

CASE STUDY

Water Ingress Detection in Marine Diesel Engine

Real-time water monitoring for marine vessel lubricating oil

In marine vessel operations, protecting diesel engine lubrication systems from water ingress is critical to avoiding catastrophic mechanical failure and unplanned vessel downtime. **Spectrolytic FluidInspectIR®** provides a data-driven solution that detects water contamination events as they occur — enabling a shift from periodic lab sampling to **real-time, condition-based intervention**.

This case study highlights a proven marine application where FluidInspectIR® identified the root cause of intermittent water spikes, enabling a planned cooler replacement that avoided catastrophic engine damage.

Inline Real-time water concentration monitoring	Planned Cooler replacement before failure	£115,000 Total saving over 9 months
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The Challenge

A marine vessel's diesel engine began showing unexplained water concentration spikes in the lubricating oil. Despite periodic lab sampling, the source and timing of the ingress could not be identified — leaving the vessel at risk of cooler failure, lubricant degradation, and unplanned downtime.

The operator required a reliable method to detect water ingress in real time and identify when and why it was occurring — to protect critical engine components between sampling intervals.

- Unexplained water spikes with no identifiable pattern using periodic lab sampling
- Risk of cooler failure and catastrophic engine damage during undetected events
- Inability of standard lab analysis to correlate water ingress with operational events
- Critical engine components left exposed between sampling intervals
- Vessel availability and health & safety implications of an unplanned failure

The Solution

A **Spectrolytic FluidInspectIR®** system was installed on the diesel engine to provide continuous, real-time monitoring of water concentration in the lubricating oil. Using mid-IR based chemical analysis, the system captured every water ingress event as it occurred — delivering the temporal resolution necessary to identify the root cause.

The inline data immediately revealed that water spikes were correlated with **harbour mooring events** — a pattern entirely invisible to periodic lab sampling. This insight enabled the engineering team to identify a failing cooler and plan its replacement before catastrophic damage occurred.

Implementation

- Installation of FluidInspectIR® on the marine diesel engine lubrication circuit
- Continuous real-time monitoring of water concentration in engine lubricating oil

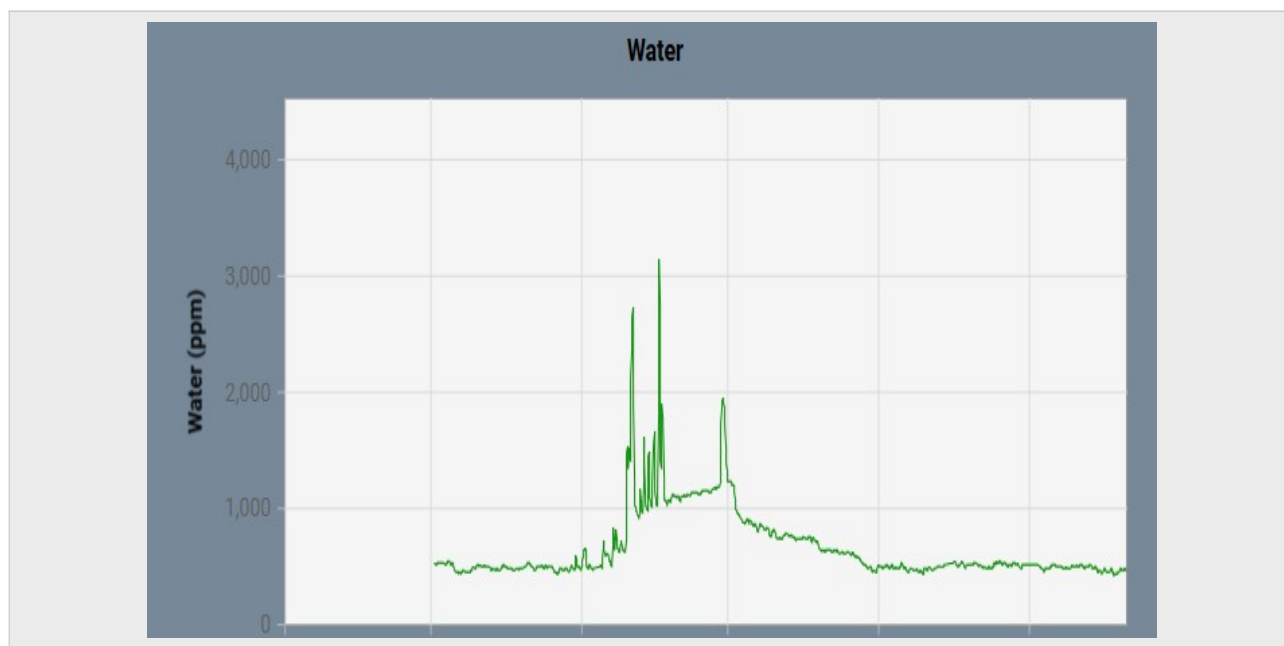
- Capture and trending of water concentration data across all operational events
- Correlation of water spike events with vessel operational mode (mooring / underway)
- Root cause identification enabling planned maintenance intervention

Results

The deployment delivered clear, measurable outcomes:

- Water concentration spikes detected in real time during harbour mooring events
- Root cause identified as **a failing cooler** — impossible to determine from lab samples alone
- Cooler failure identified and **replaced in a planned manner** before catastrophic engine damage
- Vessel availability maintained and risk of unplanned downtime eliminated
- Health & safety improved by removing reliance on manual sampling during active operations

USE CASE — MARINE: WATER CONCENTRATION TRENDING



Real-time water concentration (ppm) captured by FluidInspectIR® — showing water ingress spikes correlated with harbour mooring events. Each spike is captured the moment it occurs, entirely impossible to detect with standard periodic lab analysis.

Operational Impact

- Avoided catastrophic engine failure through early water ingress detection
- Planned cooler replacement — eliminating risk of unplanned vessel downtime
- Reduced lubricant consumption and associated replacement costs
- Improved health & safety by removing reliance on manual oil sampling at sea
- Increased confidence in maintenance decision-making and scheduled interventions
- Protection of high-value engine components between traditional sampling intervals

Key Insight

FluidInspectIR® provided the actionable, real-time data required to identify water ingress events that were entirely invisible to periodic lab sampling — and crucially, to correlate those events with a specific operational cause. Rather than discovering cooler failure after catastrophic engine damage had occurred, the vessel operator could intervene in a planned, controlled manner the moment the pattern was identified.

Financial Benefits

Total saving over 9 months:	£115,000
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Conclusion

Spectrolytic FluidInspectIR® enables marine operators to move beyond reactive lab sampling and protect critical engine systems with real-time water detection — even when the contamination source is intermittent and operationally linked.

The result is a measurable combination of **avoided downtime, planned maintenance intervention, and improved health & safety** — supported by real, actionable data that periodic sampling simply cannot provide.

Real-time inline oil condition monitoring is no longer just a maintenance improvement — it is a strategic safeguard for high-value marine assets and vessel operational integrity.

Organisations adopting advanced monitoring solutions such as Spectrolytic FluidInspectIR® today will be best positioned to manage asset risk and optimise vessel performance tomorrow.

Interested in understanding how this can be applied within your operations?

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