

XRF Analyser

Testing at sea, offshore or on land



Meeting new Sulphur limits for marine fuel oil

The ability to spot check the Sulphur content of fuel oil onboard a ship will help shipowners and operators ensure compliance with the latest IMO (MARPOL) regulations.

From January 2020 the maximum allowable Sulphur content of marine fuels is changing: for all areas outside the existing Sulphur Emission Control Areas (SECAs) the limit will be reduced from the current level of 3.50% m/m to just 0.50% m/m.

Introduced by the International Maritime Organization (IMO), the new limit is being applied worldwide and covers the fuel oils used in main and auxiliary engines as well as in boilers. Compliance with the new regulations will be monitored by Port State Control.





For shipowners and operators, the new limit leaves little room for error. The traditional method of Sulphur level confirmation by Bunker delivery note significantly increases the risk of non-compliance and subsequent penalties, furthermore waiting for a laboratory analysis is equally flawed as the vessel could have sailed by the time that is received and the Sulphur level found to be outside the specified limit.

With this new equipment bunkers can be sampled during delivery and non-compliance could be identified in the first few minutes of delivery (and at any other time interval) thereby preventing expensive de-bunkering and payment for non-compliant fuel.

It will be essential for each vessel to know and comply with the Sulphur limits of 0.10% m/m in SECAs or 0.50% m/m in all other areas worldwide. Furthermore, the XRF Analyser is particularly helpful for demonstrating legislative compliance during fuel changeovers conducted at the entry or exit of a SECA.

On-Board testing is one of the most effective means of establishing fuel compliance with the Sulphur regulations.

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As a lightweight, portable and self-contained X-Ray Fluorescence (XRF) spectrometer, the XRF Analyser enables in-situ lab standard testing of fuel oils at sea or on land.

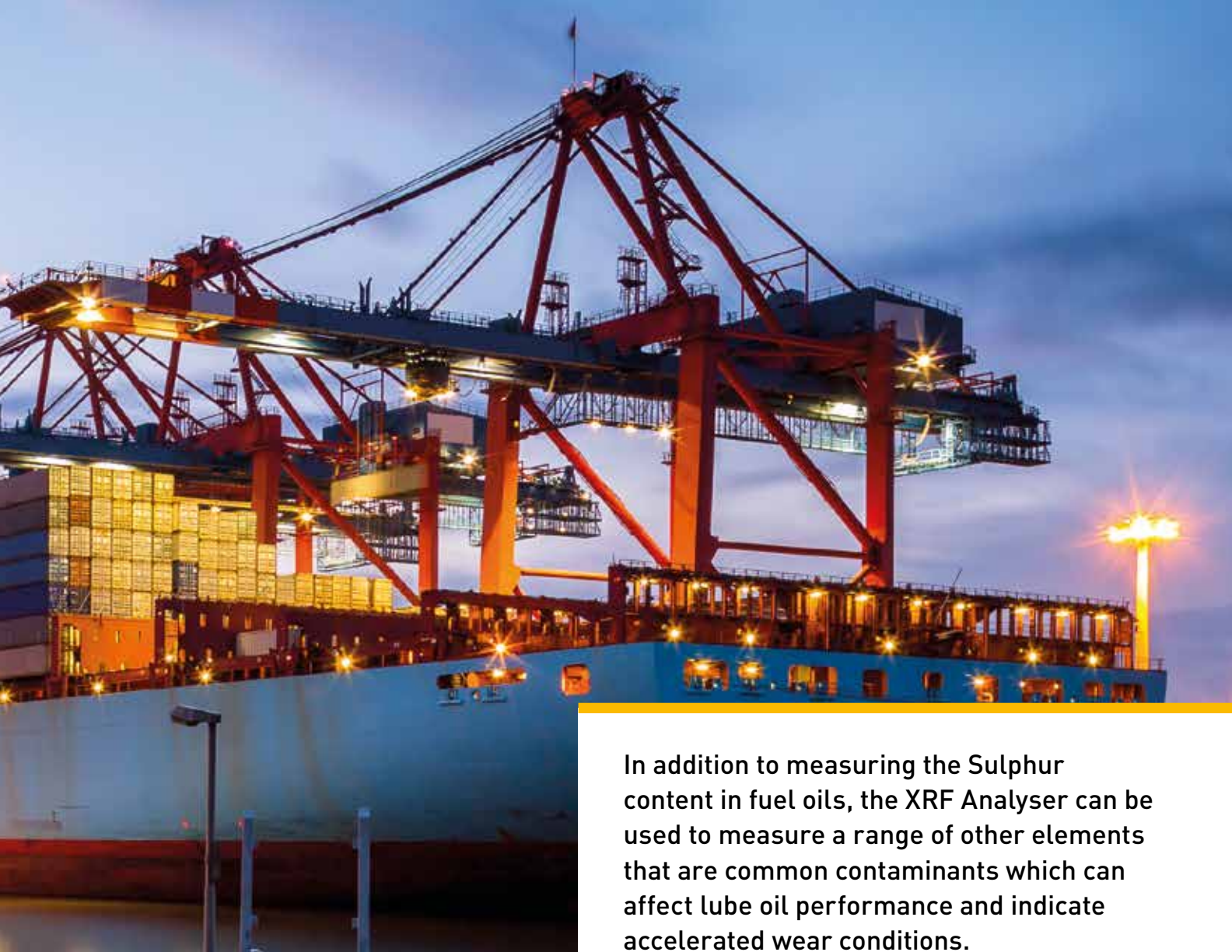
The XRF Analyser can, for example, be used in the engine room or control room of a ship to test the Sulphur content of fuel oil as it is being delivered. Checking the fuel during delivery allowing ships personnel to verify that the Sulphur content shown on the bunker delivery note is correct, thus eliminating the risk of accidental non-compliance.

