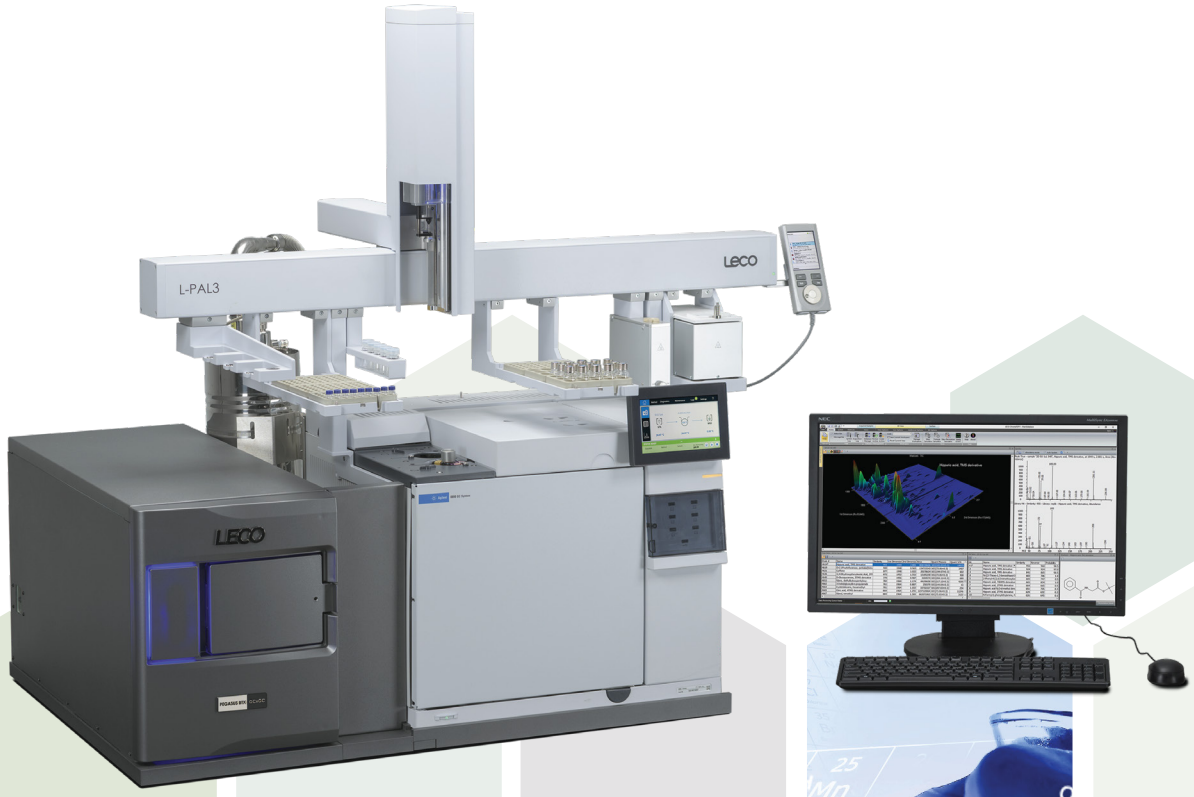
CONFIDENT MOSH/MOAH ANALYSIS WITH DUAL-DETECTION GCxGC-TOFMS/FID

AVOID FALSE POSITIVES. ENSURE COMPLIANCE. BE FUTURE-PROOF.



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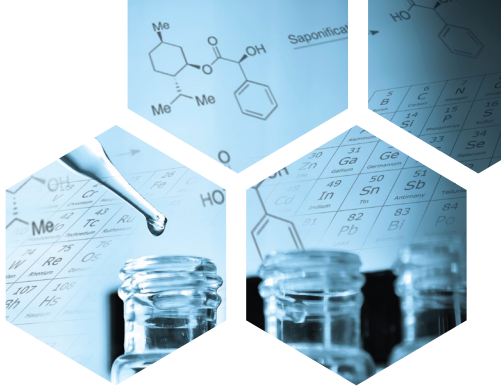

INTRODUCTION

Mineral Oil Hydrocarbons (MOHs), primarily derived from crude oil, pose a significant analytical challenge in food safety due to their complex nature and contamination pathways. They are typically classified into Mineral Oil Saturated Hydrocarbons (MOSH) and Mineral Oil Aromatic Hydrocarbons (MOAH), which can enter food through processing, packaging, or environmental contamination.

