thermoscientific

Radiation measurement and security instruments

Industrial radiation protection for your personnel, facility and business

ThermoFisher SCIENTIFIC

Monitoring is important

- There are thousands of radioactive sources no longer being used
- Sources can end up in the scrap metals stream
- Significant contamination can occur leading to costly remediation

Canton, Ohio, 2004, Cs-137, $30 M cost of melting

Cadiz, Spain, 1998, Cs-137, $26 M

Jewitt, Texas, 2005,
Cs-137, approx. $7 M

Ciudad Juarez, Mexico, 1983,
Co-60, 1 dead, 4 exposed

Hueypoxtla, Mexico, 2013, Co-60, Assumed lethal dose

Goiana, Brazil,1987,Cs-137,4 dead, 250 exposed

International Atomic Energy Agency (IAEA) is aware of, on average, 150 or so “events”/year involving scrap metal

Our experience, equipment and expertise can mitigate the risk that contaminated materials will affect you, your facility or your business. From portal, grapple and conveyor belt monitors to personal radiation detectors, we have you covered.

M cost of melting

Mayapuri, India, 2010, Co-60, 1 dead, 8 exposed

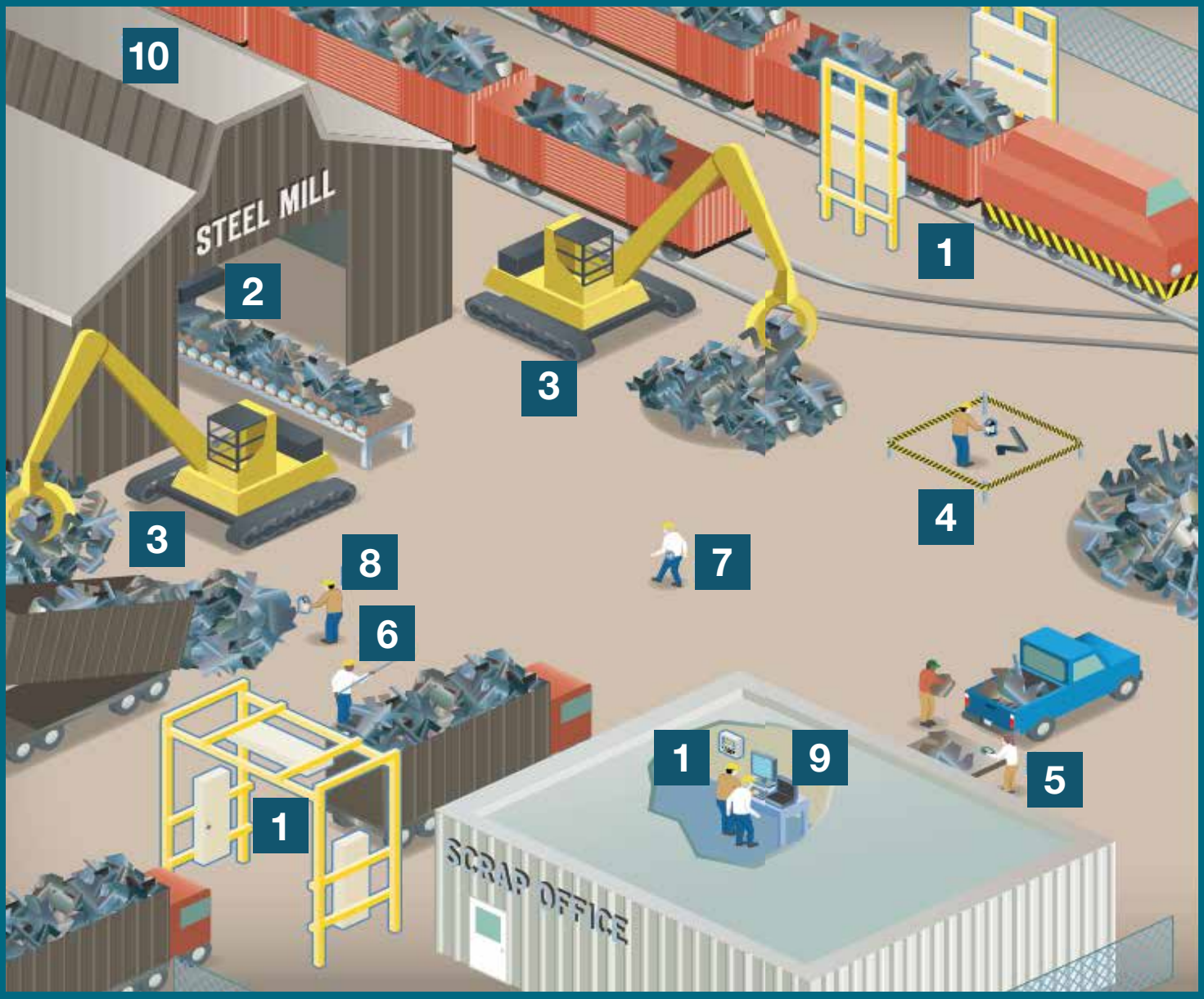
Samut Prakarn,Thailand, 2000 Co-60, 3 dead,10 exposed

