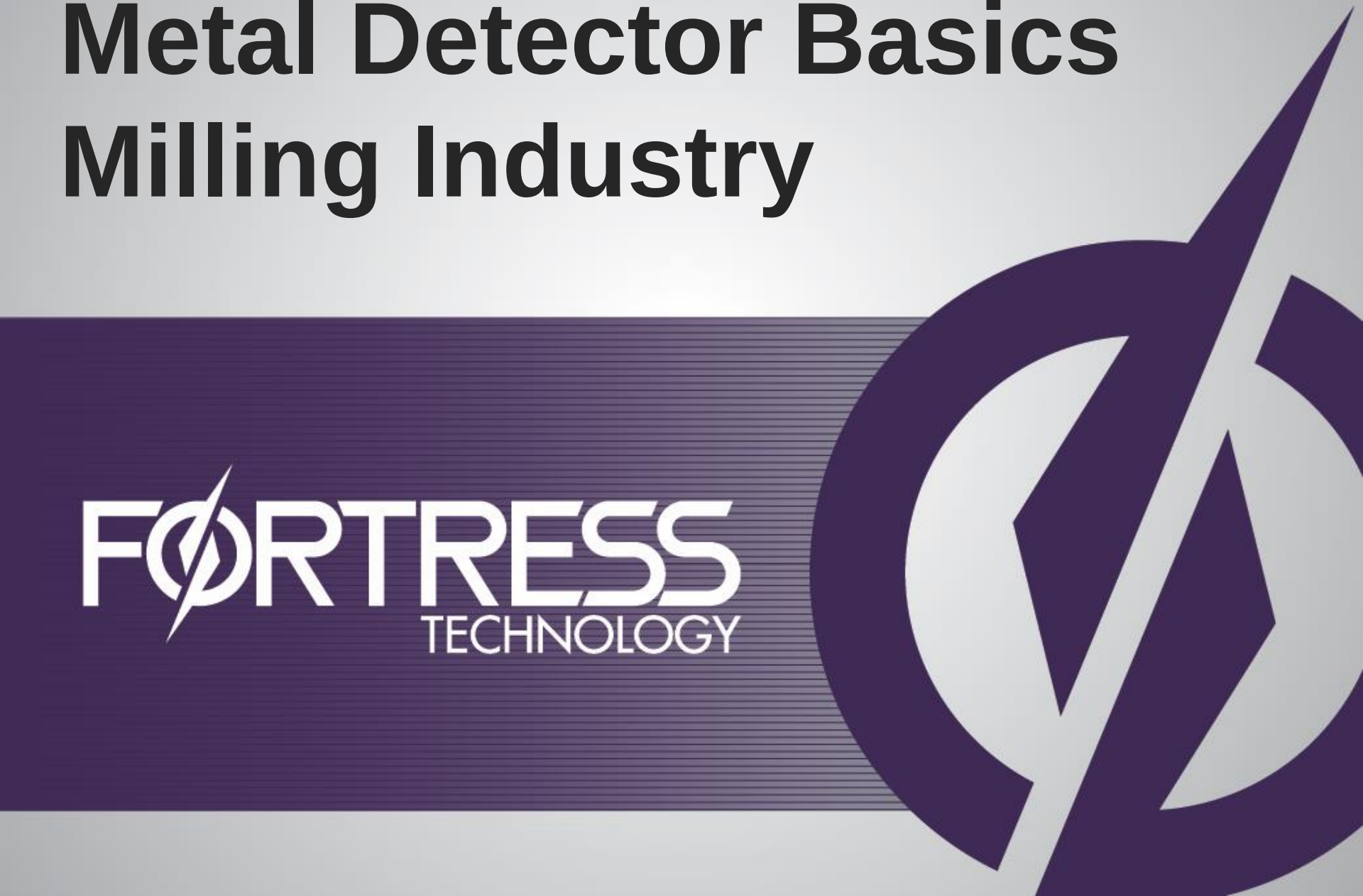
Guest Speaker – Andrew Frei

- Regional Manager of Fortress Technology
  - Managing Northeastern, South central regions of the US along with Western Canada
- 30 years experience in product inspection equipment applications
- Knowledgeable with food safety standards (i.e. HACCP, FSMA, BRC) and issues in the milling industry
- Worked with Fortune 500 and local customers to provide cost effective metal detection solutions for product and equipment protection

Metal Detector Basics
Milling Industry



Who We Are

FORTRESS TECHNOLOGY 20th ANNIVERSARY

PHANTOM

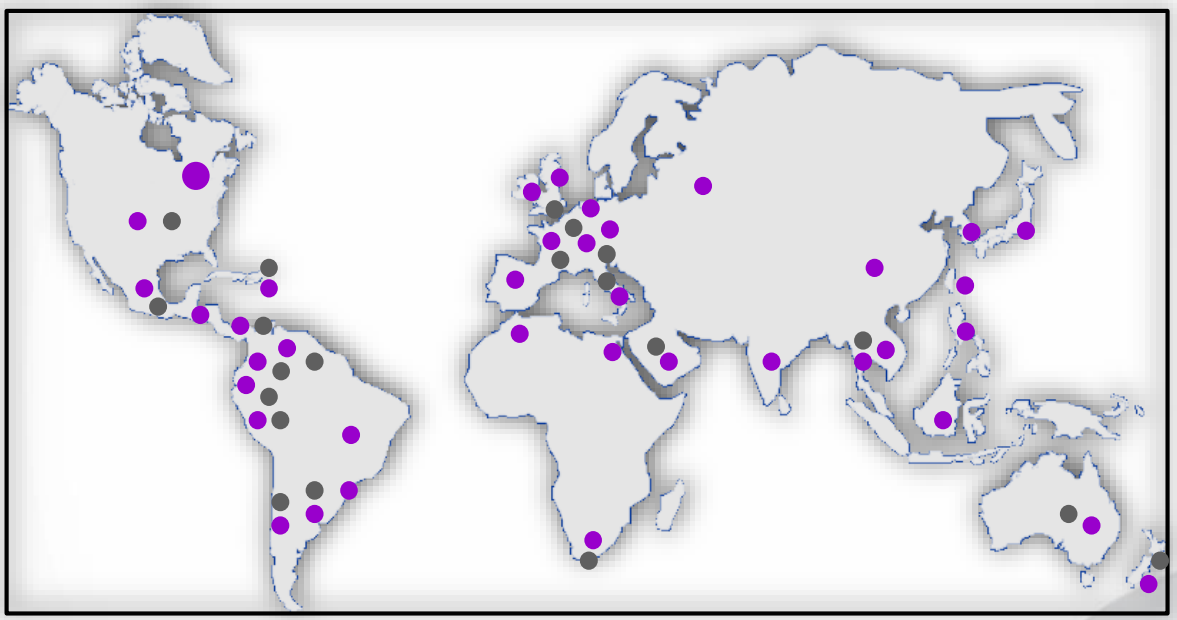
STEALTH

INTERCEPTOR

- Custom manufactures our equipment and software, to suit a customers' needs, applications and specifications
- *Never Obsolete* Commitment: detectors are always upgradable
- Simple Operation | Outstanding Reliability | Exceptional Performance

The Global Supplier

Manufacturing Sites:



