

Elemental Analysis for the Mining and Mineral Processing Industries

INSTANT GEOCHEMISTRY



*On-the-spot analysis at
every critical
monitoring point*



INSTANT GEOCHEMISTRY

Innov-X Systems is a global leader in on-location elemental analysis for mining and minerals processing. Innov-X takes the solution right to the source, providing real-time, non-destructive analysis where the answer is needed most. This full suite of on-site products from Innov-X provides immediate results to help determine the next course of action throughout the mining process - remote exploration; site mapping; ore grade control and selection; continuous process monitoring of liquids, slurries and cores; down hole characterization; environmental waste management; and heavy equipment maintenance.

Thousands of Innov-X on-site XRF analyzers are in use world-wide, the majority in remote areas or in demanding applications with continuous uptime requirements. Innov-X has the breadth of XRF experience and range of product offerings to provide field-hardened, high performance XRF systems for virtually any location and elemental measurement.

Innov-X handheld XRF systems have become essential for remote exploration activities, ore analysis and grade control. And, with our patent-pending LZ technology, operators can even measure Al, Si, Al/Si ratios, Mg, and P at low levels, without the need for burdensome vacuum pumps or tanks of compressed helium required for other handheld XRFs.

When a major mining company needed a robust, in-process fluid analyzer for monitoring precious metal content in liquids, they turned to Innov-X. The FOX-IQ Liquid Stream Analyzer continuously monitors up to 25 elements simultaneously in process streams.



The marine shipping industry depends on the SEA-Mate® oil analyzers – manufactured by Innov-X – for onboard measurements of oil, fuel and additive quality. On-the-spot decisions as to lube and fuel quality, at sea, for ocean going container vessel fleets is yet another example of the confidence placed in our XRF analyzers. Operators perform analysis of wear metals, additives, sulfur content and catfines (Al, Si) while at sea and while bunkering worldwide. Innov-X is prepared to install and service XRF systems at any shipping port in the world.



GLOBAL SERVICE

Innov-X supports an array of portable and stationary XRF products with a first class global service organization. We offer service locations in nearly every country. We have field service teams to support our non-portable products or those used in continuous operations.

With nearly 5,000 XRF analyzers operating daily around the world, Innov-X is your ideal partner for on-site or on-location elemental analysis. Because we manufacture a family of XRF systems – Handheld, Mobile, Down Hole, Process, Crossbelt or Core Logging – we can meet all your present and future elemental analysis needs. Our history of developing rugged, field-hardened XRF systems assures that you can operate our XRF systems in virtually any location, or any environment. And as your requirements change you can upgrade, add new products, even obtain instrument trade-in benefits across product lines. All Innov-X XRF products share a common “look and feel” that minimizes operator training and startup time. Finally, you’ll deal with a single global service organization for all your XRF equipment.





X-50 MOBILE XRF



The Power and Safety of a Benchtop + Total Field Portability

For situations where the performance of a benchtop XRF analyzer is critical in the field, Innov-X offers the X-50 Mobile XRF. Built like a robust toolcase, the portable X-50 has a closed beam configuration with up to 10x the power of a handheld. This makes the X-50 ideal for ores, tailings, concentrates, borings, cores, fragments, slurries, filters and films. The X-50 delivers excellent in-field performance for many transition metals, such as Cd, Ag, Sn, Sb, precious metals and rare earths. It truly brings the power of a benchtop from the lab to the field.