A stainless processing facility found 145 nuclear items in scrap in 2011 and 200 in 2010, and more than 120 shipments of contaminated goods were denied U.S. entry between 2003 and 2008. Items such as decorative tissue box holders, metal tea tins, cheese graters, elevator floor numbering buttons, rebar, patio furniture, shovel blades, fashion belts, etc. have been discovered manufactured from Co-60 contamination metal.

A Cs-137 source was melted at steel mill, vaporized and contaminated the bag house dust. The emission system was shut down, causing contaminated flue dust to back up into the secondary bag house. It took three weeks and an estimated $25 million to clean up. In two separate incidents, 500,000 lbs. and 1.4 million lbs. of low level radioactive dust were produced and required specialized disposal.

The number of “orphan sources” (found or abandoned sealed radioactive items that lack identifying marks) being discovered in scrap metal yards is increasing.

10 Reasons metal processors need radiation detection



- Radioactive sources can frequently show up at recycling facilities.
- These sources threaten works and can end up in recycled material, threatening consumers.
- Multiple points of inspection are needed – from vehicles entering to various steps in the process.

We have identified 10 key places to consider when looking to protect your facility and the public from radiation threats.

1. **Truck and Railcar Monitoring** Use Radiation Portal Monitoring systems for truck and railcar monitoring. **ASM IV Series monitoring system**

2. **Charge Bucket, Conveyor, Platform Scales or Dust Collection** Ensure process monitoring systems are configurable for conveyor, platform scales or system dust collection. **ASM IV Charge Bucket monitoring system**

3. **Grapple Load Monitoring** Use a ruggedized, wireless grapple-mounted radiation detection system. **RadEye GR Grapple Monitoring System**

4. **Secondary Inspection** Use the sensitive and fast responding **RadEye NBR High Sensitivity Gamma Radiation Monitor** to verify the radioactive find and assess if of natural or artificial (man-made) origin. Alternatively, or in addition use the ruggedized **RIIDEyeX Handheld Radioactive Isotope Identifier** to provide fast and real time identification and analysis.

5. **Combination Detection** Belt-worn radioactive gamma isotope identification and neutron indication. **RadEye SPRD Spectroscopic Personal Radiation Detector**

6. **Search and Find Applications** Portable Personal Radiation Detectors provide sensitive and fast detection of gamma radiation with accurate dose rate measurements. **RadEye PRD Personal Radiation Detector**

7. **Gamma Neutron Paging** Use a monitor that combines gamma sensitivity and energy compensated dose rate measurement with separate, high sensitivity neutron response and alarm threshold. **RadEye GN+ Gamma Radiation monitor**

8. **Accurate Identification of Source** Quickly locate radioactive materials with the most sensitive hand-held instrument featuring fast discrimination between man-made artificial sources and natural radiation. **RadEye NBR**

9. **Documentation** Utilize software for documenting scans performed. **RadEye Safety Kit and Viewpoint Enterprise Remote Monitoring System**

10. **Contamination Level Determination** Use portable steel sample counting system to determine Co-60 contamination levels in the metallurgy lab or out in the field.