- Installed detectors
- Representatives

NORTH AMERICA:
Toronto, Canada

SOUTH AMERICA:
São Paulo, Brazil

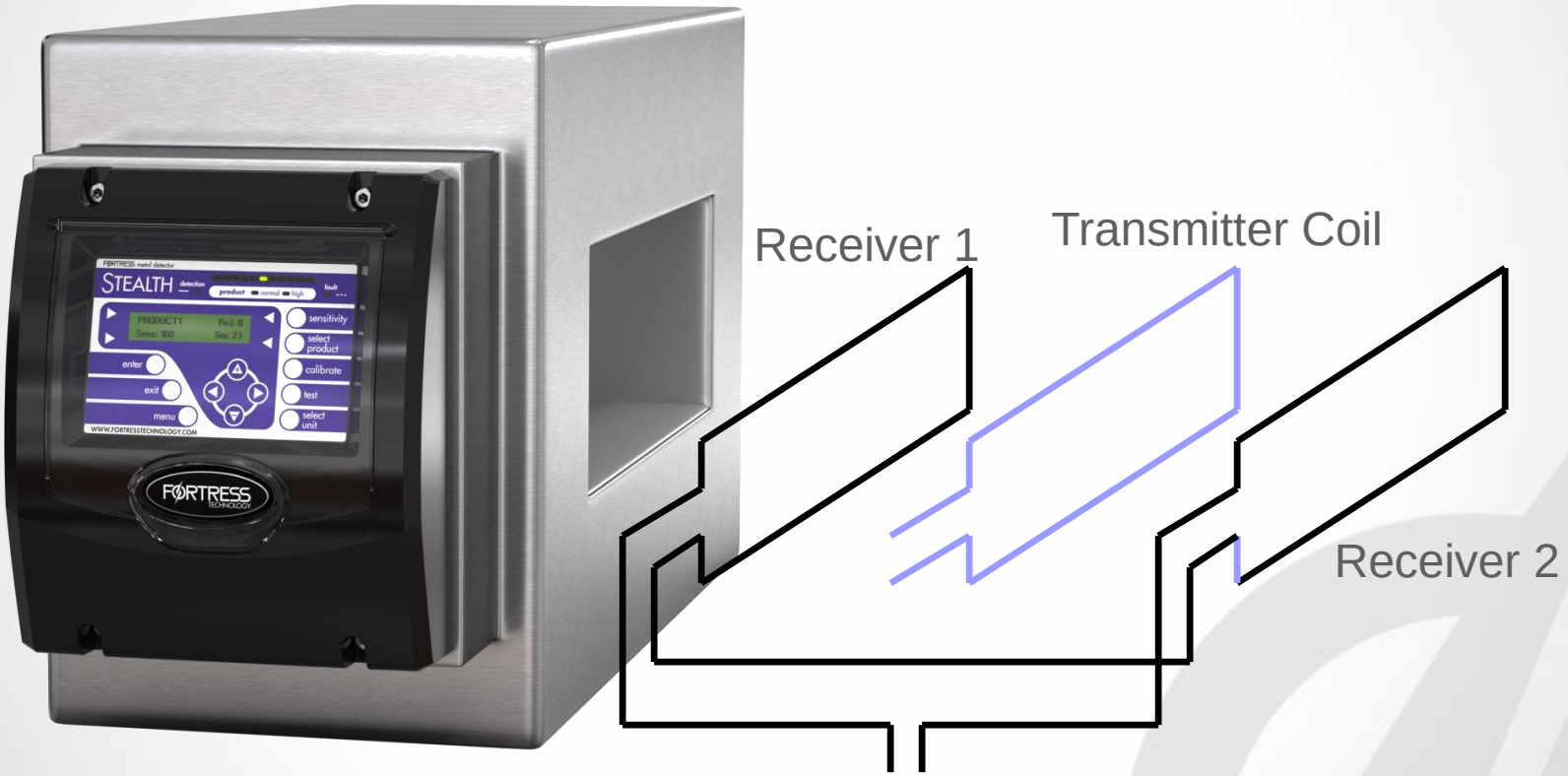
EUROPE:
Banbury, UK

AUSTRALIA/ASIA:
Dynamic Inspection
Cambridge, New Zealand

THE BASICS

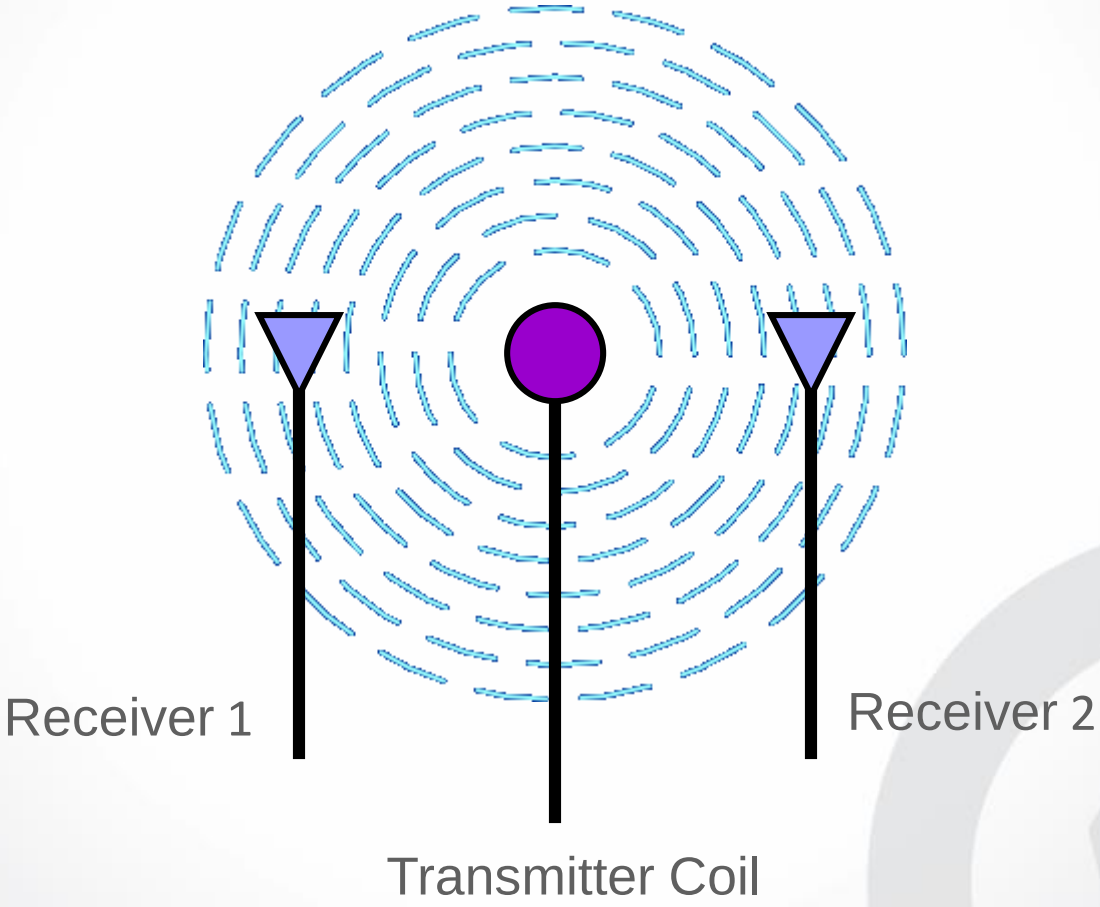
Metal Detection – The Basics

- **Balanced Coil**

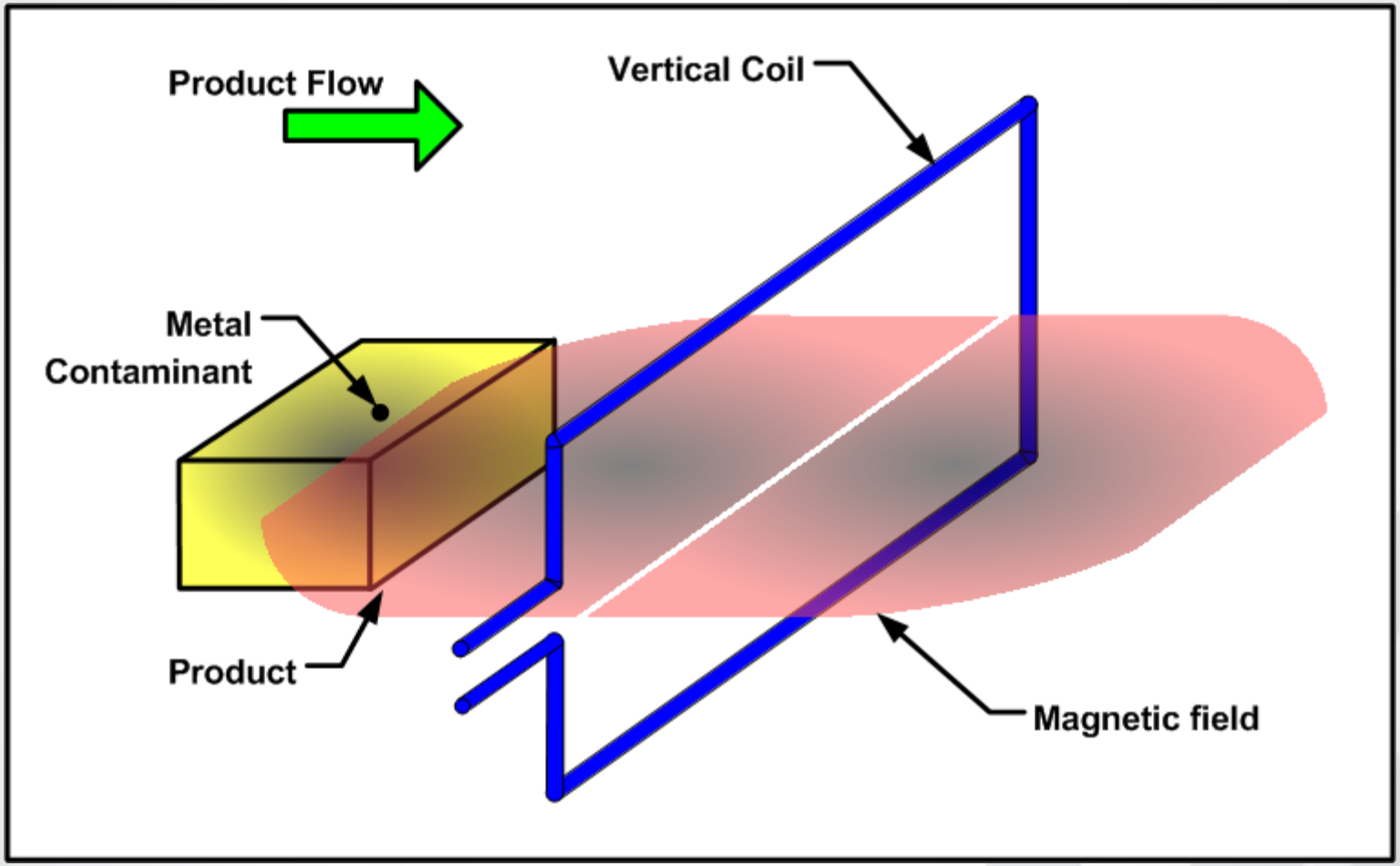