The XRF can be used by suppliers, brokers, surveyors and producers of bunker fuels. Faster and more accessible testing means that the XRF Analyser allows fuel oils to be tested more frequently and conveniently compared to sending samples to a laboratory. By allowing test results to be downloaded, or storing them for up to two years, the XRF Analyser also plays an important role in helping vessel operators to manage compliance audits more efficiently.



“The Parker Kittiwake XRF Analyser is factory calibrated according to the widely accepted ISO 8754 standard.”

Dr David Atkinson - Principal Chemist



In addition to measuring the Sulphur content in fuel oils, the XRF Analyser can be used to measure a range of other elements that are common contaminants which can affect lube oil performance and indicate accelerated wear conditions.

Wear elements measured by the Parker Kittiwake XRF Analyser and their likely sources onboard a ship (if any).

Element	Likely sources onboard a ship
Chromium	Cylinder liners or pistons/piston rings, gears
Copper	Cylinder liners, pistons/piston rings, or bearings, stuffing box, gears, hydraulic systems
Iron	Cylinder liners or pistons/piston rings, gears, stern tubes, hydraulic systems
Lead	Cylinder liners, pistons/piston rings, or bearings, gears, stern tubes
Nickel	Fuel contaminant
Vanadium	Fuel contaminant
Zinc	Lubricant additive
Molybdenum	Trunk piston engine cylinder liners, pistons/piston rings
Silver	Trunk piston engine bearings
Calcium	Lubricant additive
Titanium	Not applicable for marine
Manganese	Not applicable for marine
Cadmium	Not applicable for marine

Element	Source within fuel
Sulphur	Crude oil

Portable XRF Analyser

The XRF Analyser combines simplicity with accuracy. Its standalone operation means that it offers immediate plug-and-play operation.

Integrated into the small, lightweight housing is a high-resolution LCD touch-screen display which enables fast operation and delivers clear results.

The operator simply draws the sample of fuel oil from the ship's system into the sample container, places it in the XRF Analyser and presses the test button. As the sample is not damaged or altered during testing, it can be retained for any additional sample analysis.

The result of the test is displayed percentage of Sulphur in the sample. This helps to avoid ambiguity and human error by eliminating the need for the operator to interpret the test data.

XRF Consumables Pack (Part code: ACCK04001)

XRF Consumables Pack	Quantity
Sample Cup	100
Dose Syringes	100
Test Mylar for Cube 100S Plus	1 reel (30mtr)
Copper target	Pack of 5
Adhesive labels	1 reel (10mtr)

XRF Check Standards (Part code: ACCK04002)

XRF Check Standards	Quantity
0.35 % Sulphur Standard	100ml
2 % Sulphur Standard	100ml
3 % Sulphur Standard	100ml





A proven partner

The XRF Analyser is part of Parker Kittiwake's range of condition-monitoring equipment.

