

CMT Case Story 05 / 2026

The standardisation of Onboard Oil Analysis across a large managed fleet

The Challenge

For large, globally trading fleets, maintaining consistency in fuel and lubricating oil analysis presents a structural challenge. While most operators recognise the importance of condition monitoring, the methods used to generate and interpret that data often vary between vessels. Differences in test equipment, procedures and reporting standards can fragment datasets, limiting their value for fleet-wide decision-making.

This challenge has become more pronounced in the post-IMO 2020 fuel landscape, and even more so given the fuel price hike following the Hormuz Crisis.

The widespread adoption of very low sulphur fuel oils (VLSFO) and other blended fuels has introduced greater variability in fuel behaviour once onboard. Even fuels delivered within specification can present compatibility issues, instability, or elevated contaminant levels depending on storage, handling and mixing conditions. In this environment, reliance on supplier documentation or delayed laboratory analysis provides only a partial picture of operational risk.

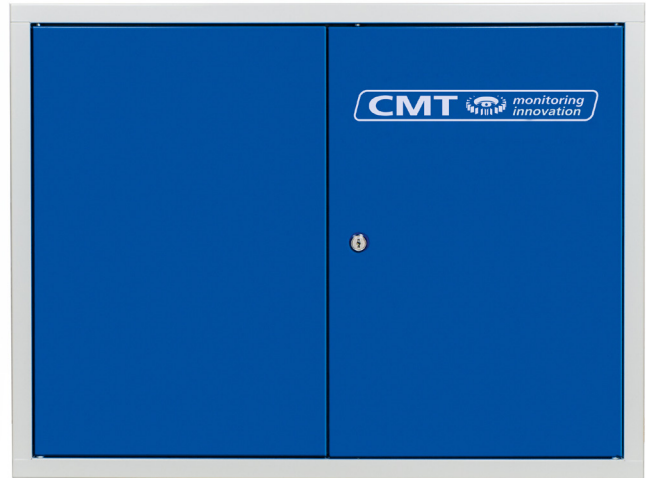
Traditional oil analysis models, based on sending samples ashore to oil majors or third-party laboratories, remain accurate but introduce a time lag between sampling and results. For vessels operating on tight schedules, this delay reduces the ability to respond quickly to emerging issues.

At the same time, inconsistent onboard testing practices can make it difficult to compare results across vessels — a significant limitation for operators managing large fleets.

The Approach

To address this, a prominent German shipmanager moved towards a standardised onboard testing model for a fleet of about 300 containerships and bulk carriers.

Working with CM Technologies to deploy integrated oil analysis systems across its fleet, the company started fuel and oil analysis not as an engineering function but more of a fleet-wide operational control system, where consistency of performance, quality and monitoring methodology are all interlinked.



CMT Test Kit Cabinet

Fluids analysis standardisation using a single testing platform simplifies procurement and lifecycle management. It reduces the complexity associated with managing multiple suppliers and testing approaches, while ensuring uniform training, maintenance and data interpretation across the fleet.

At the core of this approach is the deployment of CMT's compact onboard test cabinets.

Each unit integrates a range of diagnostic tools, including iron testing systems, fuel compatibility kits, viscosity and density measurement devices, cat fines analysis and general lube oil testing capability. This creates a repeatable and standardised testing environment on every vessel.

Implementation

The rollout has taken place progressively over the past decade, aligned with fleet expansion and technical management requirements. By standardising both equipment and testing procedures, the shipmanager has established a consistent onboard diagnostic framework across its vessels.

In practice, testing is embedded into daily operations rather than treated as a periodic or external process. Analysis is carried out at multiple stages, including during bunkering to verify incoming fuel quality, as part of routine engine condition monitoring, and in response to suspected abnormalities.



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This approach was found to reduce reliance on shore-based laboratories by enabling crews to carry out immediate analysis onboard. Engineers can assess fuel and lubricating oil condition in real time, using consistent methods and equipment across the fleet.

More recently, the system has been refined through the replacement of traditional wet chemical iron test kits with ferrous wear measurement devices.