Experience

We have been in the radiation detection and measurement business since 1949. We have been providing large scale radiation detection systems to the metal recycling and metal production industries for over 30 years, designing and installing our first scrap metal monitor in 1987. We pioneered and refined the science behind detecting and resolving the low level radioactive signal from orphaned sources of radiation buried in scrap metal. And since the terrorist events of 9-11, our portal monitoring and portables technologies have been at the forefront of radiation threat detection at ports, borders and regional locations around the world.

ASM IV Series monitoring system testing at Oak Ridge National Laboratory

Portal Life-Cyle Evaluation and Demonstration System in Oakwood Village, Ohio

Our Development Milestones Over the Last 30 Years

1980

1984
Built first vehicle radiation portal monitoring system (LFM-1) for industrial application

1987
First large scale, PVT plastic-based industrial RPM system installed at Bethlehem Lukens Steel

1989/90
First ASM designated RPM specifically for vehicle monitoring introduced for steel industry

1990

1995-1997
Advanced Digital Filtering (ADF) and 1st generation Dynamic Background Suppression recognition (DBS) / Vehicle Profiling algorithms introduced resulting in highest sensitivity with lowest false alarm rate

1996
Multi channel energy window discrimination with PVT plastic scintillators. Patented in Germany as Natural Background Reduction (NBR) technique

1996
Steel Manufacturers Association, Koppel, PA
Best detectability relative to false alarm rate

1996
Czech Meteorological Institute, Czech Republic
Best detectability relative to false alarm rate

1998
University of Milan, Milan, Italy
Best performance in 6 out of 9 categories

2000

2001
Austrian Research Center, ITRAP, Seibersdorf
Absolute highest detectability and lowest false alarm rate for both gammas and neutrons, with zero down-time

2002
Los Alamos National Laboratory, Los Alamos, NM
One of only two vehicle monitors to pass the requirements for Department of Energy Second Line of Defense Programs

2003-2006
Integration of DBS/Profiling algorithms & isotope identification software

2005
Next Gen Personal Rad. Detector, RadEye PRD, launched

2006
Nevada Test Site
One of two (out of ten tested) to be selected for award of ASP Contract by Department of Homeland Security (DHS)

2009
RadEye GR Grapple Mounted Detection system launched

2010
Next Gen RPM, ASM IV launched

2010

2012
Next Gen handheld, RadEye NBR launched

2012
Joint ResearchCenter ISPRA Italy
ITRAP+10 - RadEye range tested PRD, GN, GN+ & NBR and PackEye

2013/14
Oak Ridge National Laboratory
DHS evaluation for Illicit Trafficking Radiation Assessment Program. March 2014 received a perfect (60/60) gamma detection score for all radionuclides as required in ANSI N42.35-2006 standard

2014
Next Gen Spectroscopic PRD, RadEye SPRD and RIIDEye X introduced

2020

Independent Test Results

Equipment

History has shown time and time again that no single radiation detection instrument/ installation can guarantee protection and traceability at any single point of the material handling process. Multiple points of inspection help overcome the problems of too little time, too great a distance and too much shielding that will be surely be encountered at any one inspection point.

The breadth of our product offering is unparalleled in the industry; everything from simple electronic dosimeters to radiation detection portal systems, from hand held gamma spectroscopic instruments to advanced spectroscopic portal systems.