This equipment is used where maximum efficiency and total confidence are vital in protecting capital plant and equipment. Our equipment is used extensively throughout the Marine, oil and gas, energy generation, aviation and industrial sectors.

Sustained investment in R&D over the past 25 years has enabled Parker Kittiwake to produce best-in-class systems for the accurate monitoring and analysis of in-service lubricants, hydraulics, wear metals, fuels, gasses and acoustic emissions.

In addition to ensuring compliance to global regulations, Parker Kittiwake's conditioning-monitoring systems are used to provide the earliest indication of failure. This enables operators to use predictive and proactive maintenance to minimize repair costs and extend the lifetime of the equipment.

By supporting an intelligence-led approach to maintenance, condition-monitoring equipment can significantly reduce system downtime and make a direct contribution to increasing productivity and profitability.

Parker Kittiwake is part of a \$16.5bn engineering corporation, serving customers from a worldwide network of technical support centres. Winner of the Lloyds List Engineering Award, 2016, Parker Kittiwake holds several patents and its systems are used to monitor many thousands of vessels over the past 25 years at all levels of sophistication value and complexity. In every case giving the operator vital information in advance of the action required.

As a global leader in condition-monitoring equipment, Parker Kittiwake is synonymous with efficiency and innovation and is trusted to ensure the highest levels of protection.

Product Description



Unit dimensions 212 mm (w) x 258 mm (h) x 258 mm (d)

Technical specification

Rated Input Voltage	9 V D.C.
Operating temperature	15 to 30 °C
Operating humidity	< 70 %
Instrument weight	4.5 kg
Test time	130 seconds (typical)
Unit dimensions	212 mm (w) x 258 mm (h) x 258 mm (d)
X-ray tube	40 kV, 100 μ A
Detector type	Silicon drift
Measurable elements	Sulphur, calcium, titanium, vanadium, chromium, manganese, iron, nickel, copper, zinc, molybdenum, silver, cadmium, lead

Chemical Compatibility

The XRF Analyser is only intended to measure liquid hydrocarbons, such as lubricating oils and fuel samples.

Any liquids that are chemically incompatible with polyester may breach the Mylar film used to retain samples and destroy the X-ray detector.

Sulphur measurement precision

The Parker Kittiwake XRF Analyser is factory calibrated according to ISO 8754 and makes field sulphur concentration measurements that correlate strongly with ISO 8754 laboratory measurements.

The repeatability of the instrument, established at three different sulphur concentrations using accepted laboratory and statistical techniques, is actually better than that provided in ISO 8754. Given this information, the reproducibility of the unit should also be no worse than that stated in ISO 8754.

Sulphur conc. / %	Repeatability / % ⁽¹⁾	Reproducibility / % ⁽¹⁾	Accuracy / % ⁽¹⁾
0.100	± 0.004 ⁽³⁾	± 0.014 ⁽³⁾	± 0.014 ⁽⁴⁾
0.500	± 0.010 ⁽²⁾	± 0.037 ⁽³⁾	± 0.037 ⁽⁴⁾
1.000	± 0.017 ⁽²⁾	± 0.065 ⁽³⁾	± 0.065 ⁽⁴⁾
3.000	± 0.045 ⁽²⁾	± 0.179 ⁽³⁾	± 0.179 ⁽⁴⁾

1 - 19 out of 20 repeated measurements fall within the stated range for each sulphur concentration.

2 - Measured instrument precision.

3 - Inferred instrument precision.

4 - Inferred instrument accuracy (assuming zero bias).



Wear metal measurement precision

The repeatability of wear metal concentration measurements has been established using accepted laboratory and statistical techniques. Instrument repeatability has been determined for a subset of measurable elements at a variety of concentrations.

Metal	Conc. / ppm	Repeatability / ppm
Calcium	11,249	± 150
Vanadium	49	± 4
Chromium	6	± 2
Iron	6	± 2
Nickel	17	± 1
Copper	2	± 1
Zinc	204	± 4

Case contents

Quantity	Description
1	XRF Multi element unit
100	Sample cup (type 1)
1	Power supply
1	USB cable
100	Dose Syringes
1	Test Mylar (30 mtr reel)
1	Bluetooth label Printer & power supply
1	Adhesive labels for printer (10 mtr reel)
5	Copper targets
1	Sd card



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