C-QUAND
XRF ANALYZER

ON-LINE XRF ANALYSIS OF MULTIPLE ELEMENTS IN LIQUID PROCESS STREAMS

"With over 40 years of experience, Hobré is able to take proven XRF technology directly to our process-line, allowing for full span of control, saving both money and resources."

hobré
ANALYZER SOLUTIONS

CUSTOMIZED DESIGN TO POWER A LIFETIME OF VALUE

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The C-QUAND is the ideal cost effective, and reliable solution for continuous elemental analysis in liquids. With its multi-element analysis, the C-QUAND is a low-maintenance analyzer, allowing you to achieve cost reduction, and process optimization concerning product quality, yields, economic efficiency, safety, human labor and environmental impact. The C-Quand has a faster response time, better repeatability, higher uptime and a lower operational cost for material & maintenance, than competitive techniques.

TYPICAL APPLICATIONS

- Sulfur in ULSD, ULSG, Kerosene, Crudes
- Cl in Crude and CDU condensate for corrosion control & desalter operation
- Catalyst poisoning metals in HDS and FCC feed
- Pipeline monitoring and fuel blending
- Base- and Precious-metals in metal refining / recycling
- Catalytic processes in liquid phase (such as PTA, PIA & FDCA)
- Wastewater monitoring
- And more...

BENEFITS & FEATURES

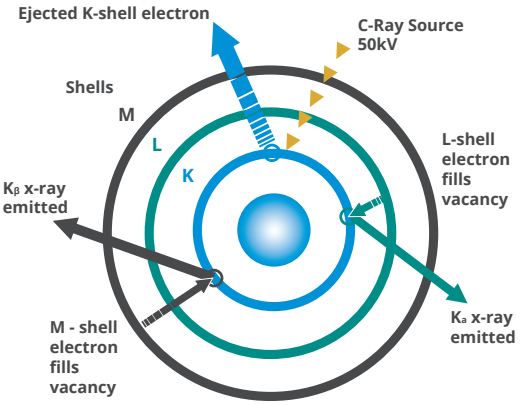
- Continuous multi-element analysis
- Close to no maintenance
- Automated zero and span correction
- Suitable for hazardous and harsh area's
- Consistent with ASTM and ISO
- Support through remote access
- Long life SDD and X-Ray tube

Principle of Operation

The C-QUAND analyzer is designed to continuously measure multiple elements starting from silicon (Z=14) from ppm levels upwards, in liquid samples. It uses energy Dispersive X-Ray Fluorescence (ED-XRF) technology, to measure the characteristic X-Rays generated by the atoms in the sample.

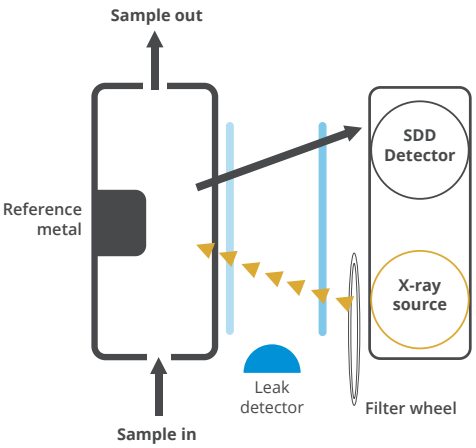
X-Ray Fluorescence

The C-QUAND has a powerful 15-watt, 50 kV X-Ray source, with a silver anode. The X-Rays displace the inner electron from the K or L orbit of the atom, leaving a void. The now unstable atom will immediately fill the void with an electron from the outer orbits. The resulting reduction in energy is emitted as a photon with a specific energy level unique to that element. The fluorescence is captured by a silicon drift detector (SDD). It's count rate being monitored directly proportional to the concentration of the element.



Measuring Cell

The X-rays generated by the source are first filtered by one of six different optical filters, dependent on the application. The X-rays continue through a thin window before hitting actual sample. The window is made from Beryllium for Sulfur measurement in hydrocarbons, or a polyimide such as Kapton® or Upilex® for the measurement of metals in aqueous and corrosive solutions. By means of the reference metal in the measuring cell, automatic gain validation and calibration is done, avoiding drift without requiring a single human action. The heated sample cell & flow path can operate at a temperature up to 80°C (176°F) avoiding precipitation.



Operational aspects of the C-Quand

Turnkey solutions

The key to success of on-line XRF analysis is the sample system. A well-designed sample system will ensure maximum measurement availability. With over 40 years of experience, Hobré Instruments has unique proprietary solutions for challenging environments, such as highly corrosive liquids and samples with high and abrasive particle load. Our in- house XRF laboratory is happy to review your specific application.