25 X-50 Mobile XRF advantages include:

- › Fast, ergonomically-friendly closed beam analysis of cores, bagged, or prepped samples
- › Designed for liquid analysis including highly acidic samples, precious metal
- › Precious Metal LODs: 3-5 ppm for gold (Au); 1-2 ppm for Silver (Ag); 1-2 ppm for PMG1 (Pd, Rh, Ru); 3-5 ppm for PMG2 (Pt, Ir, Os)
- › Rare Earth LOD's: 12-25 ppm for La, Ce, Pr, Nd



HANDHELD XRF ANALYZERS



Real Answers, in Real Time

Innov-X designed the handheld Omega to deliver state-of-the-art elemental performance in the field without removing or even altering the material of interest. These high performance, battery operated XRF units produce instant elemental analysis of soils, ores, liquids, virtually any sample type. And with our patent-pending “light elements” LZ package, you can measure even more elements – Mg, Si, Al, P – directly, and determine Al/Si ratios. The LZ option extends the element range without the need for burdensome helium gas tanks or clumsy pumps. The benefits of quantitative, on-the-spot analysis include:

Exploration

- › Determine zonal patterns and mine mapping
- › Perform real-time surveys to delineate and define anomalies
- › Evaluate real-time data immediately to pinpoint areas of highest potential profit

Ore Grade, Process Control

- › Control grade at milling, concentrating and smelting
- › Real-time check of ore block: don't let Si, Al and Mg lower your grade
- › Reduce stockpiles of untreated ore: check stockpiles in-situ to carry out your blendings
- › Immediately determine the presence of S, P and other penalty elements

Environmental

- › Analyze mine tailings – Maximize your profits
- › Meets Regulatory Methods for RCRA Metals & other Priority Pollutants
- › Rehabilitation for sustainable development planning is faster, less expensive

Handheld XRF analyzers have completely revolutionized geochemical exploration for surface and underground mining. Site sampling is no longer a limiting factor, whether for exploration, grade control, enrichment & enhancement monitoring or environmental analysis. Handheld XRF delivers quantitative geochemistry – instantly – at the location you need it most.

ON-LINE PROCESS ANALYZER



Process Liquids and Slurries

Innov-X offers a range cost effective rugged process analyzers specially developed for the mining industry.

The FOX-IQ Process analyzers will reliably monitor up to 25 elements simultaneously from P to U – from ppm to high % levels.

To monitor clear process streams like leaching and electrolytic refining, solvent extraction and electro-winning, Innov-X offers the FOX-IQ Liquid process analyzer.

To monitor process streams with significant solid content (slurries) Innov-X offers a unique FOX-IQ Slurry process analyzer. This high performance analyzer was designed using technology developed in cooperation with a world-leading mining company. The system is capable of handling a very high particle content up to 50%.

FOX-IQ Liquid Process Analyzer

The FOX-IQ Liquid Process Analyzers are developed for unattended operation for long periods of time. The Flow Cell is designed to make FOX-IQ safe for both operators and equipment.

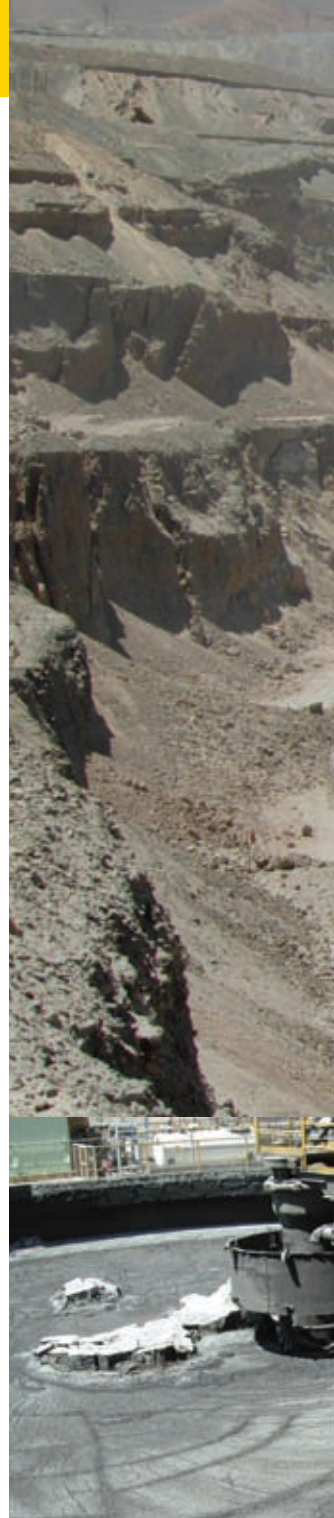
FOX –IQ applications suitable for your mining activities include:

FOX-IQ Liquid Analyzer

- › Electro-refining – Cu, Zn, Ni, Co, Pb
- › Solvent extraction and Electro winning (SX / EW) – Cu, Pb, Sb
- › Feedstock and Refining Control – Ni, Cu, W
- › Reagent Control

FOX-IQ Slurry Analyzer

- › Monitoring of Floatation processes – Cu, Fe, Mo, As, S
- › Rougher control
- › Flash Flotation Control





In the unlikely event of a window leakage, a second safety window prohibits liquid from entering the analyzer and prevents any damage to the FOX-IQ. A leak detection system instantly detects even the smallest of leaks; bypass the process stream, empty the flow cell and shut down the analyzer. The system simultaneously generates an alarm. Alarm inputs allow complete shutdown of the FOX-IQ in case of other emergencies.

FOX-IQ Slurry Process Analyzer

This unique process analyzer is specially developed to monitor slurry composition in the demanding mining industry. The Flow Cell design (patent applied) uses automatic window changing whereby at user selectable intervals, a fresh thin window is mounted on the Slurry Flow cell. The automatic window changing design allows analysis of abrasive and very high solid contents. It avoids memory effects and cross contamination of previous samples. Because a fresh new thin window is used each time, excellent low detection limits are continually achieved. A leak detection system prevents any damage to the analyzer in case of emergency.

XRF: ESSENTIAL TO MINING OPERATIONS



EXPLORATION

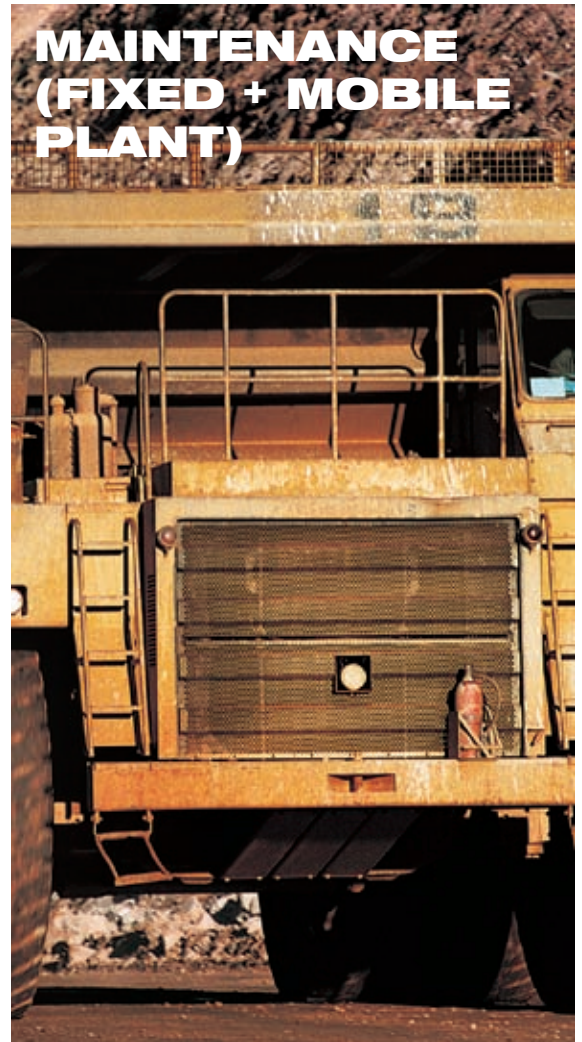
- HH – Handheld
- X-50 – Mobile
- DHP – Probe