Traditional methods such as LC-GC-FID remain important for routine screening but are limited by low specificity and the risk of false positives. Natural compounds like terpenes, squalene, or MOSH carried into the MOAH fraction can interfere with quantitation, while complex mixtures often remain unresolved.

LECO's Pegasus® BTX GC×GC-TOFMS/FID platform addresses these challenges with a powerful dual-detection workflow. By combining comprehensive separation with both quantitative and qualitative data, laboratories can:

- Avoid false positives – confidently distinguish interferences from true MOSH/MOAH signals.
- Support EFSA requirements – separate MOAH by ring count for risk assessment.
- Identify contamination sources – pinpoint DIPNs, DBTs, and other markers of origin.

Even complex food and packaging samples, such as vegetable oils, fats, and spices, can be analysed with confidence—delivering clear results that routine labs can trust.

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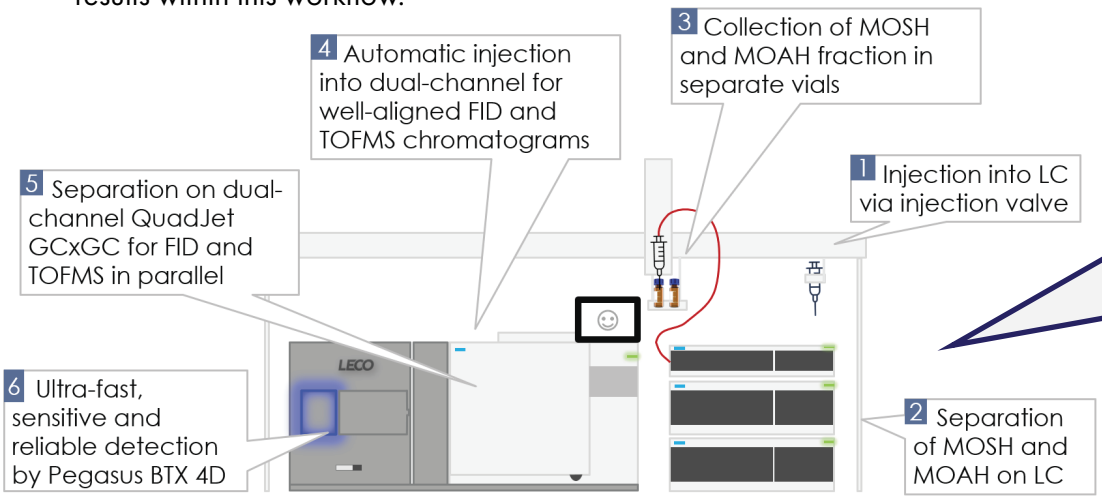
REQUIREMENTS AND WORKFLOW

Accurate MOSH/MOAH analysis still requires sample preparation and fractionation by LC to obtain separate MOSH and MOAH fractions. In this brochure, we focus on the LECO GC×GC-TOFMS/FID instrumentation and our tools providing comprehensive detection and reliable results within this workflow.



Already using LC-GC-FID?
Simply add a Fract & Collect module to collect MOSH and MOAH fractions in two vials—ready for direct injection into LECO's GC×GC-TOFMS/FID system. No need to change your existing workflow.

FIGURE 1: Full MOSH/MOAH workflow: From Sample preparation, LC fractionation required to advanced GC×GC-TOFMS/FID separation and detection.

SYSTEM CONFIGURATION AND BENEFITS

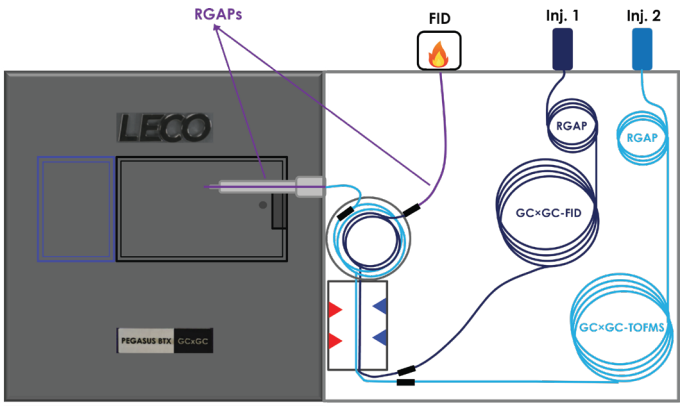


FIGURE 2: Schematic of LECO's dual-channel GC×GC-TOFMS/FID configuration

LECO's Pegasus BTX 4D system delivers both qualitative and quantitative results with superior precision.
Key features include:

- Dual-channel GC×GC configuration with TOFMS and FID
- Independently optimized column sets for seamless retention time alignment
- High separation efficiency and peak capacity
- Accurate analysis of complex MOH mixtures, and qualification of positive LC-GC-FID results

This meticulous setup ensures accurate results even for the most challenging samples.