Intuitive and low-maintenance operation

The analysis method used by the C-QUAND is a direct measurement without the need for sample preparation or conversion reactions. It does not require additional chemicals or buffers that continually need to be replaced and it has no problematic moving parts or sources of blockage.

The special coated sample cell window, minimizes contamination, allowing longer periods of operation without maintenance.

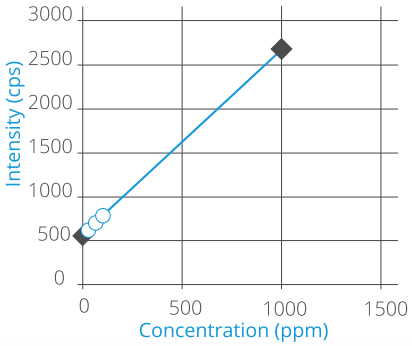
Process trends are displayed on the HMI and are remotely accessible through Modbus via RS485 or TCP/IP, both for the client and (with client' permission) Hobré for support and maintenance purposes.

100% Reliable measurement

With the C-QUAND you are equipped with an analyzer that gives you truly reliable and validated results, without human intervention. The analyzer is standard equipped with a fully automated gain validation and correction mechanism. For applications that require the measurement of light elements, in low concentrations (e.g. Sulfur in ULSG and ULSD) or that are prone to fouling/drift, the C-QUAND PLUS is available. The C-QUAND PLUS encompasses a fully automated cell-flushing, and zero & span validation + correction system.

Simple Calibration

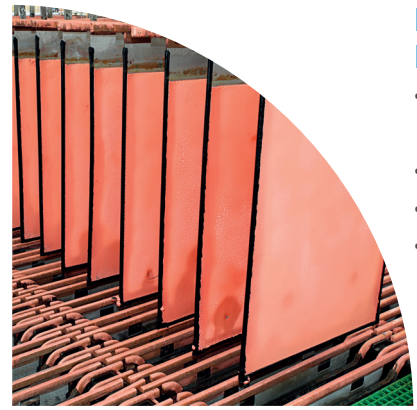
As depicted in below graph, the C-QUAND has a very linear response. In the example a Sulfur analyzer is calibrated using a blank and a 1000 ppm standard measuring samples of 10, 20 and 100 ppm.



Typical applications

Downstream (Oil&Gas)

- Total Sulphur Measurement
- Corrosion Control
- Catalyst lifetime improvement



Metal Refining & Recycling

- Electrowinning/ plating
- Leaching
- Solvent Extraction
- Precipitation/ Separation

Chemical Plants

- Catalyst control for PTA, PIA and FDCA

Wastewater Treatment

- Early stage upset detection

(Downstream) Total Sulfur measurement

With the continuous measurement of total Sulfur, refineries can aim for optimized control (WABT) of their HDS and blending units, producing ULSG, ULSD, Kerosene and other low sulfur fuels with maximum yield, yet full compliance to specifications. The ED-XRF method is the most suitable method for total Sulfur analysis in petroleum products, as it is able to measure in the low range, multiple elements and is unaffected by high boiling points, addition of FAMEs (Biodiesel) or Cetane improvers.

(Downstream) Catalyst protection

Refineries greatly depend on their catalytic process units (e.g. HDS and FCC). The deactivation of the catalyst is promoted by poisoning contaminants in the feed stream such Nickel, Vanadium, Calcium and Mercury. Unexpected fluctuations in deactivation rate due to these feedstock contaminants, can force a refinery to shut down their process units outside regularly planned maintenance periods, with high associated costs and a substantial capacity impact. Early stage detection of these poisoners can help a refinery to take appropriate measures and improve their feed acquisition process.

Metal Refining & Recycling

Efficient Recycling and refining of metals is an actual topic on many fronts, as natural resources are becoming scarce these days. Especially “Urban Mining” and the recycling of base- and precious-metals from various industries require separation & purification processes to be optimized, often entailing various steps of hydrometallurgy and wet chemical reactions. For the purpose of cost reduction, increased throughput and process optimization for improved yield and quality, on-line continuous analysis of these varying feeds with the C-QUAND proves to be beneficial in processes such as electrowinning/plating, leaching, solvent extraction, purification, precipitation, Ion Exchange and Metal compound Synthesis.

Since the C-QUAND is a direct measurement at atomic level, it does not matter in which form the elements are present, requiring no extra reagent/treatment to the sample to be analysed. The C-QUAND can measure in acidic or caustic streams at any pH, in extreme conditions both inorganic and organic solutions, low and high viscosities and temperatures up to 80°C (176°F).

With more than 40 years of experience, Hobré has developed autonomous sampling systems customized for the Metal Refining industry, from simple straight forward measurements, up to sampling systems for streams heavily loaded with solid/abrasive particles, offering the possibility to choose whether or not to include solids in the measured liquids.