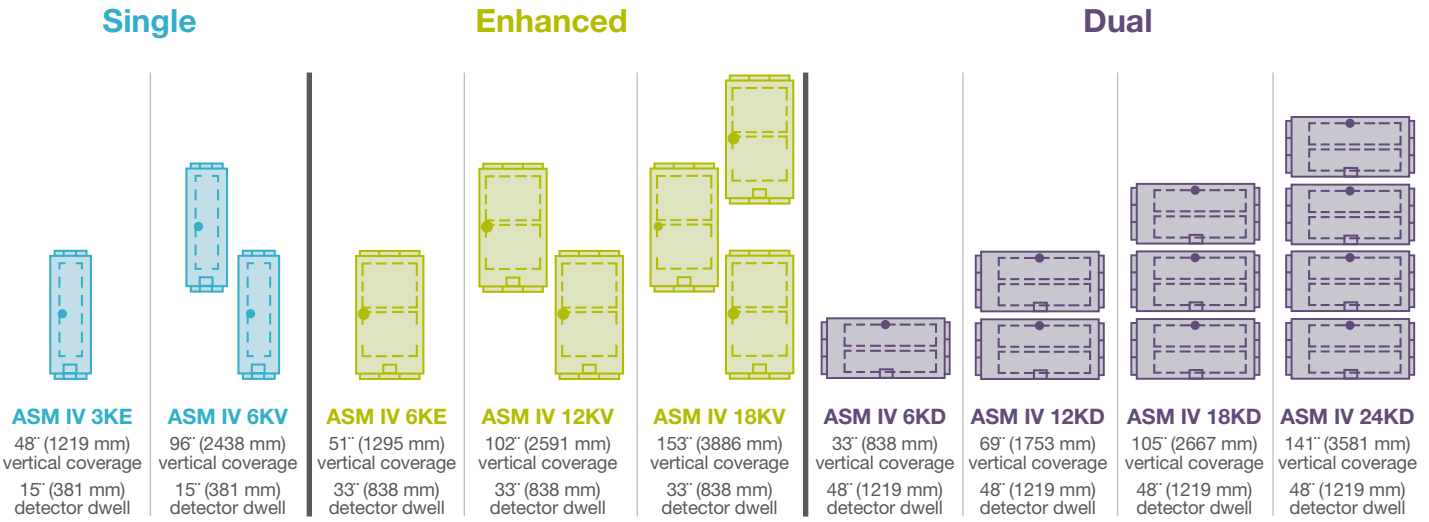
System/Instrument application chart

System	Page	Portal monitor	Material monitor	Personal monitor
ASM IV Series automatic scrap monitoring systems	7	X	X	
ASM IV-GSE Monitoring systems	11	X	X	
RadEye GR Wireless Detection System for grapple installation	13		X	
RIIDEye Series handheld radiation isotope identifier	14		X	
RadEye SPRD	15		X	
RadEye NBR System	15			X
RadEye GN+	15			X
RadEye PRD	16			X
RadEye safety kit	17			X
RadEye steel contamination kit	18		X	
Lutetium test adapters	18	X	X	X
ViewPoint Enterprise	Back	X	X	X

ASM IV Series monitoring system

Detect and deter radioactive threat items at the door and in your process. Our Thermo Scientific™ ASM IV portal monitoring system designs are the result of superior science supported by a wealth of experience in industrial applications. Our practical approach provides unparalleled performance with simple, clear, concise and actionable information to the operator. Our portal monitoring systems are configurable, offering solutions to meet, budget, application and performance requirements.

Radiation Detector Modules



Integrated System Design

Encompassing years of experience in harsh industrial environments, the latest industrial hardened ASM design, has proven to excel in rugged and difficult environments.

- Combines optimized detector design
- Virtually no false alarms with industry-proven peak detection algorithms
- Superior monitoring sensitivity
- Fully Networkable

Robust, Reliable, Real-Time Operation

- Rugged industrial PC based System Control Unit; no commercial PC's, no mechanical hard drives or cooling fans to fail
- 100% solid state hard drives
- Imbedded LINUX operating system and our latest "12 Series" electronics platform; no need for Windows™ upgrades/ maintenance

Flexible Configurations and Optimized Detector Designs for the Application

Optimized detector sizes, as a result of independent study of data and real-world testing, yield best sensitivity. While larger volume individual detectors, may provide a slight cost savings, they decrease performance by having proportionally larger background values which directly impact signal to noise ratios and figure of merit. This essentially makes finding the needle (source signal) in the haystack (background signal) more difficult due to the haystack being larger. The use of multiple, smaller volume detectors provide vertical "resolution" over the vertical coverage area, by providing more independent detector zones that allow for significant increases in performance when compared to single, large detectors.