QUALITATIVE/CONFIRMATORY ANALYSIS OF MOHS

After initial LC-GC-FID screening, unresolved 'humps' often remain. These humps can mask both contaminants and naturally occurring compounds, creating uncertainty and the risk of false positives. LECO's GC×GC-TOFMS platform removes this ambiguity by providing detailed structural information. EFSA highlights MOAH species with 3–7 aromatic rings as most relevant for risk assessment, and LECO separates these clearly by ring number.

Equally important, our system distinguishes MOSH and MOAH from biogenic compounds such as squalene, carotenoids, and terpenes—natural interferences that are frequently misquantified in LC-GC-FID. Figure 3 shows how these biogenic compounds are fully separated, ensuring that only true contaminants are reported with confidence.

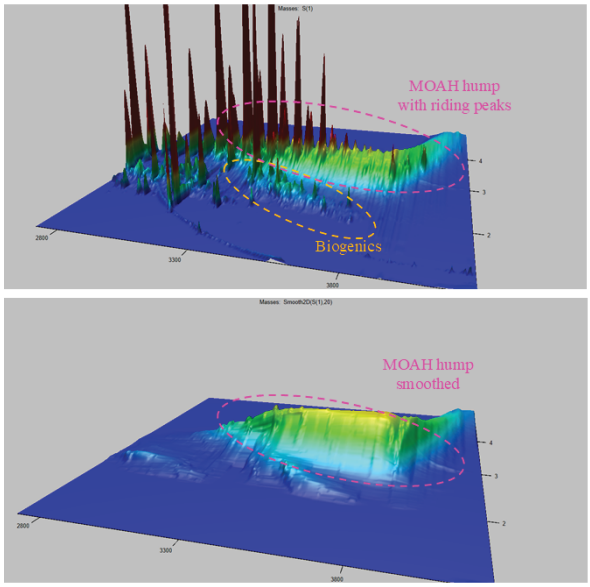


FIGURE 3: Top: Separation of biogenic compounds; Bottom: MO Quant tool applied showing cleaned hump