This transition reflects a broader move towards instrument-based diagnostics, offering improved accuracy and repeatability while reducing dependence on consumables such as reagents.

What's tested

Each test parameter within the system serves a specific diagnostic function, contributing to a broader understanding of machinery condition.

For example, water content analysis is critical in identifying contamination that can compromise lubrication performance. Even relatively low levels of water ingress can promote corrosion within engine components and piping systems, leading to progressive damage if not addressed early.



CMT Touch Cell

Cat fines testing addresses the presence of catalytic particles, primarily aluminium and silicon, originating from the refining process. These particles are highly abrasive and, if not effectively managed, can pass through fuel treatment systems and cause accelerated wear in fuel pumps, injectors and cylinder liners.

Viscosity and density measurements provide verification of fuel properties at the point of delivery, offering a means of confirming that bunkered fuel meets expected

specifications. This also introduces an element of commercial protection, allowing operators to independently assess fuel quality rather than relying solely on supplier documentation.

Iron content analysis, particularly in cylinder drain oil, provides a direct indicator of engine wear. Monitoring iron



CMT Iron Console

levels over time enables engineers to track wear rates and identify abnormal trends before they develop into more serious mechanical issues.

Individually, these parameters provide useful data points. Collectively, and when monitored consistently, they form the basis of a structured condition monitoring regime.

Data and Fleet-Level Insight

The standardisation of testing equipment across the fleet enables a level of data comparability that is difficult to achieve from a test kits from a variety of suppliers.

With a CMT test kit, there are consistent methodologies in place where technical teams can compare measurements between vessels, benchmark performance across sister ships and identify deviations with greater precision.

The shipmanager said a CMT Test Kit has “transformed onboard testing from a vessel-level activity into a fleet intelligence tool”.

Rather than relying on isolated data points, operators can analyse trends across the fleet, investigate outliers and refine maintenance strategies based on actual operating conditions. This supports a more proactive approach to technical management, grounded in consistent and repeatable data.



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Operational Impact

The rapid results from onboard analysis results in shorter time between sampling and action. Crews are able to respond immediately to verified data, rather than waiting for external analysis to arrive, often weeks later.

This has a direct effect on operational risk and reduces maintenance costs. For instance, the early detection of contamination, abnormal wear and fuel quality issues allows corrective action to be taken before problems escalate. The result is an extended intervention window, reducing the likelihood of unplanned downtime or major machinery failure.

At fleet level, the consistency of data improves decision confidence. Technical managers can act on comparable, reliable information, supporting more targeted interventions and reducing uncertainty in maintenance planning.

The transition towards instrument-based testing further strengthens this framework. By reducing reliance on manual, reagent-based methods, the system improves repeatability and simplifies onboard procedures, enhancing the overall reliability of the data being collected.



CMT Viscosity/Density Meter

Key Benefits

The benefits of this approach are cumulative and primarily operational in nature, emerging from the combination of consistency, immediacy and improved data quality.

- **Failure prevention**
Early detection of contamination and wear reduces the risk of escalation into major machinery damage.
- **Faster decision-making**
Onboard testing shortens the feedback loop between sampling and action.
- **Fleet-wide consistency**
Standardised equipment enables direct comparison between vessels, supporting benchmarking and trend analysis.
- **Improved operational control**
Reduced reliance on external laboratories and independent verification of fuel quality at delivery.
- **Extended intervention window**
Earlier detection allows corrective action before issues develop into failures.
- **Improved data reliability**
Instrument-based diagnostics enhance accuracy and repeatability across the fleet.

Findings

The adoption of standardised onboard oil analysis across the owner's fleet reflects a broader shift in maritime technical management.

Condition monitoring is no longer treated as a discrete onboard function, but as an integrated system linking measurement, data consistency and fleet-level decision-making. By aligning testing methods across vessels and enabling real-time analysis, operators gain greater control over machinery condition and reduce exposure to operational risk. As fuel variability increases and operational margins tighten, the ability to generate reliable, comparable data across a fleet is becoming a defining capability. In this context, onboard testing is moving from a supplementary tool to a central component of modern fleet management — one that supports not only technical performance, but overall operational resilience.