Metal Detection – The Basics

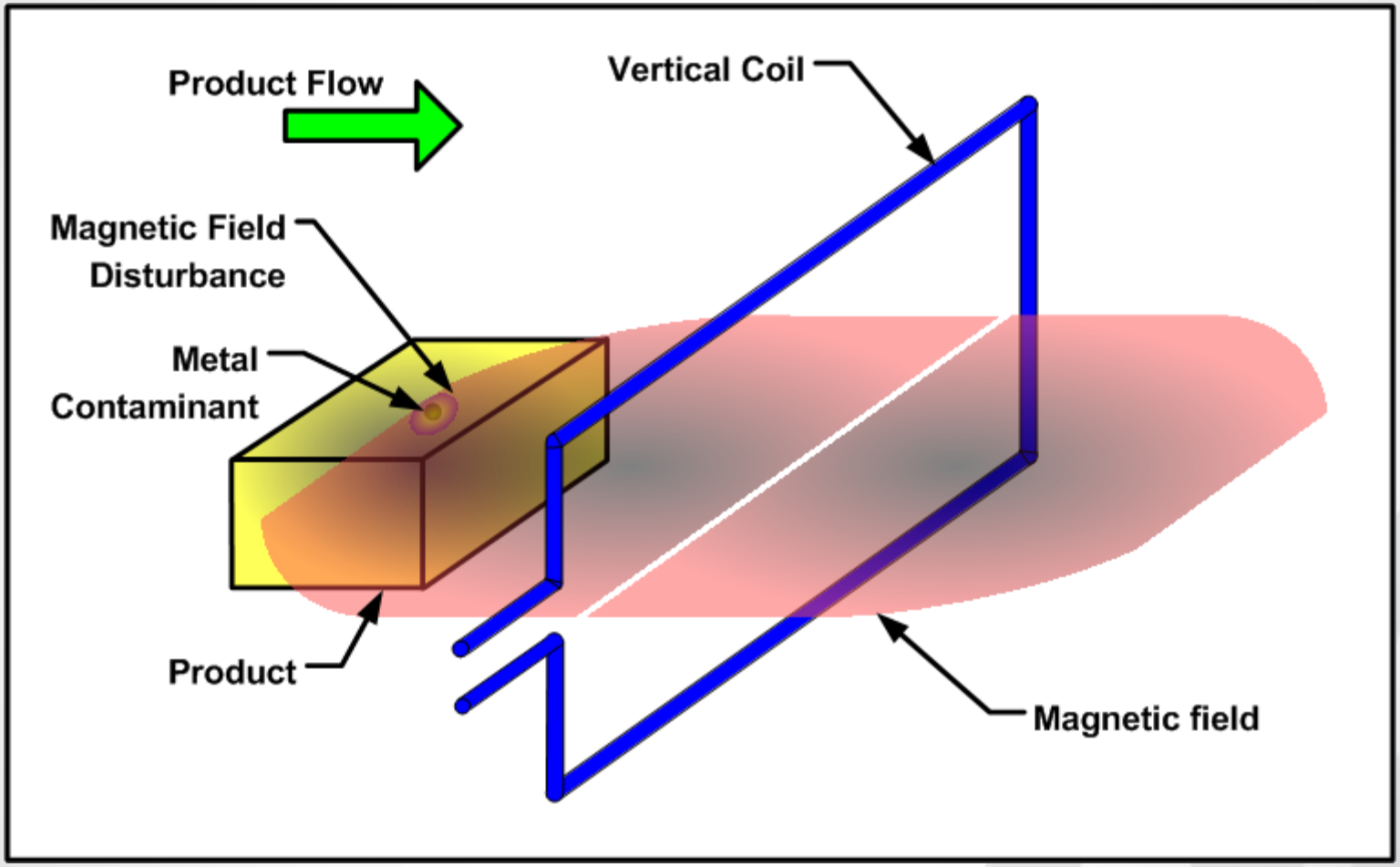
- **Balanced Coil**



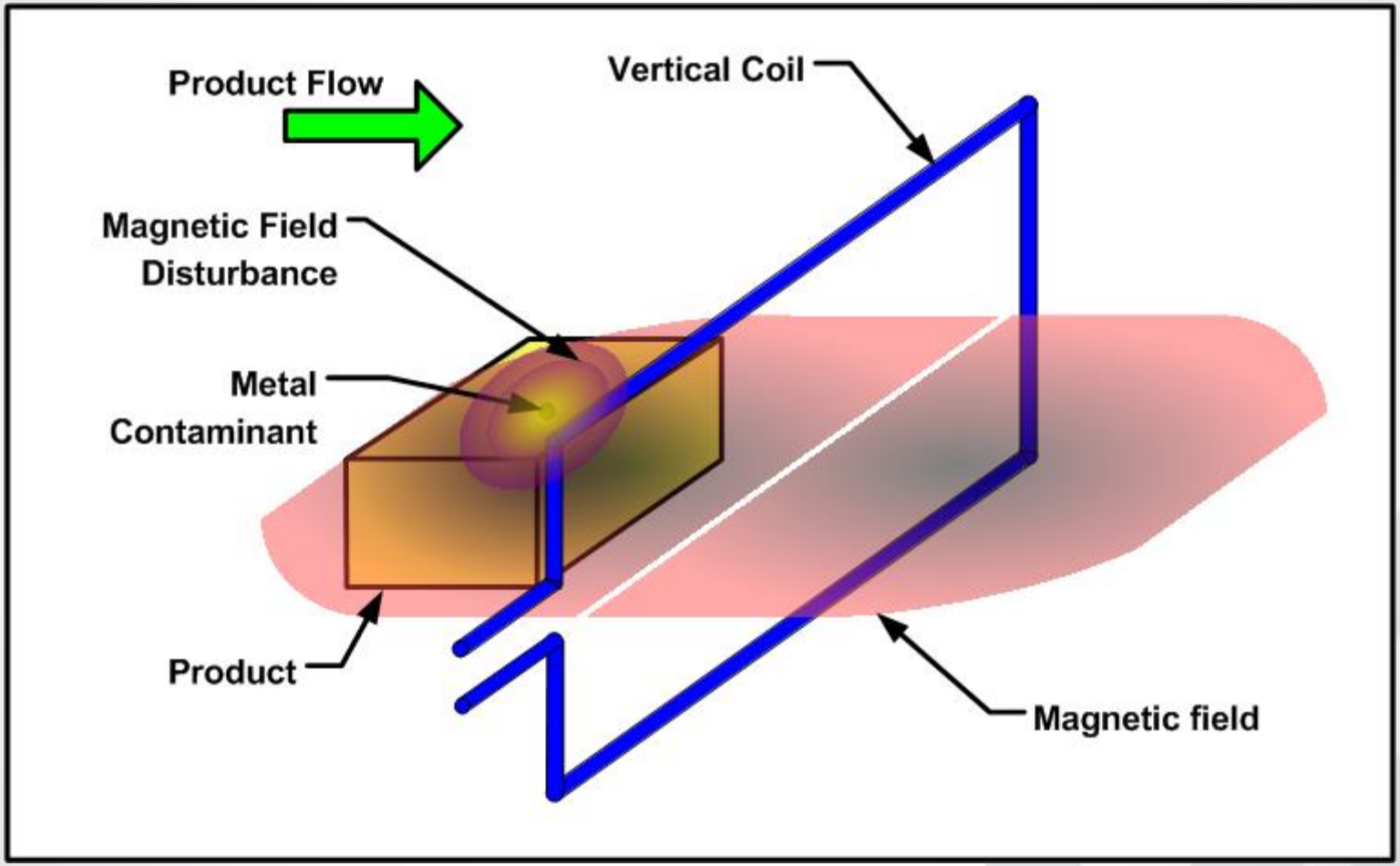
Vertical Coil



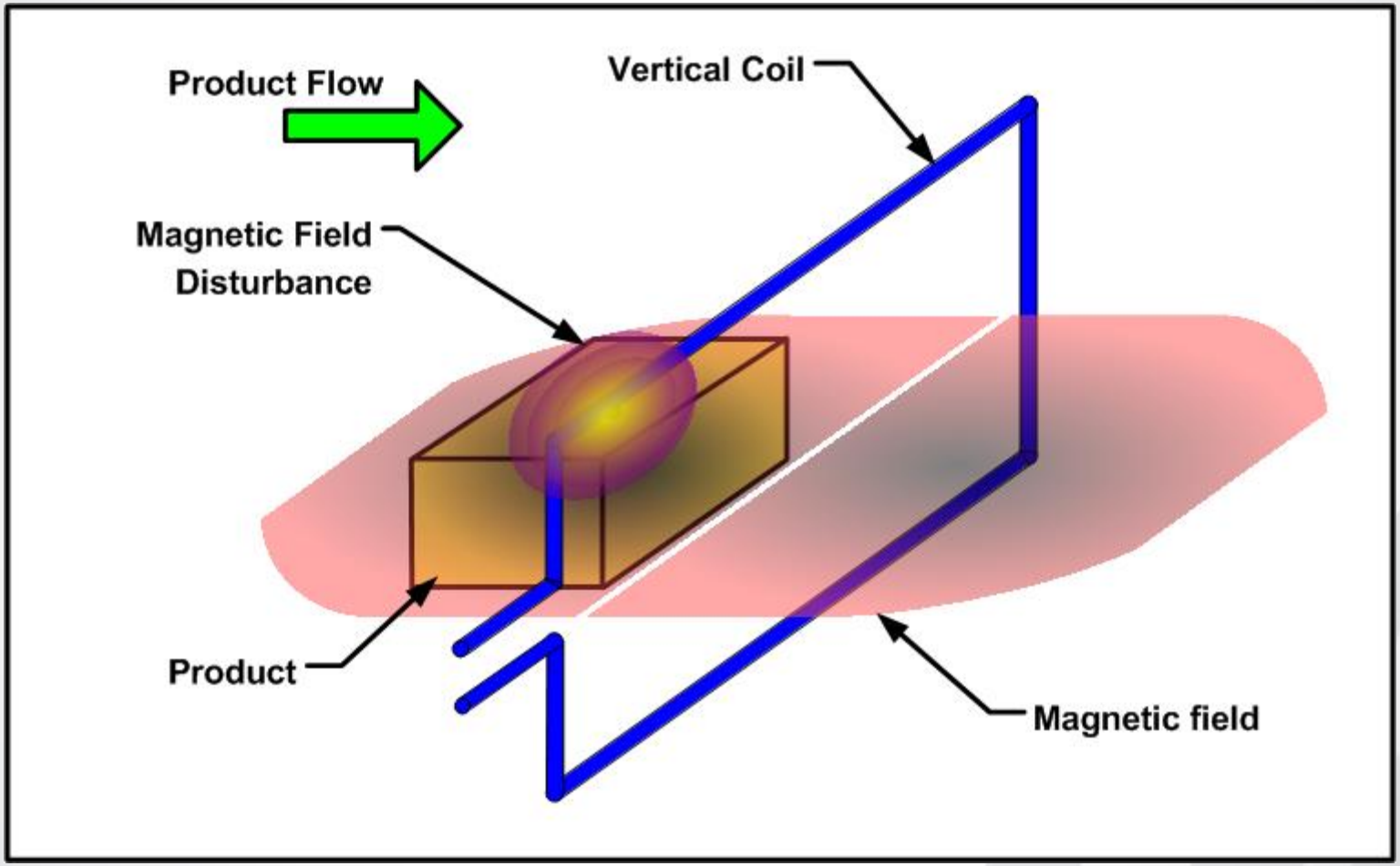
Vertical Coil



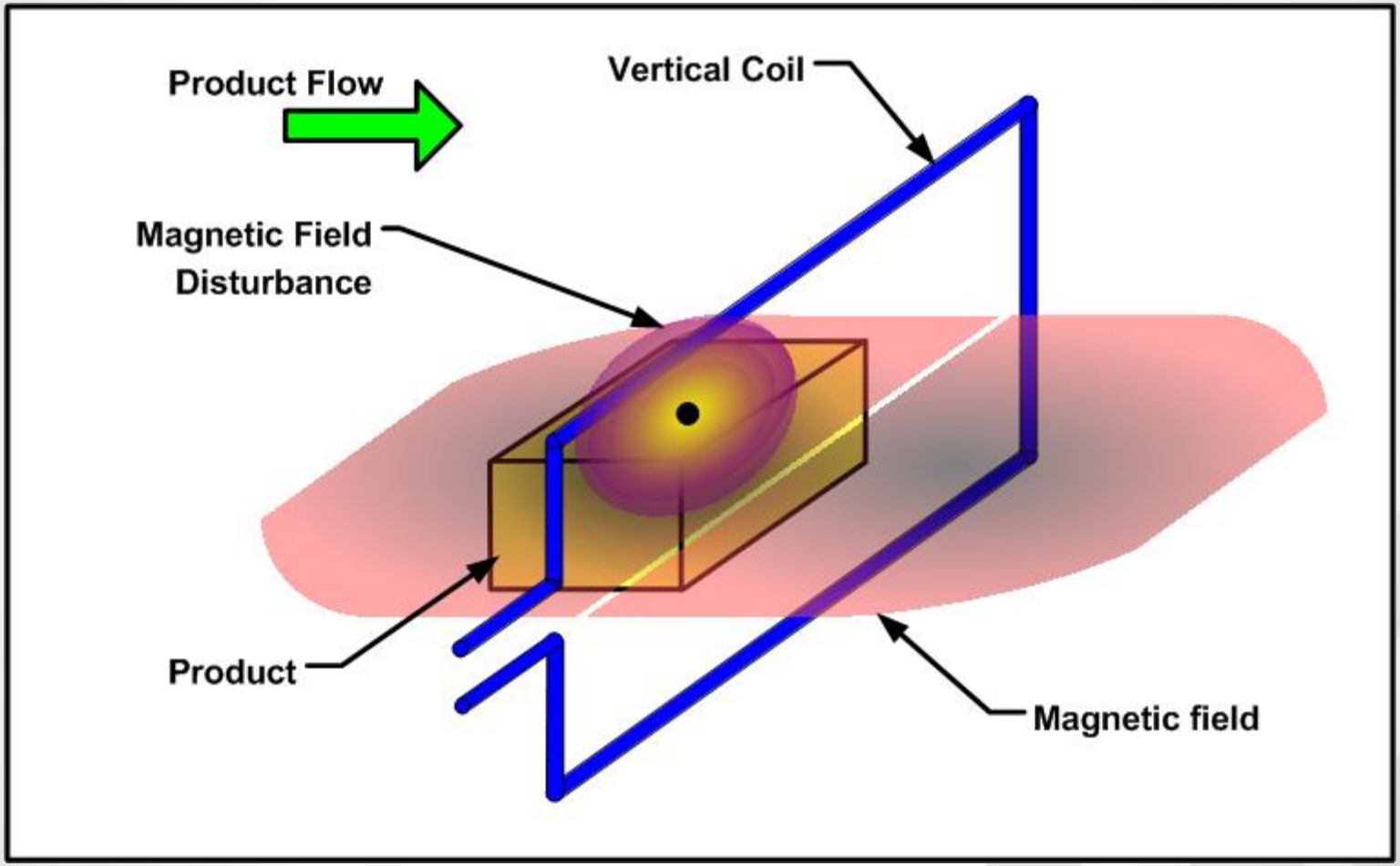
Vertical Coil



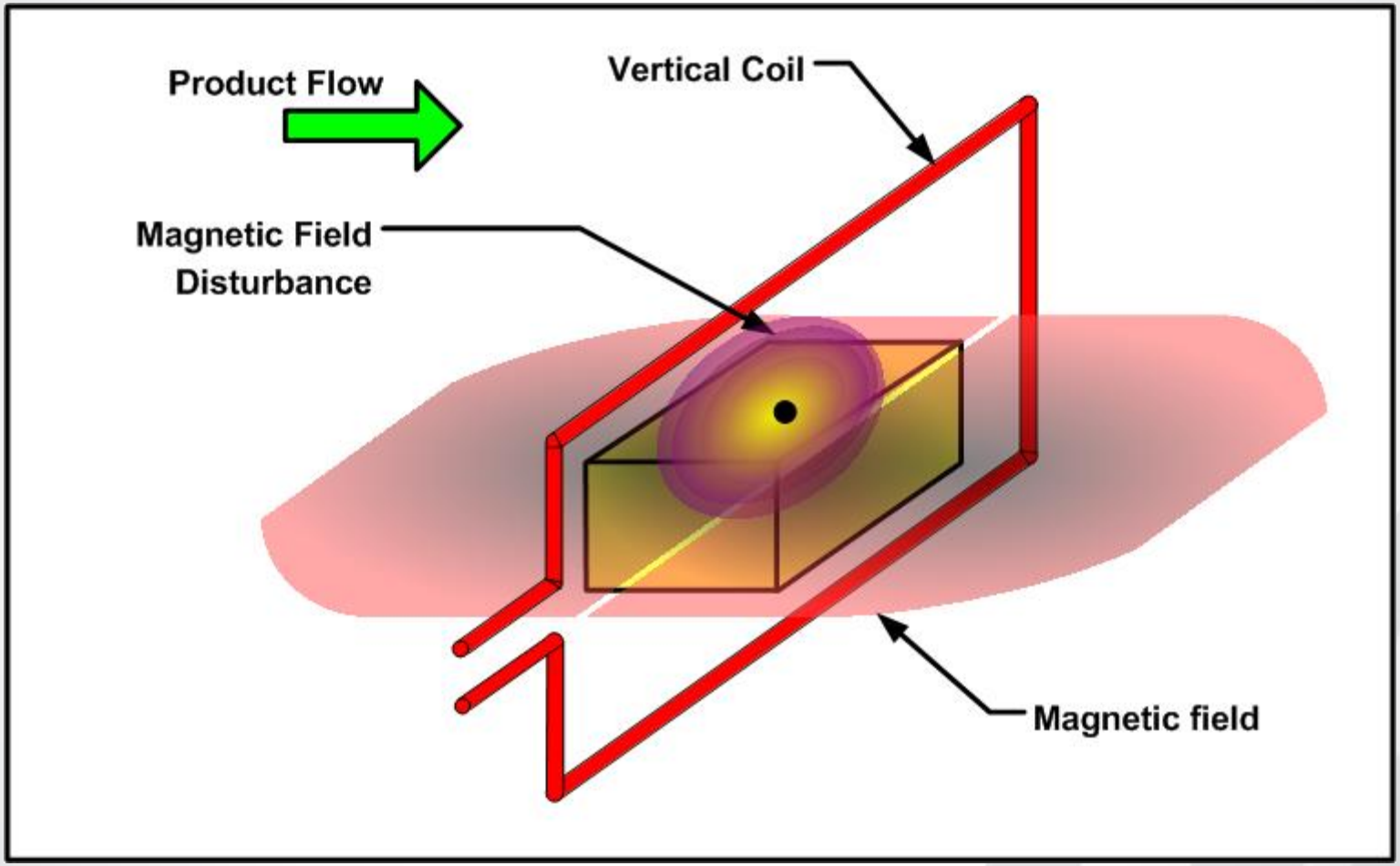
Vertical Coil



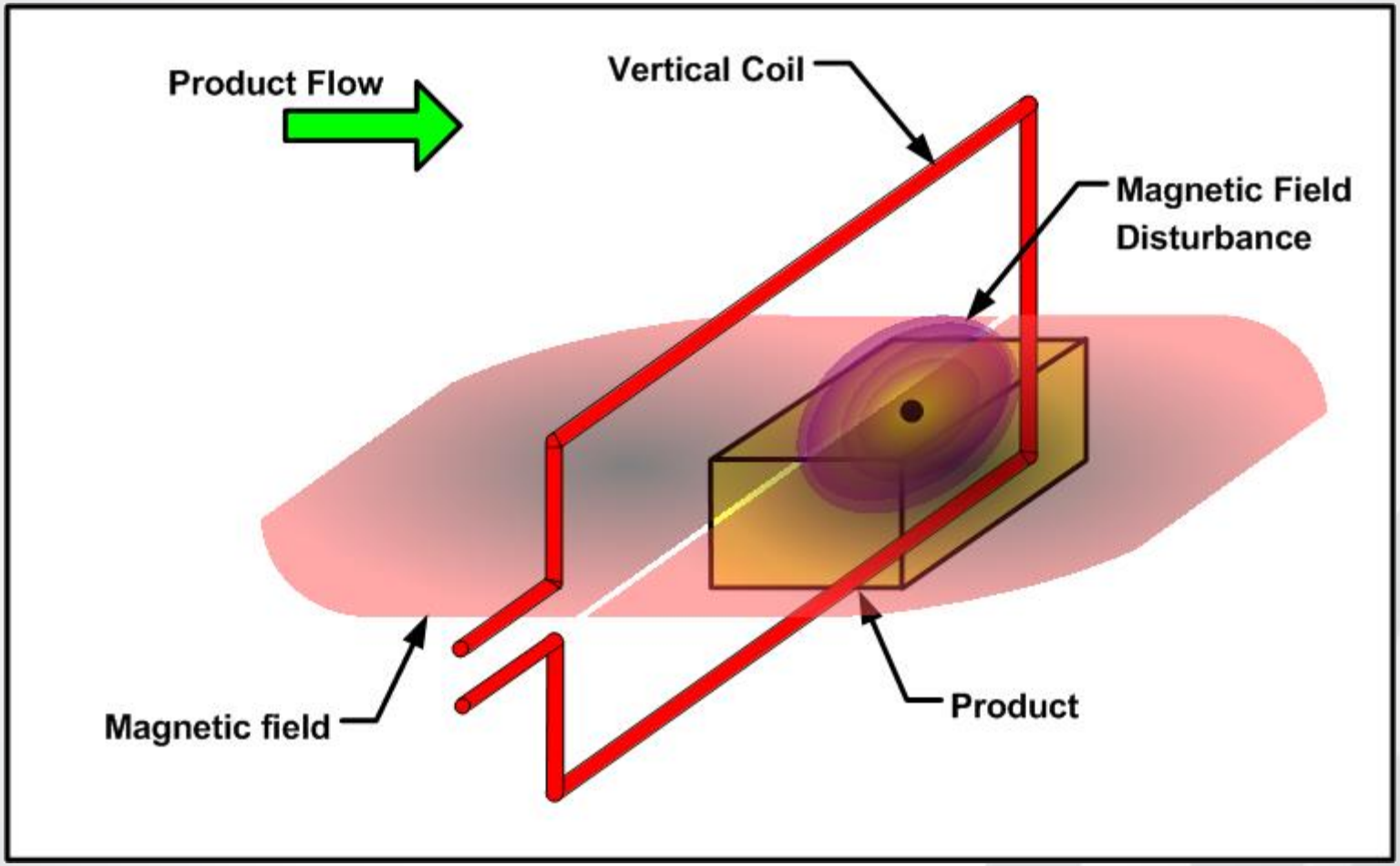
