Thermo Scientific Niton XRF Analyzers

The Laboratory in the Field
Agenda

• Evolution of Portable XRF
• Why Portable XRF
• Markets
  • Environmental
  • Mining
  • Scrap
  • PMI
  • Precious Metal
  • RoHS / WEEE
  • Consumer Product
  • Academia
Why Portable XRF

- Increasingly the lab is moving to the field
- Deliver traditional laboratory testing
  - Palm of the operator
  - Low cost and reliable
  - Minimal sample preparation
  - Purpose built for harsh environments
- Real time results
  - Improves decision making & productivity
  - Saves time & money
- Eliminate delays associated with analytical turnaround time
- Measure more samples – statistical improvements
- Compliance with regulations
  - Reduce risk of recalls and civil penalties
- 30,000 analyzers used Worldwide
Evolution of Portable XRF

- Since late 1960s, XRF has evolved through 7 generations; each generation has added new capabilities
  - Smaller
  - Faster
  - Better performance
  - Easier to use
- Today, nearly all alloys can be tested with these powerful tools
Thermo Scientific Niton Analyzers – A Family Revolution

- **1994 – Niton® XL-300 Analyzer**
  - Introduced for lead-paint analysis

- **2002 – Niton XLt Series**
  - First mass produced x-ray tube-based handheld XRF analyzer

- **2007 – Niton XL3 Series**
  - Integrated tilting color touch-screen display; customizable menus; optional camera & small spot

- **2008 – Niton XL3t GOLDD™ Series**
  - Up to 10X faster testing times than conventional technologies; up to 3X more precise; light element detection (Mg-S)

- **2009 – Niton XL2 Series**
  - Value choice – fast, accurate, lightweight, rugged

- **2010 – Niton XL2 GOLDD, Niton XL3t GOLDD+**
  - Exceptional accuracy, precision & ease of use; superior light element detection (Mg-S)

- **2011 – Niton FXL Field X-ray Lab**
  - Compact, portable unit with our highest performance, lowest LODs; operate virtually anywhere on site
A Feature-rich Family

- Easy to use, exceptionally fast
- Ergonomic design
- Lightweight
- Customizable menus; easy-to-read, icon-driven, color, touch-screen display
- Long battery life
- Multi-language support
- Standard analysis range of more than 25 elements (Mg to U)
- Nondestructive test
- Moisture-proof, dust-proof
- Bluetooth wireless, USB communications
- Password-protected user security
One Tool, Many Industries

**Alloys**
Scrap metal recycling, PMI, quality control in production, Fabrication and manufacturing

**Environmental**
Based on US EPA Method 200, FPXRF has become the standard for on-site screening of organics in soils

**Toys**
Rapid screening of toys for lead and other heavy metals

**Consumer Product**
Solder, components, PCBs and finished goods are all gating points for RoHS compliance and Hi-Rel screening programs

**Mining**
Greenfield exploration, drilling programs and ore grade assessment require timely, accurate data for operations

Also: Archaeometry, Forensics, and many more…
Environmental Market

- In-Situ, measure direct to the soil for fast screening
  - Clay
  - Loam
  - Sand
- Comply with ISO/CD 13196 soil screening by portable ED-XRF
- EPA 6200 in USA
  - Run control standards

- Ex Situ
  - Dry
  - Grind
  - Sieve
  - Sample cup
Typical Environmental Elements Analysed
Mining and Mineral Exploration Markets

- Base metal mining operations historically employed lab-based XRF analyzers
- Processes run more effectively and efficiently with real-time data
- Less waste to mill
- Better stockpile management
- Better ore boundary definition
- Less grade dilution
- Presence of penalty and credit metals
- Improved sample turnaround time

- GIS field mapping for Exploration
  - Plot geochemical data on maps in real time
  - Reach infill and step-out decisions instantly
  - Make more informed decisions while saving significant time and labor costs
Mining Customers Around the World

- Thermo Scientific Niton XRF analyzers are providing answers to mining companies around the world.
  - Anglo American
  - African Consolidated Resources
  - Barrick Gold
  - Bell Copper
  - CODELCO Exploraciones
  - Colorado Goldfields
  - CVRD
  - Grupo Mexico
  - Rio Tinto Mining & Exploration
  - Store Norske Gull
Metal Recyclers Need Handheld XRF Analyzers