- Best in class vertical coverage
- Best in class vertical resolution

Algorithm Design for the Application

- Proven, unsurpassed Dynamic Background Suppression and Vehicle Profiling algorithm
- Fastest dynamic scanning interval coupled with optimized detector width provides best in class horizontal resolution

Vehicle and cargo application matrix

Many factors come into play in determining what system may be most appropriate; material to be scanned, vehicle types, vertical coverage requirements, sensitivity, cost, etc. Use the matrix as a starting point to guide you in determining a range of models that may best match your needs.

Thermo Scientific ASM IV Part #/ Configs.;	ASM IV 3KE	ASM IV 4KEO	ASM IV 6KV	ASM IV 6KD	ASM IV 6KE	
Small Vehicles; Cars, Pickup Trucks	★★★					
Garbage Trucks	★★★	★★★				
Roll-Off Containers ***(Solid Waste)***	★★★	★★★				
Roll-Off Containers ***(Scrap Metal)***	★▪▪	★★▪	★★▪		★★★	
Triaxle Dump Trucks ***(Solid Waste)***	★★★	★★★				
Triaxle Dump Trucks ***(Scrap Metal)***	★▪▪	★★▪	★★▪		★★★	
Semi Dump Trailers ***(Solid Waste)***	★★★	★★★				
Semi Dump Trailers ***(Scrap Metal)***	★▪▪	★★▪	★★▪		★★★	
Semi Box Trailers ***(Solid Waste)***	★★★	★★★				
Semi Box Trailers ***(Scrap Metal)***	★▪▪	★★▪	★★▪		★★★	
Large Scrap Haulers ***(Euclids/Terex)***	▪▪▪	▪▪▪	▪▪▪	★▪▪	★★▪	
Rail Cars ***(Standard Gondolas)***	▪▪▪	▪▪▪	▪▪▪	★★★	★★▪	
High Sided Rail Cars	▪▪▪	▪▪▪	▪▪▪	▪▪▪	▪▪▪	
ASM Dimensions						
Radiation Detection Modules (RDM)	2	3	4	2	2	
Top quantity of scintillators	2	3	4	4	4	
Number of RDM per side	1	1	2	1	1	
Number of RDM overhead	0	1	0	0	0	
Horizontal Dwell PVT Width - inch (mm)	15 (381)	15 (381)	15 (381)	48 (1219)	33 (838)	
Vertical Resolution PVT Height - inch (mm)	48 (1219)	48 (1219)	48 (1219)	15 (381)	24 (610)	
PVT Volume/System - inch^3 (l)	2,880 (47)	4,320 (71)	5,760 (94)	5,760 (94)	6,336 (104)	
PVT Vertical Coverage - inch (mm)	48 (1219)	48 (1219)	96 (2438)	30 (762)	48 (1219)	
ASM IV System Application Selector Guide - inch (mm) *Please note that consultation with our expert staff is recommended to ensure that where a mix of vehicle types or sizes is possible that the most appropriate system is selected.*	48¨ (1219) load height smaller trucks lower density scrap	48¨ (1219) load height enhanced with overhead detector	96¨ (2438) load height trucks lower density scrap	33¨ (838) load height enhanced vertical and horizontal resolution high density scrap	51¨ (1295) load height standard trucks higher density scrap	