Vertical Coil



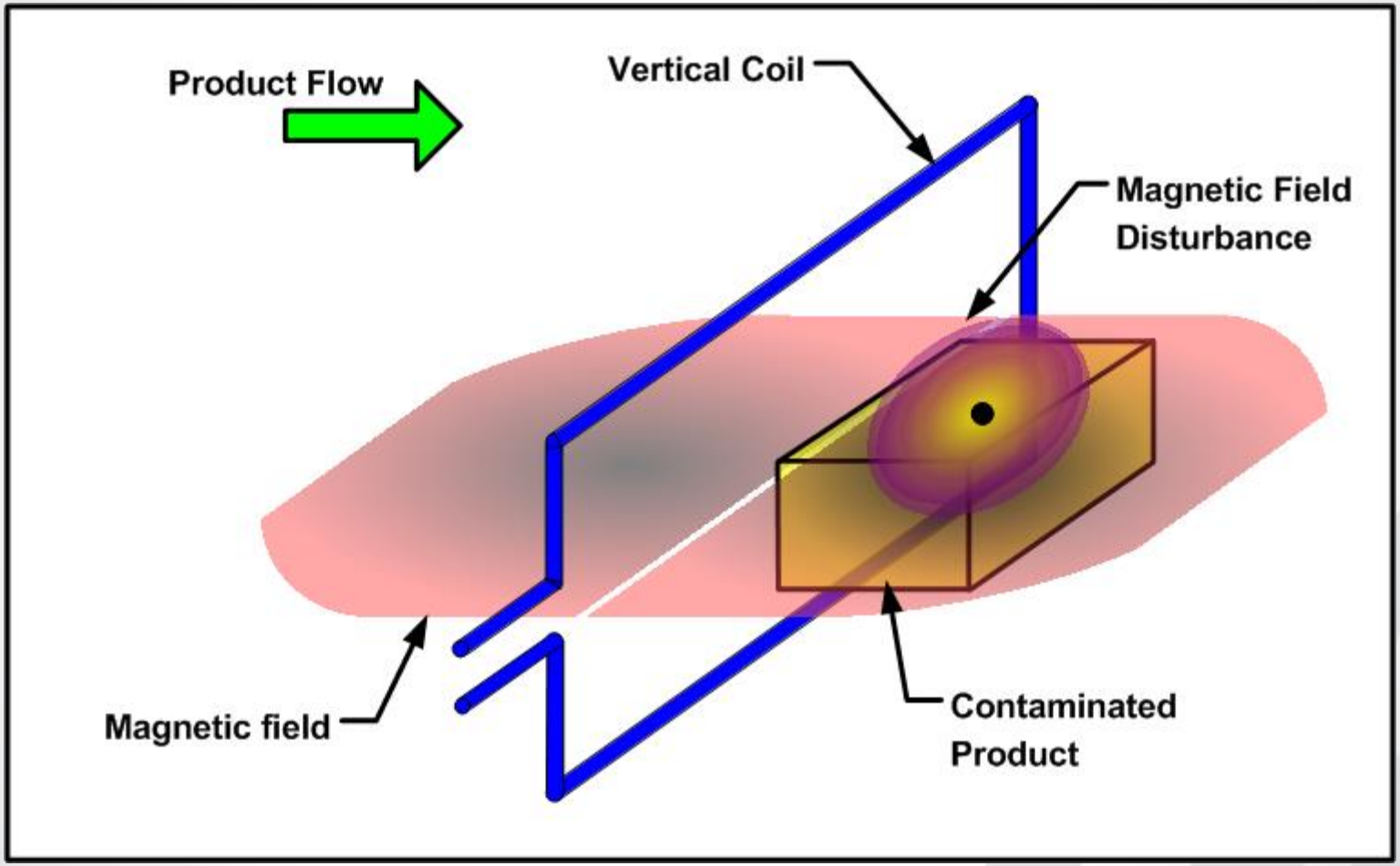
Vertical Coil



Vertical Coil

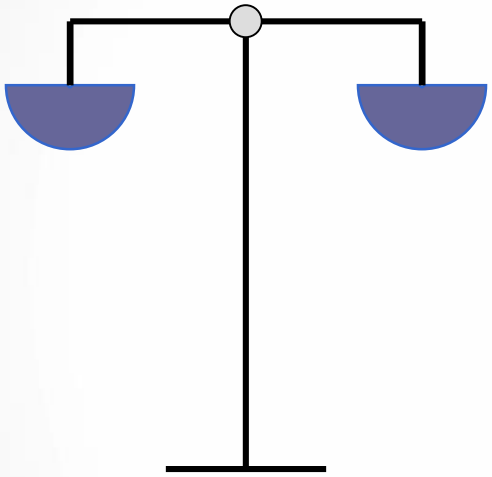


Vertical Coil

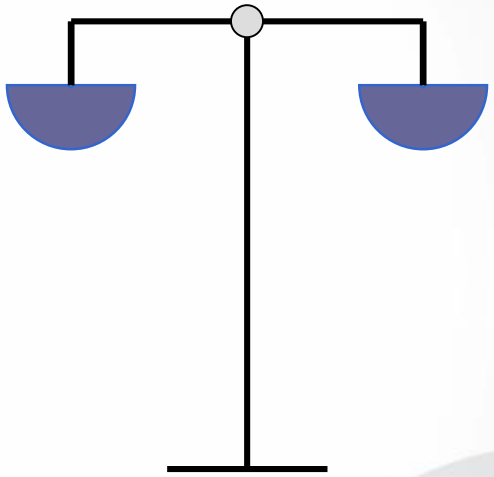


Metal Detection – The Basics

- **Product Effect**



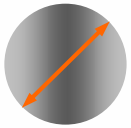
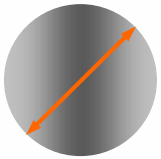
Conductive Scale