(Downstream) corrosion control

As refineries strongly depend upon varying supply of Crude from countries located all over the world, running a refinery is a strategical interaction between the selection of the lesser expensive yet more complex to process “heavy” crude oils vs. the more costly but easier to process “light” crudes. Many of these lower quality crudes contain higher levels of salts (chlorides), organic chlorides, Sulfur, Nitrogen, metals, tramp amines as well as high solids and acidity. All of these elements can drive up corrosion within the crude process complex without proper conditioning.

Online analysis with the C-QUAND is a cost-effective solution, making insight in the performance of the desalting unit and the CDU overhead condensate easily at hand. The C-QUAND provides a continuous insight into changes in critical crude quality parameters, and particularly those elements that pose problems for downstream equipment such as chlorides, Sulfur, Iron, Nickel, Vanadium and other metals.

Wastewater Analysis

With an increasing focus on care for nature, it is of great importance to properly treat our wastewater (effluent). During normal operations, wastewater treatment plants ensure that the level of suspended solids does not exceed environmental limits, harming nature and life.

With its continuous elemental analysis, the C-QUAND is an all-time gate keeper which ensures that even in times of rapid unexpected upsets, appropriate measures can be taken to assure properly treated effluent. The C-QUAND distinct itself with: a performance meeting and often exceeding offline lab analysis techniques, being fully autonomous and having a rapid response time without the use of any consumables, other than power and instrument air.

PTA, PIA, FDCA plants

The production of PTA, PIA and FDCA is enhanced by the addition of Co, Mn and Br based catalyst. Continuous measurement of these elements enables better control of the process thus enhancing yields, improving product quality and increasing throughput. In this highly corrosive environment, the C-QUAND can facilitate early stage corrosion management with the detection of corrosion products such as Fe and Cr.

The high temperatures, high solid content, possible precipitation or sample freezing opt for a well-designed sample conditioning system. Over the years, Hobré Instruments has built a long-track record of extensive experience with this particular application.

TECHNICAL SPECIFICATIONS

ANALYTICAL	
Measurement principle	Energy dispersive X-Ray fluorescence
Element range	From Si to U (Z=14 to Z=92)
Measurement range	From 0.3 ppm to % levels (application specific)
Simultaneous elements	Up to 15 elements per analysis
Accuracy	Application specific
Standards	Consistent with ASTM D4294, D7212, D2622 and ISO20847
Hazardous Area Classification	ATEX (II 2G EX PXB ... [IB] IIC T4 GB (analyser), II 2G Ex db IIC T5 Gb (signal box)), CSA (Class I, Div. II) and PESO/CCOE approval
Zero and Span stability	Fully automated zero and span correction
MEASUREMENT CORE	
X-Ray detector	Silicon drift detector, resolution 135 eV
HV power supply	0-50kV
Source	15 W X-Ray tube, Ag anode
Filter wheel	6 filters (for multi-element analysis)
Stability	Automatic drift and back scatter peak correction; temperature and ambient pressure correction; Not affected by density or C/H fluctuations
Sample window	Kapton®, Upilex®, Beryllium
CENTRAL PROCESSING AND CONTROLLING UNIT	
Industrial PC	Linux operating system, custom touch keyboard with 8" TFT color display
Analog outputs	2 or 4 x 4-20mA active
Digital outputs	1 output for malfunction. 8 outputs for calibration status etc. (freely programmable)
Communications	4 - 20 mA, MODBUS via RS485 or TCP/IP, Optical Fiber (option)
Digital inputs	8 internal / external powered (24V) for sequencer, calibration, start-profile etc.
Ambient temperature	5 – 40°C / 41 – 104°F (Indoor installation recommended)
IP Rating	Designed according to IP65 standards
SAMPLE CONDITIONS	
Sample flow rate	Continuous measurement flow = 0,1 - 0.5l/min, Cyclic measurement as option available
Sample cell temperature	≤ 80°C / 176°F
Sample cell pressure	Atmospheric drain
Viscosity	Standard window ≤100 cSt, but up to 600 cSt upon request available
Contaminants	Sample to be filtered ≤10 micron. Free water to be removed from hydrocarbon streams
UTILITY REQUIREMENTS	
Power supply	110-230 VAC 50/60 Hz
Power consumption	100-200W
Instrument air	<5 L/min and (≥5 barg) for Safe Area C-QUAND, 30L/min and (≥5 barg) for Hazardous Area C-QUAND
GENERAL	
Size	HxWxD = 1000 x 400 x 360 mm / 39,4 x 15,8 x 14,2 inch
Valve control	Automatic stream switching, cell flushing, validation and (optionally) liquid sample recovery control are done by the analyzer
Weight	± 110 kg / 243 lbs

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For additional specifications, please refer to the general brochure of the C-Quand: WWW.HOBRE.COM

januari 2020

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