

CASE STUDY

Daily Oil Condition Intelligence for Gas Turbine Reliability

Continuous inline monitoring of acid number, water content, oxidation, and amine concentration — replacing quarterly lab sampling with real-time actionable data



Gas turbine operators rely on lubricating oil to maintain bearing integrity and system reliability under extreme operating conditions. Oil degradation — whether through oxidation, moisture ingress, additive depletion, or acid build-up — can progress rapidly, yet traditional monitoring programmes depend on laboratory analysis with turnaround times measured in weeks.

A recent **FluidInspectIR®** installation on a gas turbine is already delivering real value — giving the operator **daily actionable data** where previously they waited up to three months for laboratory results.

Daily Oil condition data vs. quarterly lab reports	4-Parameter Acid number · Water · Oxidation · Amine concentration	Compact Inline, online solution with no sample extraction
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The Challenge

Gas turbines place exceptional demands on lubricating oil. High temperatures accelerate oxidation and acid number increase; moisture ingress threatens bearing surfaces; amine-based additives deplete over time, reducing the oil's protective capacity. The window between normal degradation and a condition requiring immediate intervention can be narrow.

For this customer, oil condition monitoring had relied on periodic laboratory analysis — samples sent away every three months and results received days or weeks later. This left long gaps during which the turbine was running with no real-time visibility into oil health, and no ability to detect a rapid degradation event before it escalated.

- Quarterly lab sampling left up to 90 days of blind operation between data points
- No ability to detect rapid oxidation or water ingress events in real time
- Acid number and amine depletion trends invisible between sampling intervals

- Maintenance decisions made on historical data, not current oil condition
- Risk of unplanned turbine downtime due to undetected oil degradation

The Solution

A **Spectrolytic FluidInspectIR®** was installed inline on the gas turbine lubrication circuit, providing continuous, automated measurement of four critical oil parameters:

- Acid Number — early indicator of oil oxidation and additive breakdown
- Water Content — detection of moisture ingress that threatens bearing surfaces
- Oxidation — direct measurement of oil degradation at the molecular level
- Amine Concentration — tracking of antioxidant additive depletion over time

The compact, online form factor required no process interruption for installation and no manual sample extraction — data flows continuously from the turbine lube oil system to the operator's monitoring platform.

Implementation

- FluidInspectIR® installed inline on the gas turbine lubrication circuit — continuous flow-through measurement with no sample extraction
- Four-parameter model deployed: Acid Number, Water Content, Oxidation, and Amine Concentration measured simultaneously
- Real-time data output replacing the previous quarterly laboratory sampling programme
- Trending dashboards configured to display daily oil condition readings and flag parameter drift against defined alarm limits
- Baseline oil condition profile established on commissioning to provide a reference for ongoing trend analysis

Results

The installation is already delivering measurable operational value:

- Daily oil condition data replacing quarterly lab reports — a 90× increase in monitoring frequency
- Acid number and oxidation trends now visible in real time, enabling early intervention before limits are breached
- Water content monitored continuously — moisture ingress events detectable within hours rather than months
- Amine concentration tracking enables condition-based additive top-up, extending oil service life
- Faster maintenance decision-making backed by current data rather than historical lab results
- Greater confidence in turbine reliability through continuous, quantified oil health assurance

USE CASE — GAS TURBINE: REAL-TIME OIL DEGRADATION TRENDING



Continuous oil condition data captured by FluidInspectIR® — showing real-time trends in acid number, oxidation, water content, and amine concentration across turbine operating cycles. Each data point represents insight that was previously unavailable between quarterly laboratory samples.

Operational Impact

- Elimination of the 90-day blind spot between laboratory sampling intervals
- Condition-based oil management replacing fixed-interval sampling and change schedules
- Earlier detection of oil degradation enabling planned intervention rather than reactive maintenance
- Reduced laboratory costs through significantly reduced dependence on external oil analysis
- Increased turbine availability through proactive oil condition management
- Auditable, continuous oil health record supporting maintenance documentation and compliance requirements

Key Insight

The transition from quarterly laboratory sampling to daily inline measurement is not simply an improvement in monitoring frequency — it is a fundamental shift in how gas turbine operators can manage oil condition. With FluidInspectIR®, degradation trends that previously remained invisible for weeks or months become visible within hours, enabling operators to act on current data rather than historical snapshots. The result is greater turbine reliability, lower maintenance risk, and a more cost-effective approach to oil condition management.



Financial Benefits

Reduced lab costs + extended oil life + avoided unplanned downtime:	Proven ROI
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Comprising: elimination of quarterly external lab sampling, condition-based oil life extension, and reduction in unplanned maintenance events

Conclusion

Spectrolytic FluidInspectIR® transforms gas turbine oil condition monitoring from a periodic, retrospective process into a continuous, real-time capability — delivering daily actionable data from a compact, inline solution.

For operators managing critical rotating assets, the ability to monitor acid number, water content, oxidation, and amine concentration in real time represents a significant step forward in **turbine reliability, maintenance efficiency, and oil management cost control.**

This installation demonstrates that real-time oil condition intelligence is no longer the preserve of large-scale refineries and process plants — it is now available, compact, and deployable on individual gas turbines, delivering value from day one.

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

Patrick Taylor | patrick.taylor@spectrolytic.com | +44 7795 260490
Carsten Giebeler | carsten.giebeler@spectrolytic.com | +44 7515 697010

spectrolytic.com