Magnetic Scale

Metal Detection – The Basics

- **Types of Metal – Detection Ratios**

Dry Product Mode	Wet Product Mode
 2.00mm Ferrous	 2.00mm Ferrous
 2.00mm Non-Ferrous	 3.00mm Non-Ferrous
 3.00mm Stainless	 4.00mm Stainless

(Example of Ratios ONLY)

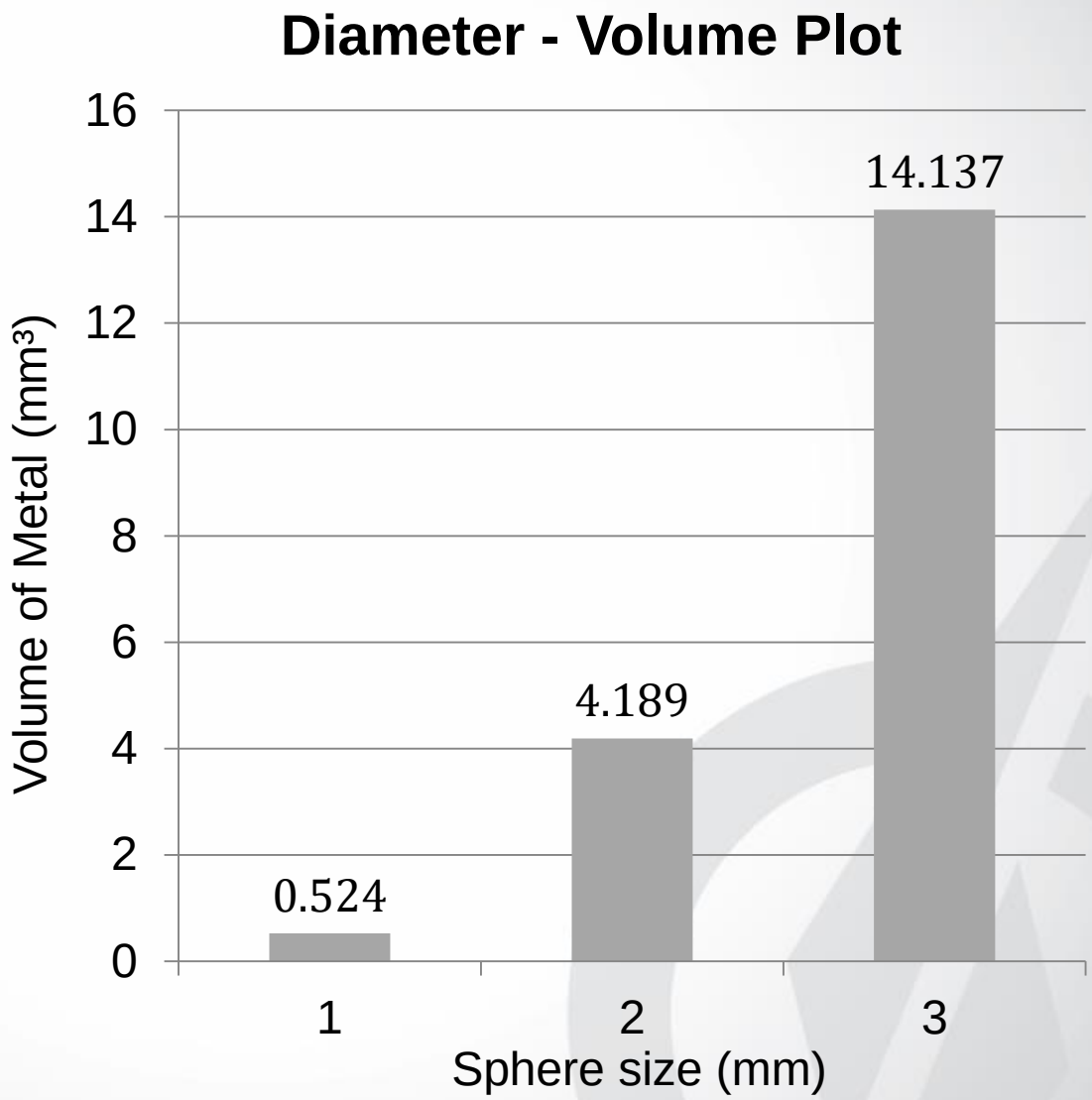
Metal Detection – The Basics

- **Typical Guidelines for Sensitivity**

Aperture Height	Dry Product	Wet Product	
	Ferrous & Non Ferrous	Ferrous	Non Ferrous
≤ 50 mm (2 In)	< 0.8 mm	< 0.8 mm	< 1.2 mm
≤ 125 mm (5 In)	< 1.0 mm	< 1.0 mm	< 1.5 mm
≤ 200 mm (8 In)	< 1.5 mm	< 1.5 mm	< 2.2 mm

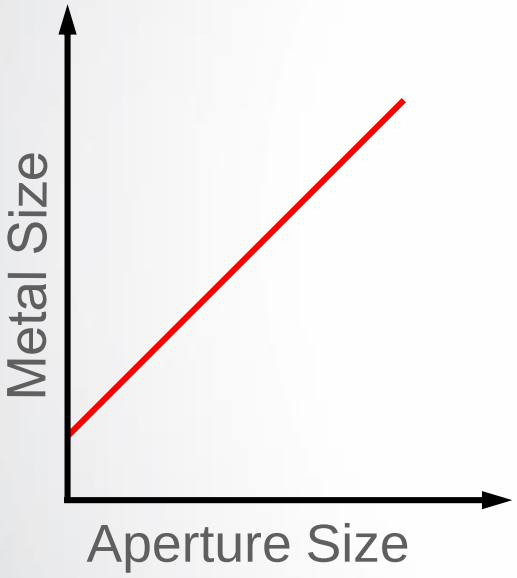
Sphere Size vs. Volume

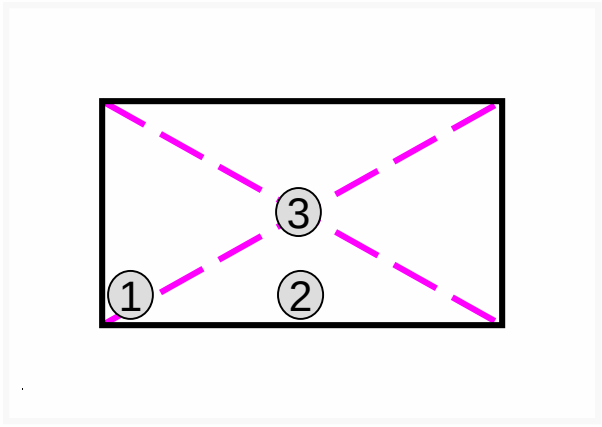
Diameter	Volume
0.25	0.008
0.50	0.065
0.75	0.221
0.80	0.268
1.00	0.524
1.25	1.023
1.50	1.767
2.00	4.189
2.50	8.181
3.00	14.137
3.50	22.449
4.00	33.510
4.50	47.713
5.00	65.450
5.50	87.114
6.00	113.098
6.50	143.794
7.00	179.595
7.50	220.894
8.00	268.083
8.50	321.556
9.00	381.704
9.50	448.922
10.00	523.600

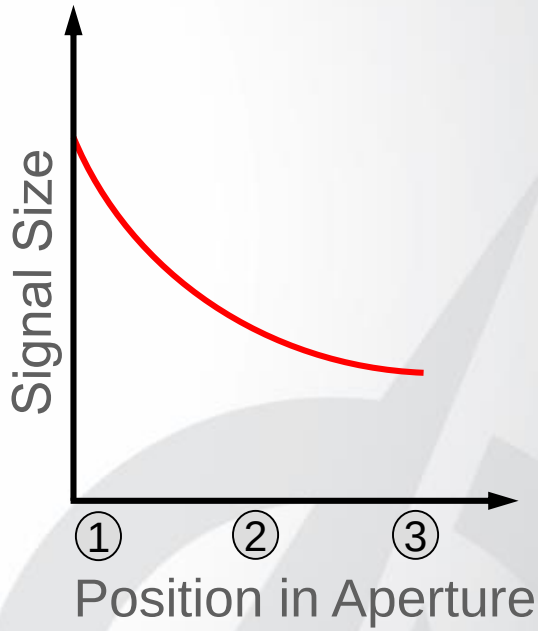


Metal Detection – The Basics

- **Sensitivity**







Metal Detection – The Basics

- **Shapes & Orientation of Metals**

Ferrous Wires:

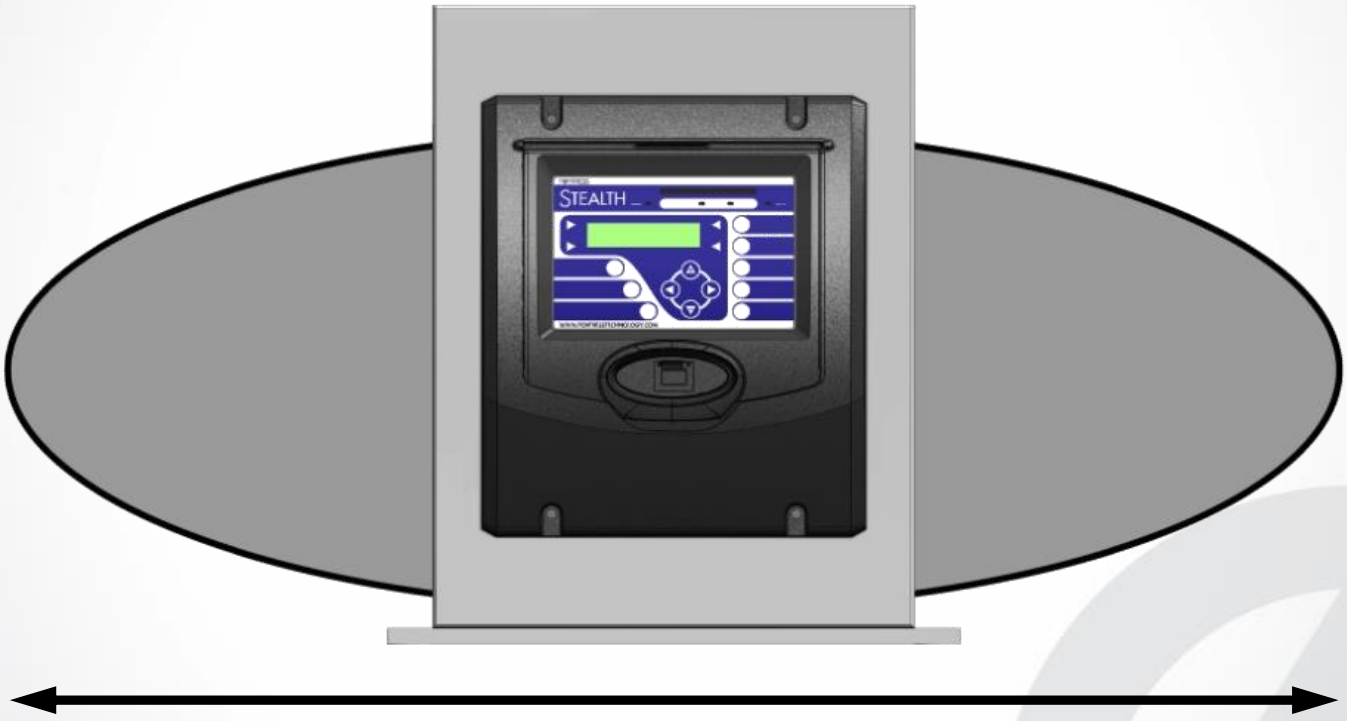
- **A** - Easiest position, biggest signal.
- **B, C** - Hardest Position, smallest signal.

Non-Ferrous and Stainless Steel Wires:

- **B, C** - Easiest position, biggest signal.
- **A** - Hardest position, smallest signal.