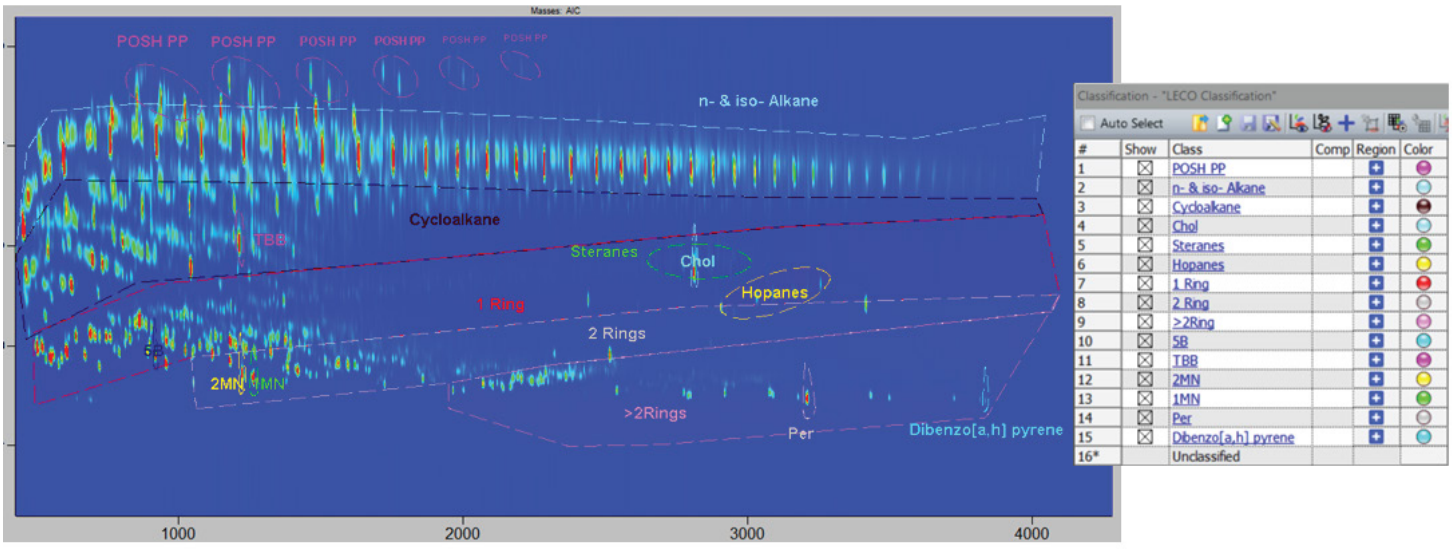


FIGURE 4: GC×GC space mapping using the MoMix reference standard

QUANTITATIVE ANALYSIS OF MOHS

For reliable quantitation of MOSH and MOAH, FID is preferred due to its uniform response to hydrocarbons. However, unresolved signals in complex matrices can obscure true values. LECO overcomes this challenge by combining GC×GC-FID with the MO Quant Tool (Figure 5), which automatically removes overlapping peaks and blank contributions. This delivers smooth, accurate chromatograms that are easy to quantify.

Unlike LC-GC-FID, LECO's GC×GC workflow not only quantifies hydrocarbons more accurately but also provides confirmatory information from TOFMS in parallel. This allows laboratories to both measure concentrations and identify contamination sources, such as Dibenzothiophenes (DBTs) and Diisopropylnaphthalenes (DIPNs). These source markers provide valuable insight into the origin of contamination, strengthening risk assessment and regulatory reporting.

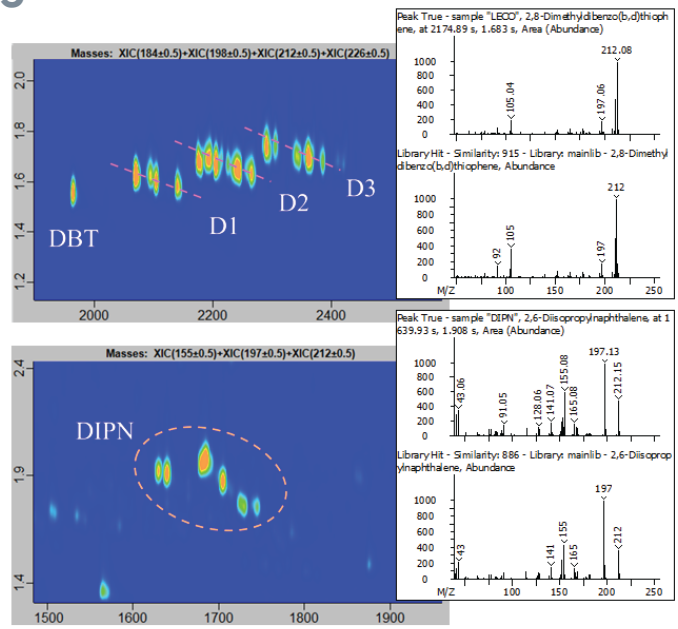


FIGURE 5: GC×GC-TOFMS contour plots showing Dibenzothiophenes (DBTs) and Diisopropylnaphthalenes (DIPNs) indicating contamination sources