★★★ **Best**
★★▪ **Better**
★▪▪ **Good**
▪▪▪ **Not Recommended**

	ASM IV 9KEO	ASM IV 12KD	ASM IV 12KV	ASM IV 18KD	ASM IV 18KV	ASM IV 18KDO	ASM IV 21KDO	ASM IV 24KD
	★★★							
	★★★							
	★★★							
	★★★							
	★★▪	★★★		★★★		★★★		
	▪▪▪	★★▪	★★▪			▪▪▪	▪▪▪	
	▪▪▪	★▪▪	★▪▪	★★▪	★★▪	▪▪▪	▪▪▪	★★★
	3	4	4	6	6	6	7	8
	6	8	8	12	12	12	14	16
	1	2	2	3	3	2	3	4
	1	0	0	0	0	2	1	0
	33 (838)	48 (1219)	33 (838)	48 (1219)	33 (838)	48 (1219)	48 (1219)	48 (1219)
	24 (610)	15 (381)	24 (610)	15 (381)	24 (610)	15 (381)	15 (381)	15 (381)
	9,504 (156)	11,520 (189)	12,672 (208)	17,280 (283)	19,008 (311)	17,280 (283)	20,160 (283)	23,040 (378)
	48 (1219)	60 (1524)	96 (2438)	90 (2286)	144 (3658)	60 (1524)	90 (2286)	120 (3048)
	51¨ (1295) load height enhanced with overhead detector	69¨ (1753) load height enhanced vertical resolution and horizontal dwell high density scrap	102¨ (2591) load height standard trucks higher density scrap	105¨ (2667) load height enhanced vertical resolution and horizontal dwell high density scrap	153¨ (3886) load height standard trucks higher density scrap	69¨ (1753) load height enhanced with overhead detector	105¨ (2667) load height enhanced with overhead detector	141¨ (3581) load height enhanced with overhead detector

ASM IV Series charge bucket monitoring systems

Customized detector placement allows the monitoring of the charge bucket or charging pan loading process, by looking at individual magnet loads of scrap metal as they are loaded into bucket or pan.

This application takes advantage of the background suppression provided by the large bucket or pan, as well as the minimal amount of shielding surrounding a potential source in each magnet load compared to when that same source is located in an entire rail car or truck trailer.

ASM IV and ASM-GSE Series process monitoring systems

Designed for monitoring material on conveyor systems, platform scales or dust collection system

- ASM-GSE systems combine optimized. detector design with patented Natural Background Rejection (NBR) algorithm
- ASM-GSE systems provides additional information regarding likelihood of man-made sources.
- ASM-GSE uses configurable up to 4 detector modules
- ASM-GSE uses simple FHT 6020 based system control unit

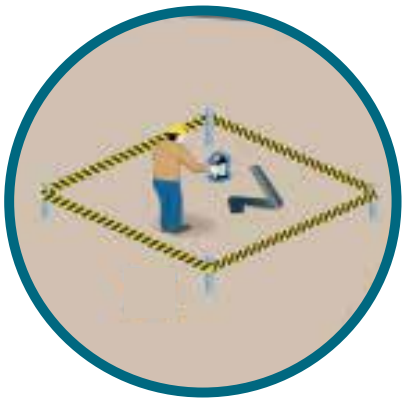
Grapple monitoring

Thermo Scientific RadEye GR grapple monitoring system

Monitor each individual load of scrap from within the cabin of the crane

- Small detector, minimizes effect on grapple load capacity
- Battery life in excess of 1500 hours
- Simple, straightforward installation
- Comprehensive data logging and reporting

Handheld radiation detection



Thermo Scientific RIIDEye Series handheld isotope identifier

Quickly identify the exact isotope and precise location of radioactive material to quickly initiate a plan of action

- Clear, bright and easy to read, full spectrum color coded display
- A range of configurations and modular versions ensure you have the optimal instrument for your facility
- Available external removable gamma detector
- Reduced fase IDs and improved detection sensitivities
- Environmentally sealed exceeds IP65 rating and drop resistant to 5 feet

Thermo Scientific RadEye SPRD spectroscopic personal radiation detector

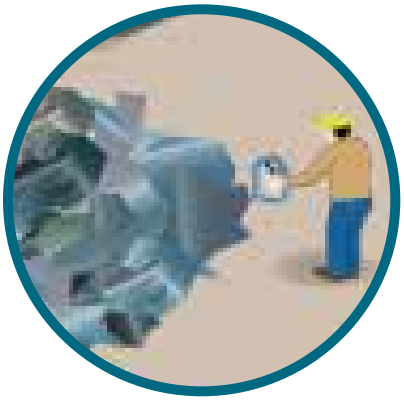
RIID Capability in the palm of your hand

- Compact, rugged and reliable
- Worn on belt for constant monitoring
- 150 hours from 2 AAA batteries
- Phone app available with real time indications on multiple connected phones
- Quickly share time indications on a smart phone or tablet