Metal Detection – The Basics

- **Metal-free Area**



Applications

Pharmaceutical

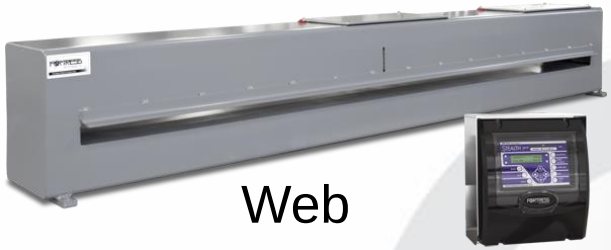
Gravity

Pipeline

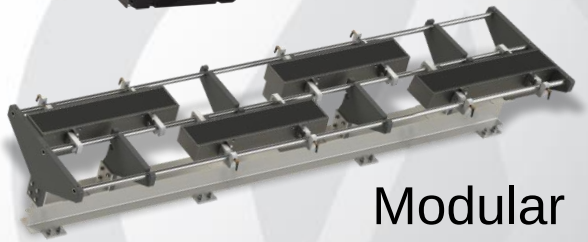
Vector

Large Bag

Vertex



Web



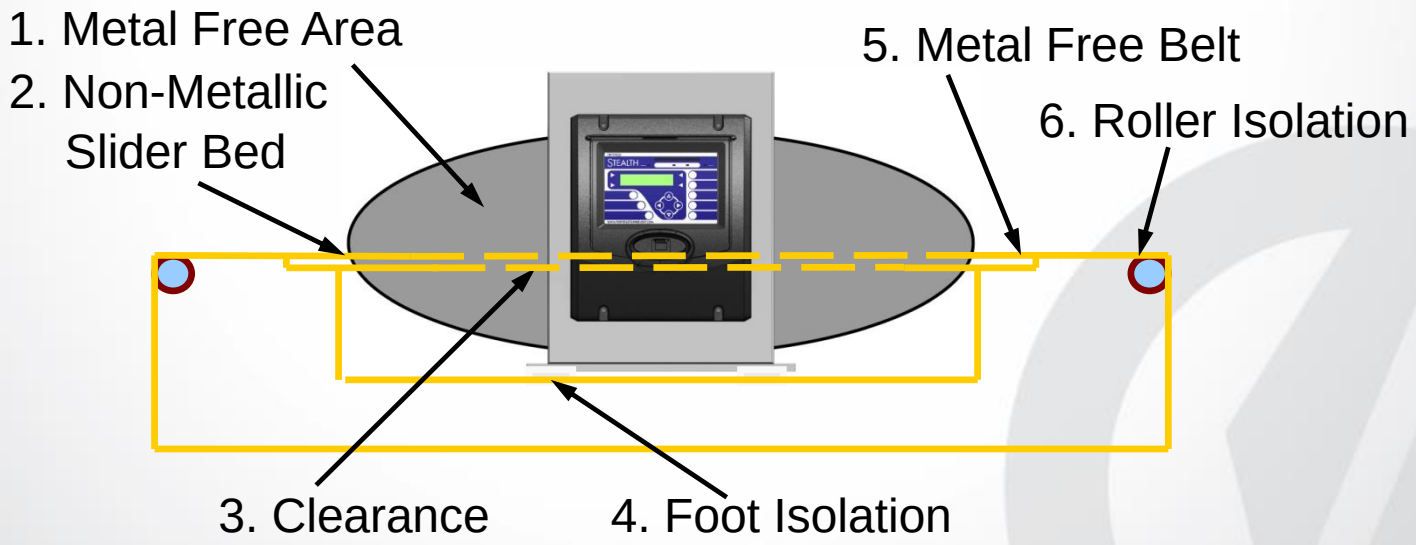
Modular

Applications – Conveyor

- Ideally suited for:
  - Packaged products of any kind
  - Bulk flow solids and powders
- Critical design factors:
  - Aperture size
  - Product rates
  - Reject design
  - Testability
  - Compliance factors

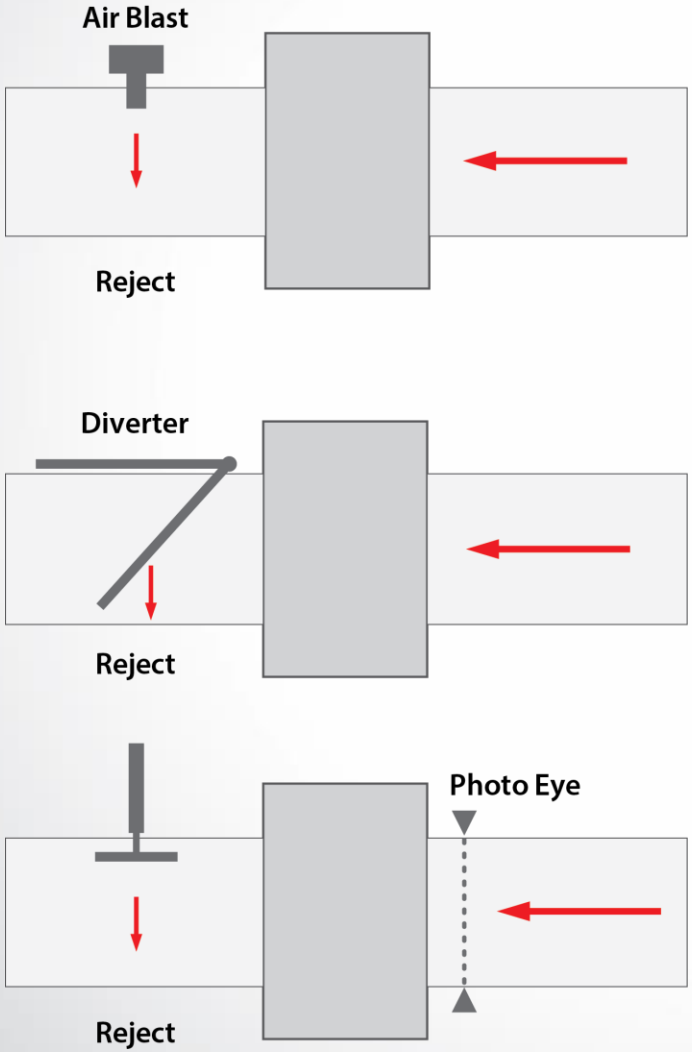
Metal Detection – The Basics

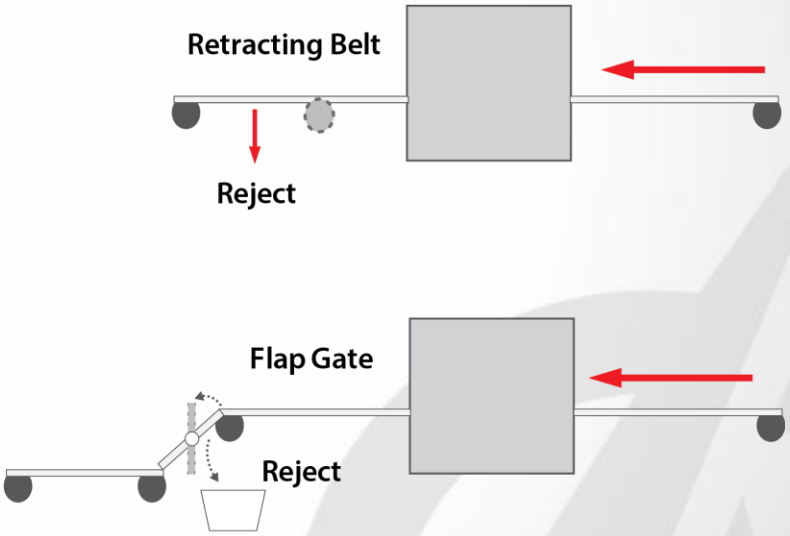
- **Detector Performance**
  - Isolated rollers - prevents loops
  - High quality belt – metal-free, carbon-free, interlocked finger
  - Splice or plastic modular belt (white or natural)
  - Low vibration and static
  - Adequate metal-free area



Metal Detection – The Basics

- Typical Metal Detector Conveyor Reject Options



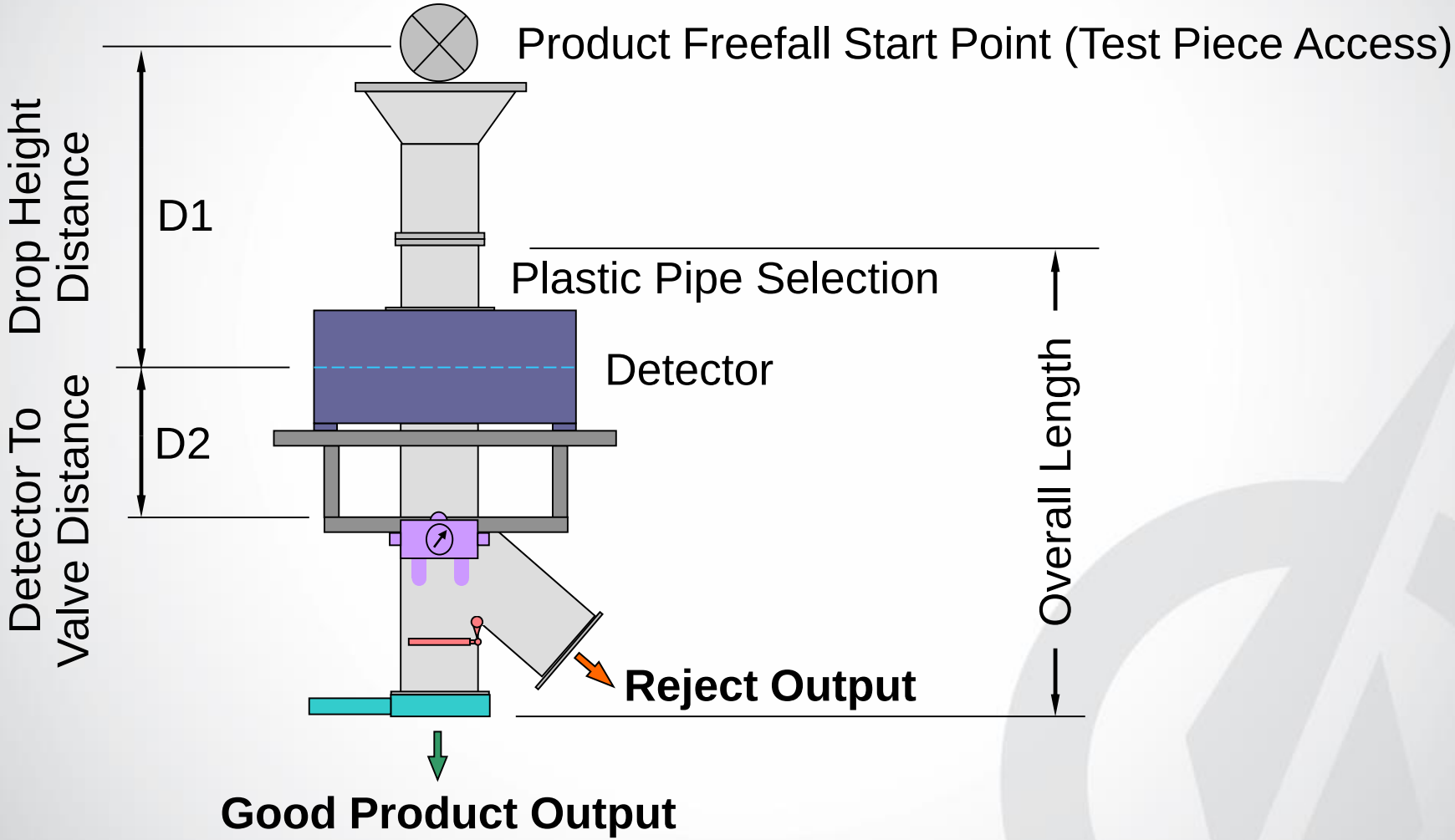


Applications – Drop Through / Gravity

- Ideally suited for inspecting dry, free flowing products such as:
  - Grains, flours, cereals
  - Rice, nuts, sugar
  - Plastic pellets and flakes