MINING + GRADE CONTROL

- HH – Handheld
- X-50 – Mobile
- DHP – Probe

GEOMETALLURGY + PROCESS

- HH – Handheld
- X-50 – Mobile
- FOX-IQ – On-line
- QXR – Ore Sorter



GY + PROCESSING

ENVIRONMENTAL + MINE CLOSURE

HH – Handheld

X-50 – Mobile

DHP – Probe

**MAINTENANCE
(FIXED + MOBILE PLANT)**

HH – Handheld

X-50 – Mobile

FOX-IQ – On-line

SEA-Mate type applications

QXR-OA



High Volume, Automated Ore Analyzer

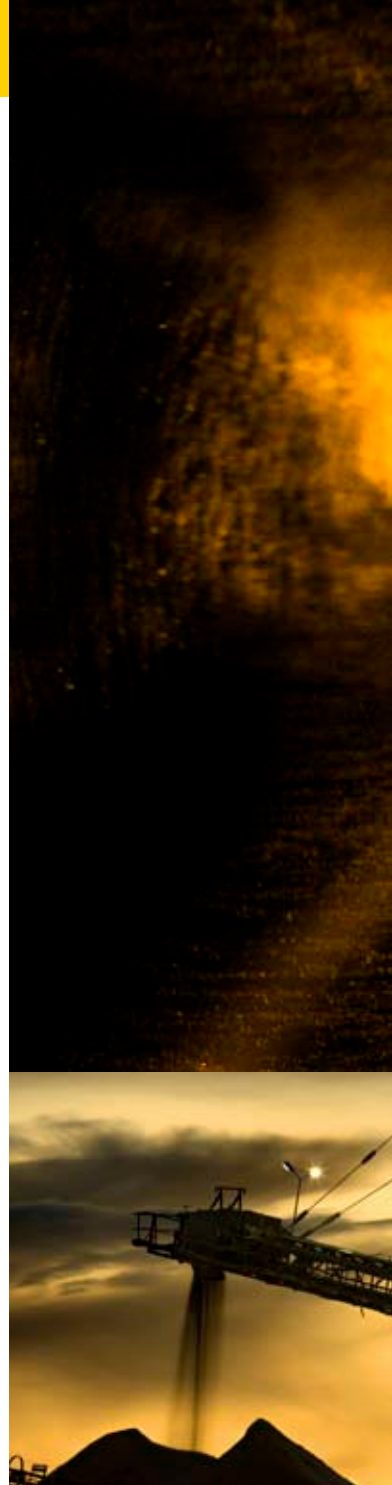
In an effort to improve overall processing efficiency in the mining industry, Innov-X Systems is currently collaborating with several prominent mining companies to

develop a high volume sorting system for mineral applications, particularly refractory minerals that are not easily identified via current technology offerings. The result of this innovative product effort will be the QXR-OA cross-belt Ore Analyzer. This continuous, automated sorter will provide real-time elemental information for mining process control – no sampling or sample preparation required.

Currently, Innov-X Systems' QXR Series uses proprietary high speed XRF to determine elements from Calcium (Ca) and above on the periodic table. These analyzers have proven ideal for the direct on-line analysis of various materials on-conveyor belts. Examples are scrap metal, glass cullet, recycled wood, plastics, etc. This same XRF technology has been successfully applied to various base and refractory ore analysis for data generation of concentrations in outgoing production ores.

Innov-X is dedicated to product innovation to meet your present and future analysis needs. Our goal – to develop and manufacture solutions that provide your operation with faster, more accurate process control capabilities. Currently in development with leading mining industry partners is the QXR-OA cross-belt ore analyzer. Real-time, automated mining applications include:

- › Sorting various grades of material
- › Mine grade control
- › Blending and raw material asset management

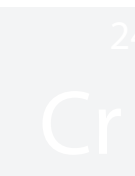
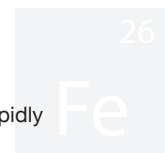




CORE LOGGING

Automated Elemental Analysis of Drill Cores

If you study sediment cores for mining, oil exploration, or oceanographic research, Innov-X manufactures an automated analysis system for sediment cores. The FOX-IQ Process XRF integrates easily as a standalone product, or as a component in other manufacturers multi-instrument core logging systems. Field analytical performance has been proven independently by some of the leading geochemical research institutions¹ in the world. You get all this in a package that is more robust and field tested under extreme conditions from the pole to the equator.