Thermo Scientific RadEye NBR High Sensitivity Gamma Radiation Monitor

The most sensitive handheld detector featuring fast discrimination between artificial and natural radiation

- Ideal for detection of shielded sources
- Alarm on small traces of artificial gamma radiation
- One-hand operation



Thermo Scientific RadEye GN+ Gamma Neutron Pager

Early warning of harmful nuclear materials

- Compact, rugged and reliable
- Very high neutron and gamma sensitivity.
- Immediate classification of gamma source (NORM/non-NORM).
- Energy compensated gamma dose rate.
- Dual gamma/neutron display.
- No false neutron alarms for even intense gamma sources.

Thermo Scientific RadEye PRD personal radiation detector

Detect and locate orphaned sources or problematic NORM related sources in scrap yard

- Small and easy to use
- Fully automated self-diagnosis minimizes required maintenance
- Functions easily accessed even while wearing gloves
- Available extension poles allow you to access hard to reach areas

Extenda-Pole

Kits and accessories

Safety kit

Accessory for Thermo Scientific RadEye PRD/PRD-ER and RadEye R

Contents of the RadEye PRD Safety Kit

1 High sensitivity gamma pager
2 Holster for the RadEye PRD
3 Universal RadEye PRD “snap in” adapter
4 RadEye PRD Test Adapter (natural lutetium oxide)
5 Short handle for “snap in” of the universal RadEye PRD adapter
6 USB to the RadEye PRD’s IR port adapter cable
7 RadEye PRD desktop stand with mounting support of the adapter cable
8 Special application-specific software and handbook

**Appropriate RadEye ordered separately

RadEye Safety Kit

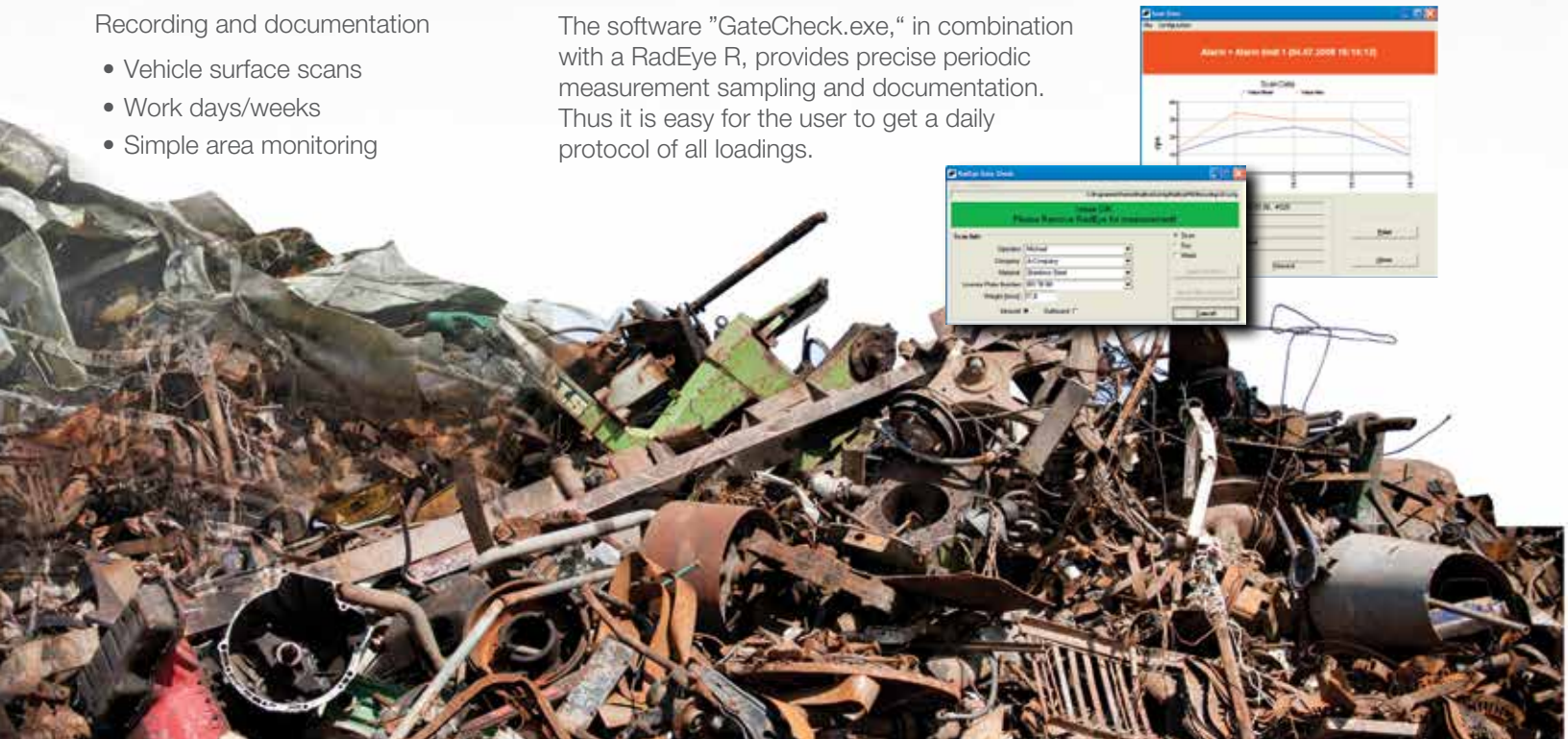
Scanning for contamination is assurance of quality