- Critical design factors:
  - Flow rate
  - Bulk density
  - Free fall distance
  - Pipe size
  - Space available
  - Testing procedure (insert + recovery)

Applications – Drop Through / Gravity

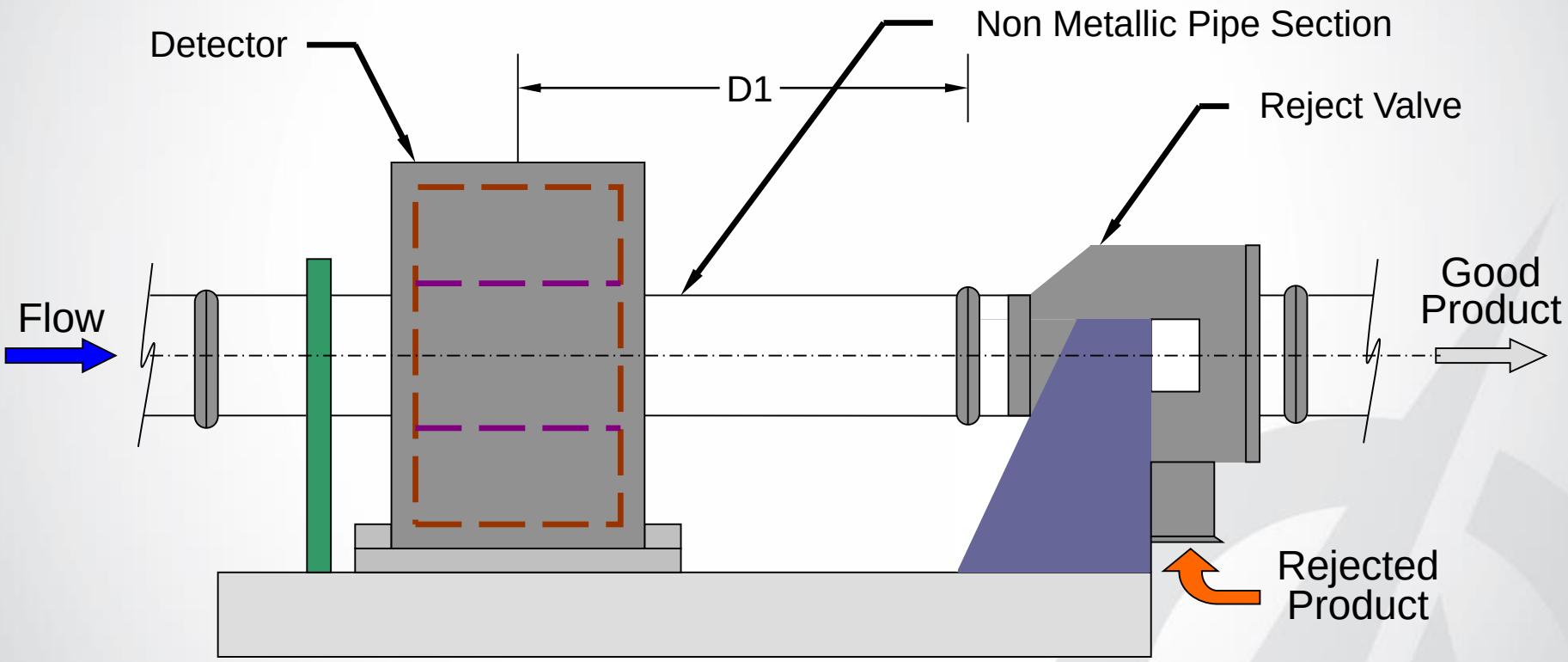


Applications - Pipeline

- Ideally suited for inspecting liquid, slurries, or paste products that can be pumped through, such as:
  - Sauces, dairy products, meat slurries, Juices etc.

- Critical design factors:
  - Pipe I.D.
  - Pipe clamp connection style (tri-clamp, I-line etc)
  - Product flow rate (GMP)
  - Product viscosity
  - Product temperature range
  - Product pressure
  - Expected cleanup procedures (wash down, pipe pig, etc.)

Applications - Pipeline



Food Safety Audit
Metal Detectors

- Metal Detectors have been reported as a leading cause of audit non-conformances

Most common issues:

- Lack of training / knowledge at all levels
- Lack of commitment at management levels
- Improper test procedures
- Equipment function failures

Testing Metal Detectors

1) How to test? Test methods?
2) When to test? How frequently?
3) What to test with? What size & type of metal, and what encapsulation type (Test wand, card, ball, other)?
4) Basic Test Procedures
5) What to do with the results (Test records, pass/fail, decisions & actions)?

Testing Metal Detectors

1) How to test?

Minimum considerations:

- Center of aperture
- Consistent position
- Speed same as product speed
- Number of passes/tests
- Use product where feasible
- Test must include rejection device
- Safety of procedure

Testing Metal Detectors

2) When to test?

Minimum considerations:

- Shift change or shorter regular interval (ie: every 4 hours)
- Product change
- Application change (speed, reject position, etc.)
- After line maintenance
- Consider the logistics of a test failure

Testing Metal Detectors

3) What to test with?

Minimum considerations:

- Choose Sphere sizes that are reliably detectable
- Stainless Steel sample always;
- Ferrous & Non-Ferrous can be at lesser frequency
- Form of test sphere encapsulation should suit the application (size, colour differential)
- Certified test samples

Testing Metal Detectors

4) Basic Test Procedures?

- Test sample should travel through the centre of the aperture
- Use ‘real’ product to carry the test sample whenever possible
- The test sample must be allowed to be rejected and enter the reject bin
- Record results

Testing Metal Detectors

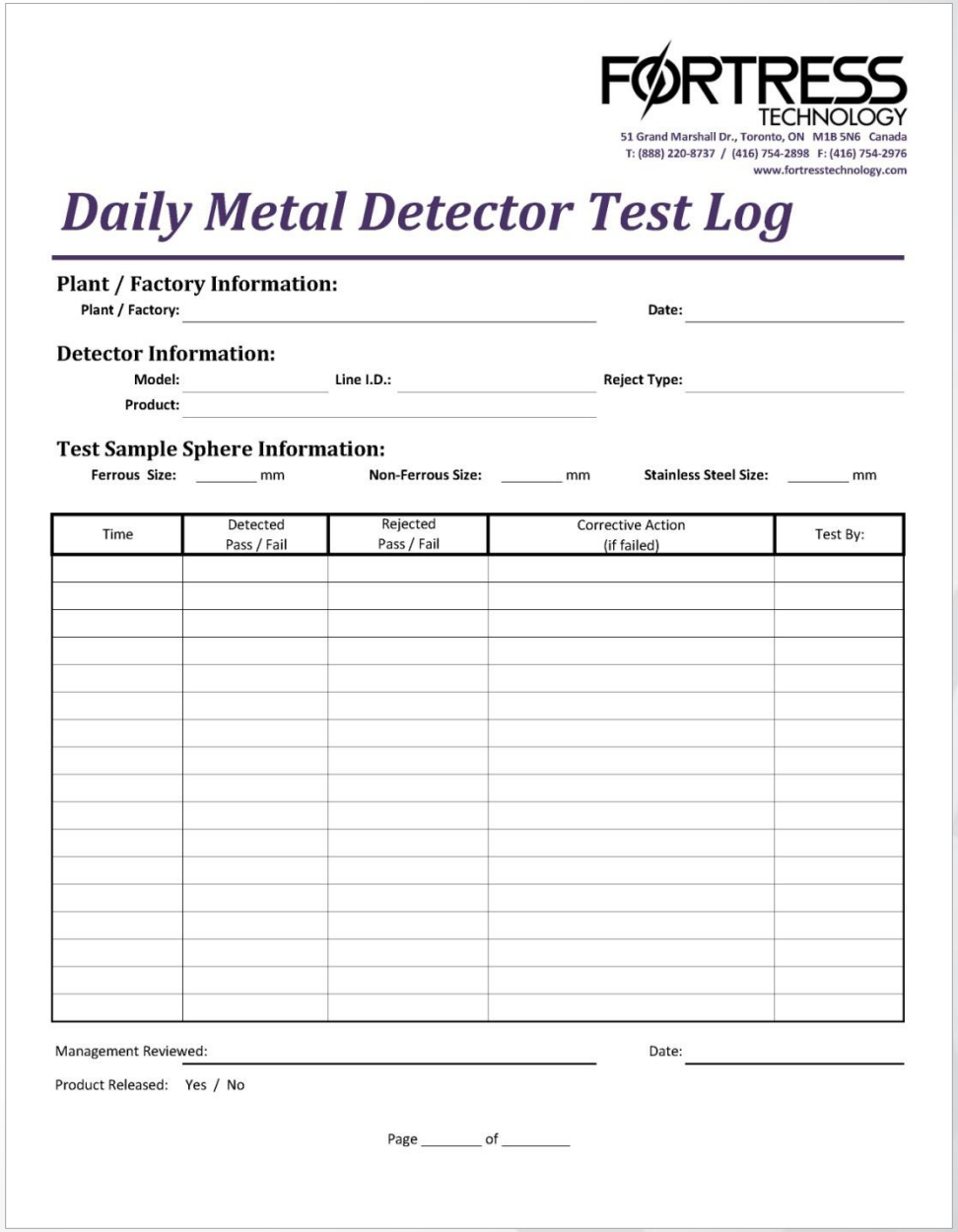
5) What to do with results?

Minimum considerations:

- Manual record of each test event
- System of collection/storage of records
- Easy method to decide pass/fail
- Clear action upon test failure

Test Documentation

- **Example of daily test log**



FORTRESS TECHNOLOGY
51 Grand Marshall Dr., Toronto, ON M1B 5N6 Canada
T: (888) 220-8737 / (416) 754-2898 F: (416) 754-2976
www.fortresstechnology.com

Daily Metal Detector Test Log

Plant / Factory Information:

Plant / Factory: _____ Date: _____

Detector Information:

Model: _____ Line I.D.: _____ Reject Type: _____

Product: _____

Test Sample Sphere Information:

Ferrous Size: _____ mm Non-Ferrous Size: _____ mm Stainless Steel Size: _____ mm

Time	Detected Pass / Fail	Rejected Pass / Fail	Corrective Action (if failed)	Test By:

Management Reviewed: _____ Date: _____

Product Released: Yes / No

Page _____ of _____

Test Data Automation

FORTRESS TECHNOLOGY

DETECTOR0001

Print Preview | Excel | PDF | Refresh | Toggle filter | Today | This Week | This Month | Previous Week | Previous Month | Last 7 Days | Last 30 Days

Print | Export | Refresh | Filter

November 2013 - December 2013

November 2013

	Su	Mo	Tu	We	Th	Fr	Sa
44	27	28	29	30	31	1	2
45	3	4	5	6	7	8	9
46	10	11	12	13	14	15	16
47	17	18	19	20	21	22	23
48	24	25	26	27	28	29	30
49							

December 2013

	Su	Mo	Tu	We	Th	Fr	Sa
48							
49	1	2	3	4	5	6	7
50	8	9	10	11	12	13	14
51	15	16	17	18	19	20	21
52	22	23	24	25	26	27	28
1	29	30	31	1	2	3	4