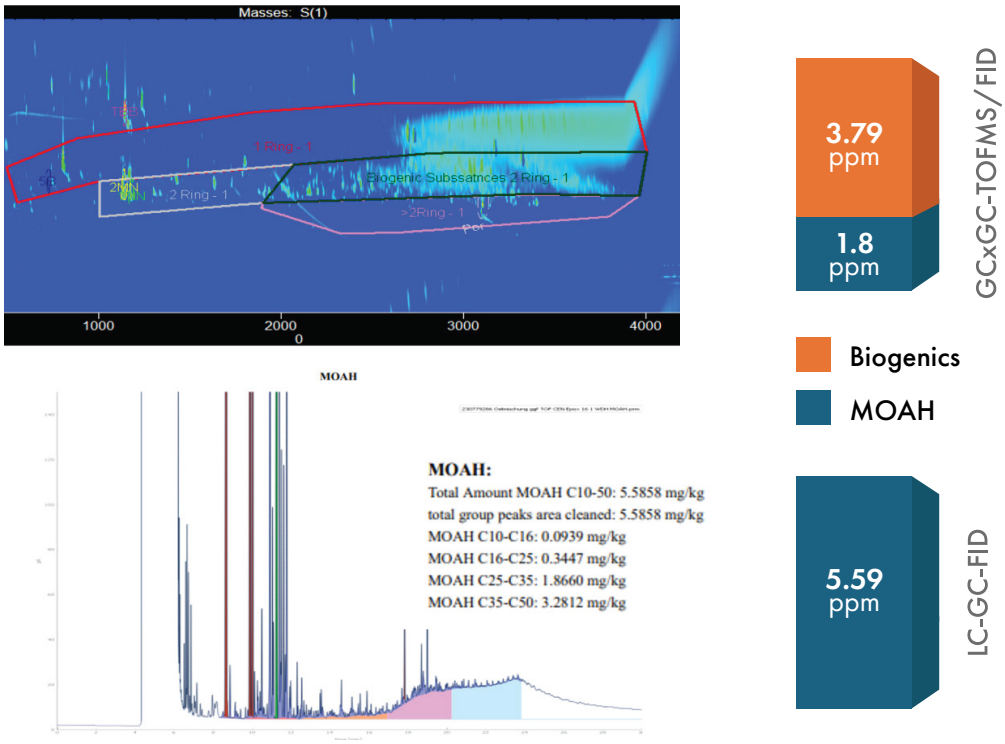


FIGURE 6: Improved GC×GC separation of MOAH fractions ensures accurate quantitation. A sample classified as non-compliant by LC-GC-FID is correctly resolved and quantified with LECO GC×GC-FID.

Choose LECO. Analyse your samples with Confidence.

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SYSTEM VERIFICATION AND SUPPORT

Every Pegasus® BTX system is fully tested and verified upon installation to ensure confidence from day one. This includes:

- Complete hardware and software integration
- Conformance testing according to JRC technical reports
- Performance checks using the MoMix reference standard
- Our commissioning process goes beyond a simple setup.

Each installation includes:

- Site Acceptance Testing with real-world matrices (e.g. vegetable oils and fats)
- Mapping of elution areas for key MOSH/MOAH classes
- Verification of quantitation using proficiency test samples with known spiked amounts

Once installed, your team receives hands-on training, ensuring you can move quickly from method familiarisation to confident routine operation.

History

Since 2020, LECO has been the first and only provider to offer both qualitative and quantitative MOSH/MOAH analysis in one validated workflow. Our advanced instrumentation, powerful software tools, and dedicated support ensure reliable results and user confidence.

References

1. Update of the risk assessment of mineral oil hydrocarbons in food. EFSA Journal 2023;21(9):8215
2. S. Bratinova, P. Robouch, E. Hoekstra, Guidance on sampling, analysis and data reporting for the monitoring of mineral oil hydrocarbons in food and food contact materials – 2nd Edition, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/963728, JRC133174

WHY LABS CHOOSE LECO

- Avoid false positives from natural interferences such as terpenes, squalene, or MOSH carried into MOAH fractions
- Meet EFSA guidelines with clear MOAH ring separation for risk assessment
- Identify contamination sources (e.g. DIPNs, DBTs) with confidence
- Seamless integration with existing LC-GC-FID workflows through Fract & Collect
- Trusted results even in complex matrices like vegetable oils, fats, and spices

YOUR COMPLETE MOSH/MOAH SOLUTION

For customers seeking a full solution, LECO - together with our partners - offers a complete MOSH/MOAH workflow. This combines LC-GC-FID for regulatory compliance with GC×GC-TOFMS/FID for advanced confirmation, risk assessment, and source identification.

Take the Next Step

Interested in a demo or sending samples? Scan the QR code or contact us to see how LECO's solution can work in your lab.

"LECO's GC×GC-TOFMS/FID system gives us the certainty we need. It eliminates coeluting and biogenic interferences, allowing us to confidently quantify what's really in the sample. That confirmation is critical — especially when contamination levels are close to the LOQ and the margin of error is so narrow."
– Prof. Wenceslao Moreda, Instituto de la Grasa (CSIC)

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