• **Applications**
  - Take the instrument to Buys
  - Check incoming or Stored Scrap
  - Convert Turnings into Profits

• **Analyse and separate**
  - Stainless and specialty steels
  - Ni and Ni/Co alloys
  - Cobalt alloys
  - Titanium alloys
  - Tool steels
  - Copper alloys
  - Aluminum alloys
PMI

- Typical markets
  - Refineries
  - Power Plants
  - Producers/fabricators
  - Aerospace
- Rapid grade identification – unique library of 400+ alloy grades
  - Incoming QA/QC
  - Inventory Management & Recovery
  - Outgoing QA/QC
  - In process material identification
    - Routine inspections
  - Maintenance and fabrication related material identification
New Alloy Applications Resulting from SDD (He Purge)

Opens up alloy testing and analysis applications that previously required OES or laboratory XRF spectrometers

- **Al** in Titanium Alloys
- **Al** and **Si** in Al/Si Bronzes
- **Mg**, **Si** and **Al** in Aluminum Alloys
- **Al** and **Si** in Super Alloys and High Alloy Steels
- High **Si** in Cast Steels
- **Al** in Zinc (Zn) alloys
- **Mg** alloys
Cautionary Items

- Plating
- Residual paint
- Read-through (thin foils)
- Corrosion, oxide layer
- Metallic dust on surface
- Turnings / powders - mixed alloys
- Shot-blasting (residual from pellets on surface)
Precious Metal

- Gold Jewelry comes in a large variety of alloys – literally 100’s. The most common are
  - Yellow gold (Au/Ag/Cu)
  - White gold (Au/Pd/Ag or Au/Ni/Cu/Zn)

- Other less common gold alloys
  - Rose, red and pink gold (Au/Cu & maybe Zn or Ag)
  - Green gold (Au/Ag and sometimes Cd & Cu)
  - Spangold (Au/Cu/Al – heat treatment provides a fine surface texture)
  - Grey gold (Au/Ag/Mn/Cu)
  - Purple gold (Au/Al): brittle, typically used for decorative inlay
  - Blue gold (Au + In or Ga) brittle, typically used for decorative inlays or plating
  - Black gold (surface treated creating brown-black color)
Manufactures are required to eliminate toxic heavy metals and other restricted materials from consumer products.


- Cadmium (Cd) 100 mg/kg
- Mercury (Hg) 1,000 mg/kg
- Lead (Pb) 1,000 mg/kg
- Hexavalent chromium (Cr₆⁺) 1,000 mg/kg
- Polybrominated Biphenyls 1,000 mg/kg
- Polybrominated Diphenyl Ethers 1,000 mg/kg

Niton 700 Series Analyzers

**Equipment Covered by the RoHS Directive**

- Large household appliances
- Small household appliances
- IT and telecommunications equipment
- Consumer equipment
- Lighting equipment
- Electrical and electronic tools (large-scale industrial tools exempt)
- Toys, leisure and sports equipment
- Medical devices with the exception of all implanted and infected products (Category 8 devices exempt)
- Monitoring and control instruments (Category 9 devices exempt)
- Automatic dispensers

RoHS – WEEE Testing
TOYS / Consumer Goods Screening

Large, extended objects

Irregular shape and small objects
Archaeometry, Museum Artifacts

- Testing paintings “The Scream” and “Madonna” by Edvard Munch at the University in Oslo
  - Restoration
  - Conservation
  - Authentication/Forgery
Summary

• Large installed base
• Take the analyzer to the field
• Designed for harsh environments
• Quantitative results
• Flexible sample types
• Real time information
  • Improves decision making & productivity
  • Saves time & money
• Measure more samples – statistical improvements
• Compliance with regulations
Worldwide Service and Support

More than 30,000 Thermo Scientific Niton XRF analyzers are in use daily in more than 75 countries on six continents

A dedicated network of more than 70 distributors and 30 factory-trained service centers around the world