If the RadEye PRD is used for the manual scanning of vehicles, then the application-specific RadEye Software documents via printing of the scanning protocol that no radiation was found in the inspected load. Additional information such as “Company,” “Material,” “Weight,” etc. may be entered and stored or printed with the measurement values.

Recording and documentation

- Vehicle surface scans
- Work days/weeks
- Simple area monitoring

The software ”GateCheck.exe,“ in combination with a RadEye R, provides precise periodic measurement sampling and documentation. Thus it is easy for the user to get a daily protocol of all loadings.



Contamination kit

Portable solution for steel, slag and dust sample monitoring

- Portable, robust system in a transport case
- Minimal investment required
- Required RadEye PRD-S also to be used as a sensitive handheld gamma detector
- Battery power supply supports field operation
- Data logger for 1000 sample measurements
- PC interface via Infrared or optional Bluetooth
- Firmware upgrade for regular RadEye PRD (> version 3.0) to PRD-S possible

Lutetium (Lu 176) Test Adapters

- Lu-176 is an exempt source. No license required.
- A 3.7E10 year half-life means:
  - no need for error-prone half-life corrections
  - no need for reoccurring purchase of the (decayed) check sources
- Provides a highly reproducible and uniform activity content of 50 Bq/g (1.3 nCi/g)
- The design of a special shape enclosures and high density Lu2O3 ceramics minimizes the required activity for small size detectors
- Ideal to test the low energy efficiency of portal detectors; Three peak energies at 300KeV and below, closely resemble the compton scattered energies of lead shielded Cs-137 and Co-60 further attenuated by scrap metal loads

Lutetium (Lu 176)
Test Adapters

thermo scientific

Thermo Scientific ViewPoint Enterprise System

The intelligent integration of hardware and software, the Thermo Scientific™ ViewPoint™ Enterprise system is built around three major components, Sensors, Communications, and Decision Analysis.

- Sensors compatible with ViewPoint include the ASMIV and SGSII Portal Monitoring Systems, the RadEye family of Detection Instruments, and dozens of other Radiation Detection Products.
- Communications encompasses wireless and networked means of transferring information rapidly from sensors to the ViewPoint system.
- Decision Analysis is the powerful array of software tools that allow ViewPoint to remotely monitor, graph, and display data, as well as triggering alarms. Centralized Decision Analysis allows management and response personnel to make effective and rapid decisions when alarms occur.

Extended warranties and service plans

Configure your extended warranty, preventative maintenance, calibration and commissioning and start up services plan and enjoy peace of mind.

Find out more at
www.thermofisher.com/radiationmeasurement

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