¹ Timothy C. Kenna et al, "Application of Field Portable X-ray Fluorescence Spectrometry to Rapidly Measure Metal Distributions in Sediment Ores," AGU Fall Meeting 11 December 2006.



LAMBDA



PPM-Level, In-Field Elemental Analysis

The Innov-X LAMBDA Series is a mobile, tabletop family of high performance XRF analyzers. The LAMBDA Series features our patented coupled XRF + Optics package that delivers ultra low limits of detection for low atomic number metals, specifically Mg (Z=12) through Ca (Z=20) in addition to excellent performance on transition and heavy metals.

Initially developed for “catfines” measurements in marine fuels, the LAMBDA provides ppm level detection limits for Mg and higher atomic numbers in process fluids and other samples. The same coupled XRF + Optics package may also be used with our FOX-IQ Liquids platform providing a high performance, process system for continuous sample monitoring.

- › High performance for low atomic number elements in process streams, fuels, additives, other liquids
- › PPM measurements of S and P in Bauxite and iron ore, and for Mg, Al, Si, P, S, Cl and Ca in various sample types
- › Ultra-low limits of detection for Al, Si
- › Ultra Low Sulfur Diesel (< 1 ppm S)
- › Chlorine in process fluids to guide preventative maintenance
- › General fluids analysis for ppm level transition metals



DOWN HOLE PROBE



3-D Sub-Surface Characterization

The high performance DHP is the world's only tube-based XRF spectrometer capable of being lowered into drill holes to analyze the soil face for base metal content. The DHP provides real time elemental analysis to determine minor and major concentrations of elements/ore on walls as a function of depth. The DHP is also equipped with helium purge technology to measure Al, Si, Mg and P content, and provide Al/Si ratios. No sampling is required, so there is no waiting on lab results.

Depth profile data is collected in real-time and trended on a PC at surface level, allowing you to make quick, reliable decisions that will ultimately optimize drilling and blasting activities lessen environmental impact, decrease excavation time, and reduce labor and equipment usage.

The DHP system is ruggedly designed and engineered for routine use by non-technical personnel in a field deployable environment. The system can be lowered down a pre-drilled hole up to 30 m. An optional specially engineered stand allows operator to simulate benchtop-type XRF analysis while in the field.

The Innov-X Down Hole Probe (DHP) revolutionizes in-situ soil characterization, providing real-time concentration information in three dimensions – no waiting on lab results.

Applications where the DHP can optimize your mining activities include:

- › Ore body mapping – Ni, Cu, Zn
- › Grade control
- › Tracer elements
- › Coals – S and Ash
- › Lithology
- › Mineral recovery – tailing piles
- › Site clean-up

MAINTENANCE

Predictive Maintenance - Oils, Additives, Fuel Analysis

To keep your mining machinery at peak performance, Innov-X portable analyzers can be integrated into your preventative maintenance programs. The analyzers can detect wear metals in oils, plus Zn, Ba, V and other metals as evidence of contaminants in engine oils and fluids. These are all early indicators of equipment wear that can help identify and prevent unexpected component failure. By preventing unplanned and catastrophic breakdowns, maintenance can be scheduled in a timely and cost saving manner.

Via our joint venture with A. P. Moller-Maersk, Innov-X already supplies the marine shipping industry with on-board oil, additive and fuel analysis. On-the-spot decisions as to lube and fuel quality, at sea, for ocean going container vessel fleets is yet another example of the confidence placed in our XRF analyzers. Put this same expertise to work in your preventative maintenance program for all your remote equipment.



