling points of the species. Therefore, analysis must be done directly from the liquid phase.

Chromatotec® Solutions

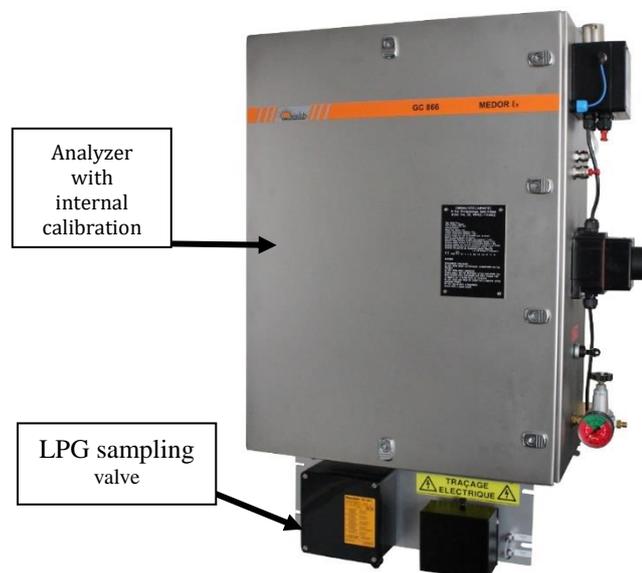
A **LPG sampling valve** specifically designed to extract representative samples from the liquid phase was developed for the analysis of H₂S, mercaptans, DMS and/or Total Sulfur (TS) in LPG at very low concentration levels (ppb and/or ppm).

The extracted liquid sample is then vaporized and injected into the column of the **energyMEDOR® auto-GC analyzer** with a sulfur specific electrochemical detector.

In addition, validation of the results is assured by the **internal calibration** system (permeation tube).

Thanks to an **internal PC** (required for safety areas), it is possible to collect data with **Vistachrom software**. It allows transferring concentrations, TS calculations and status (calibrations, streams, default analyzer) by the **Modbus protocol** to the control room.

Its **calculation module** can perform a daily average of the selected components. This information can be provided to the Modbus driver as well as the component analysis.



The main advantages are:

- Very easy use.
- No auxiliary gas needed: only N2 (nitrogen generator from instrument air in option) or air needed.
- No flammable gases required.
- No need of special pre-instrument filters or conditioners or traps. LPG under liquid phase at 8 to 10 bars is required.
- **energyMEDOR® is available in rack, wall mounted and explosion proof versions**

Technical information and results

energyMEDOR® coupled with an LPG valve was installed in a fuel gas industrial site (Figure 2). Samples of 1 µL of odorized LPG were continuously analyzed.

A chromatographic run of **10 min** allowed separating the analytes of interest from the LPG sample. Figure 3 shows the chromatogram obtained. Concentration values obtained for DMS and TBM were higher than their odor thresholds.

Conclusions

The proposed solution provided:

- Speciation by Gas Chromatography on LPG samples.
- Unique sulfur specific detection with direct response to H₂S, mercaptans and THT.
- Good linearity for each sulfur component studied.
- Robust and compact instrument.
- Minimum maintenance.
- Compliance with ASTM D7493-08 guidelines
- Certification for hazardous areas ATEX, IECEx zone 1 and CSA C1D2.
- State of the art PC and software solutions (Modbus, calculation modules, Windows embedded based software).
- Embedded calibration device with DMS permeation tube for automatic data validation.
- ppb or ppm analyzer version available.

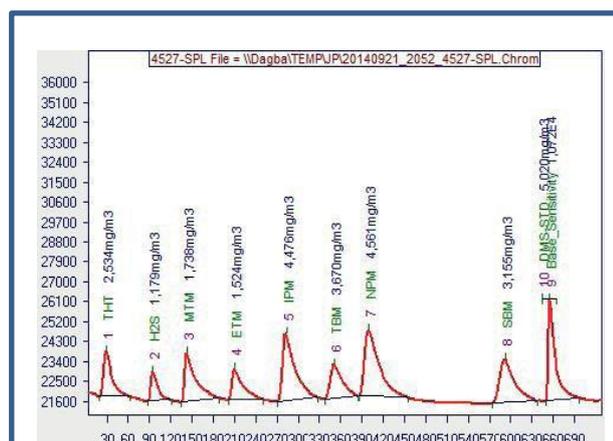


Figure 1. energyMEDOR® chromatogram with 8 compounds and internal CALIB validation



Figure 2. Picture of the energyMEDOR in hazardous area ATEX zone 1

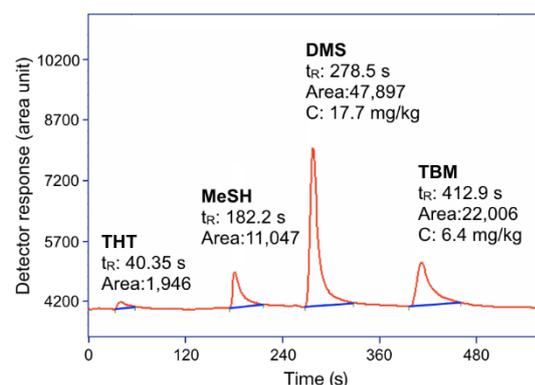


Figure 3. Chromatogram obtained with energyMEDOR® on LPG sample with odorant from Spotleak® by ARKEMA and natural sulfurs like MeSH¹.

1 Seguel, R. J., Mancilla, C. A. & Sakamoto, P. A. Continuous Measurement of Odorant Composition for Liquefied Petroleum Gas. Chem. Eng. Trans. 331–336 (2018). doi:10.3303/CET1868056