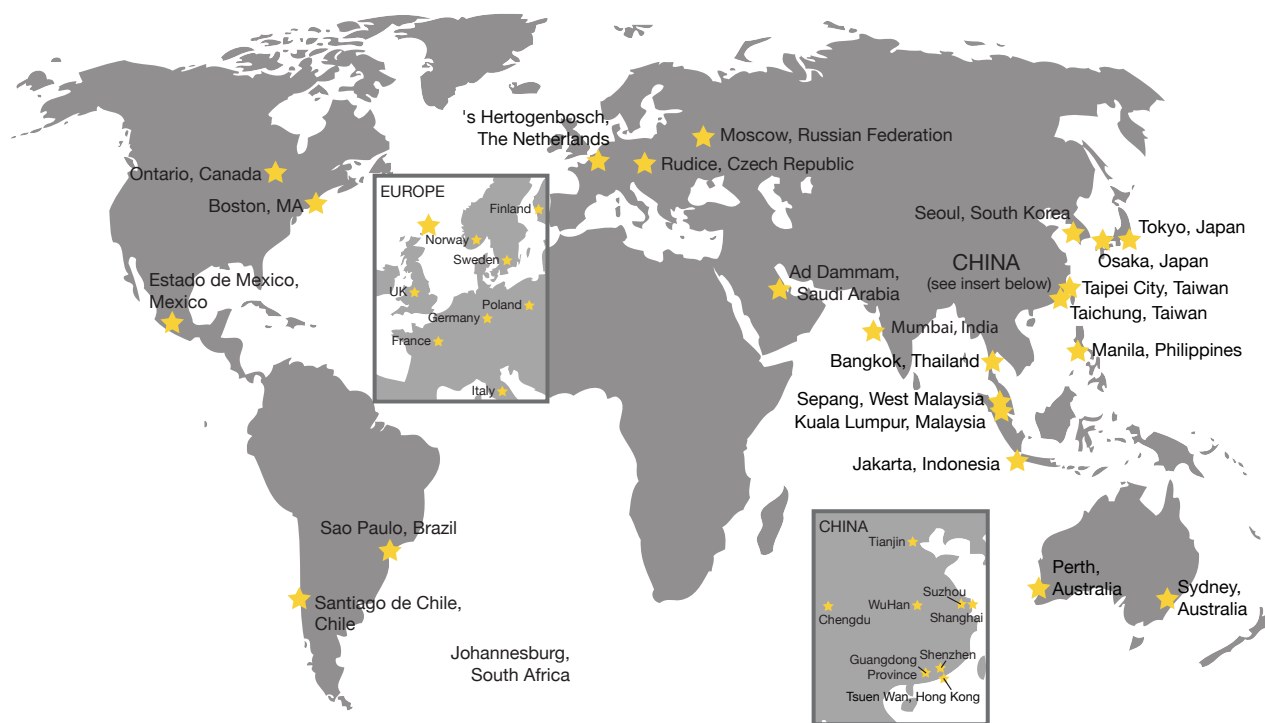
Why Choose Innov-X?

- › We take the solution to the source – real-time, non-destructive analysis where and when you need it
- › Over 5,000 analyzers in service worldwide – mainly in remote areas for demanding applications with continuous uptime requirements
- › A complete range of field-hardened, high performance systems for mining: Handheld, Mobile, Down Hole, Process, Crossbelt or Core Logging
- › Proven XRF technology providing elemental measurement range from Magnesium (Mg) to Uranium (U)
- › Our continuous dedication to product innovation and commitment to first rate global service & support

WORLDWIDE SUPPORT CENTERS

Worldwide support, local service

Innov-X is dedicated to providing the best worldwide technical support and service in dozens of countries. In Europe we have multiple full-service centers providing local service to virtually every customer. Our analyzers run multiple language software and customers receive local training.



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