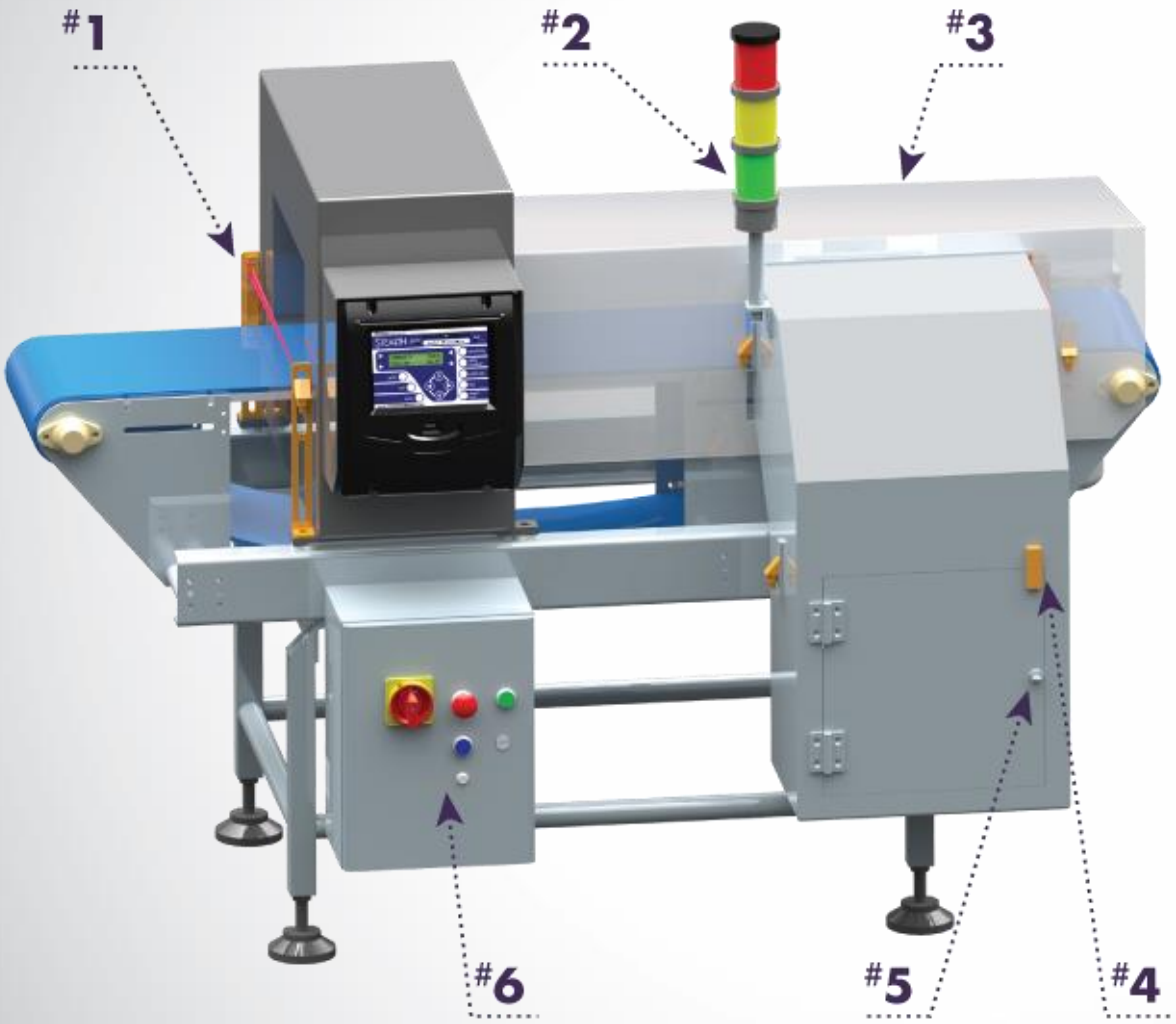
Today

Drag a column header here to group by that column

Date/Time		Type	Description
11/20/2013 8:51:28 AM		Powering up	Firmware: 201307080001
11/20/2013 12:39:30 PM		Configuration Change	Main Reject Duration: 0.25 -> 2.25
11/20/2013 12:51:04 PM		Reject	Peak: 5072, ID: 8
11/20/2013 12:56:56 PM		Test Request Failed	
11/20/2013 12:56:56 PM		Fault Ended	Test
11/20/2013 1:57:02 PM		Test Request Failed	
11/20/2013 2:57:08 PM		Test Request Failed	
11/20/2013 3:57:16 PM		Test Request Failed	
11/20/2013 4:57:22 PM		Test Request Failed	
11/20/2013 5:00:52 PM		Fault Started	Test
11/20/2013 5:17:42 PM		Reject	Peak: 4870, ID: 9
11/20/2013 5:17:50 PM		Configuration Change	Sensitivity: 105 -> 85
11/20/2013 5:17:54 PM		Configuration Change	Sensitivity: 85 -> 65
11/20/2013 5:18:00 PM		Reject	Peak: 475, ID: 10
11/20/2013 5:18:14 PM		Test Request - Fe	Peak: 276
11/20/2013 5:18:50 PM		Test Request - SS	Peak: 323
11/20/2013 5:18:52 PM		Test Request Passed	
11/20/2013 5:18:54 PM		Reject Counter Clear	
11/20/2013 5:19:04 PM		Manual Test	Peak: 337
11/20/2013 5:19:24 PM		Configuration Change	Test Mode: Request -> Auto
11/20/2013 5:19:42 PM		Auto Test - Operator Triggered	Peak: 32767
11/20/2013 5:19:54 PM		Auto Test - Operator Triggered	Peak: 32767
11/20/2013 5:20:08 PM		Auto Test - Operator Triggered	Peak: 32767
11/20/2013 5:20:18 PM		Configuration Change	Test Time Interval: 60 -> 1
11/20/2013 5:23:00 PM		Reject Counter Clear	
11/20/2013 5:23:50 PM		Auto Test - Operator Triggered	Peak: 32767

Failsafe Systems

FORTRESS TECHNOLOGY



#1 Infeed Photo Eye
(photo gate sensor for accurate reject timing)

#2 Beacon Lamp – On Metal Reject
Beacon Lamp/or Alarm – On Fault
Beacon Lamp – On Sensitivity Test Due

#3 Fixed Cover – from detector and over reject area

#4 Bin Door Open Sensor

#5 Lockable Bin

#6 Reset Keyswitch for faults

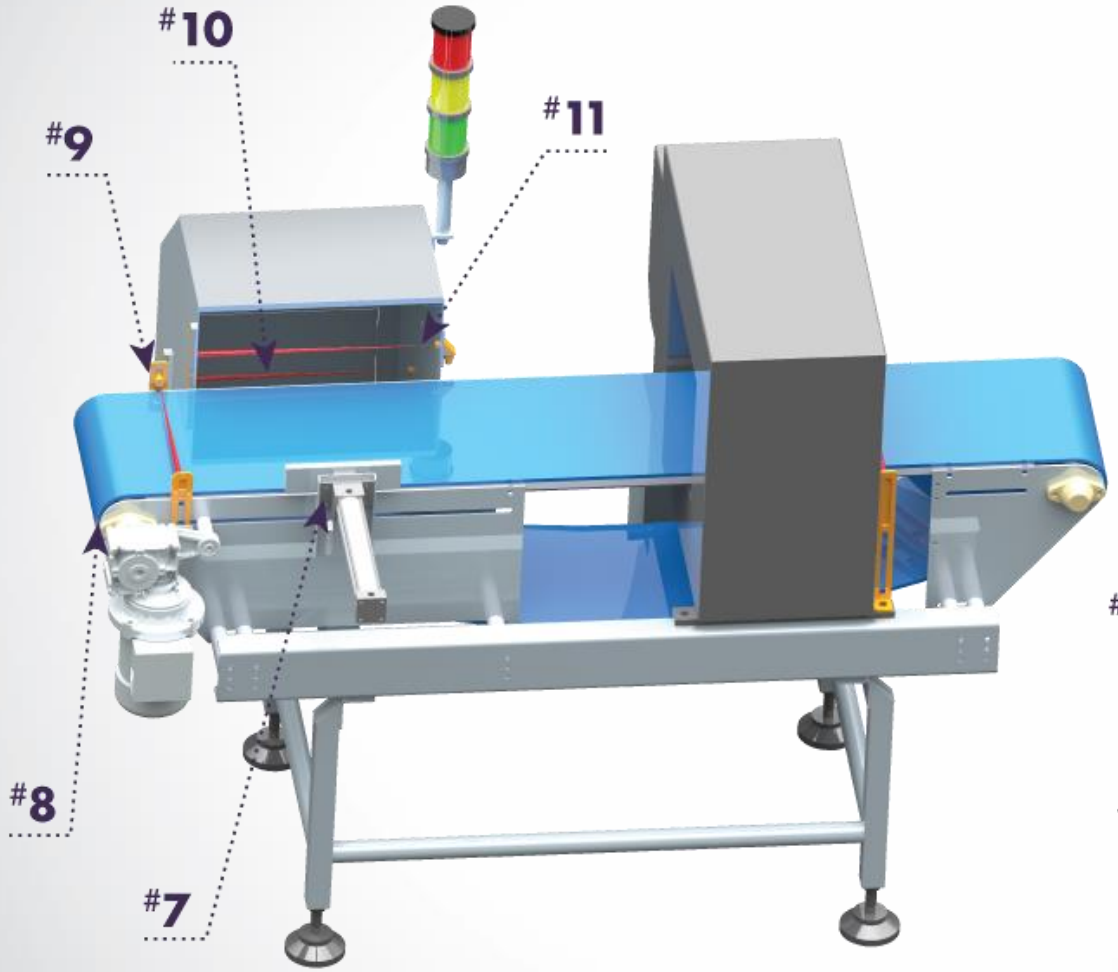
Reject Override Keyswitch – for testing reject

Build Back Signal from next conveyor to indicate product build back.

Output signal to upstream conveyor to cause it to stop if reject failure

Failsafe Systems

FORTRESS TECHNOLOGY



#7 Automatic Reject Device - Application Dependant

Air Pressure Failure Switch (with facility to test)

#8 Belt Speed Monitor – encoder or inverter for variable speeds/stoppages

#9 Second Reject Check/Confirm Sensor

#10 Bin Full Sensor (typically installed for 1/3 bin capacity)

Test facility for Bin Full sensor

#11 Reject Confirmation Sensor

Testing of Failsafe Systems

During an Audit, Proof of failsafe sensing devices may need to be demonstrated.

- In-feed eye blocked / misaligned
- Reject bin full
- Reject confirm fail
- No / low air
- Belt stop / start timing compensation
- Reject exit eye blocked

Audit Preparation

- Know GFSI scheme requirements
- Training for all levels of staff up-to-date
- Metal Detection equipment reviewed
  - Condition and Operation
  - Scheme requirements
- Test Samples – certified and appropriate size

Audit Preparation

- Audit team: review documentation & procedures
  - Accurate
  - Current
  - Compliance
- Detector calibration certificates from recognized source
- Test procedures, critical limits and report records
- Maintenance records and/or agreements

Food Safety Audit

Rejected Product

- Isolate – Locked Bins/Enclosures
- Examine/Re-inspect
- Use of Off Line or Lab Metal Detectors
- Identify metal
- Identify Source

Food Safety Audit

Summary

- Training, Training, Training
  - All levels of staff should be proficient
  - Management especially
- Documentation
  - All pertinent documentation organized and available
- Recall Procedures
  - Everyone on the audit team should know
- Metal Detector Supplier
  - Source for training and information

CONTACT Software

Events and Data Logging

OVERVIEW

Contact Communication system is designed to help with quality assurance record-keeping and reporting.

PHANTOM

Contact Service

Database

CONTACT REPORTER SOFTWARE

REJECTS

- Reject types:
  - Reject : Reject event from normal operation.
  - Reject Counter Cleared : Indicates counter was cleared by operator.
  - Photo Peak : Peak from a product in which metal was not detected.
    - Used for statistical analysis for discrete products.
  - Auto-Test
  - Test Request : Test done as part of a test request (FE, NFE, SS)
- Date & time
- Signal – Indicates the magnitude of the reject signal.

Event	Date & Time	Signal	Operator/Result	Rej. No.
Reject	Mar-05-2008 22:19:26	640		1
Reject	Mar-05-2008 22:19:27	10176		2
Counter Cleared	Mar-05-2008 22:19:27			
Reject	Mar-05-2008 22:19:27	1835		1
Reject	Mar-05-2008 22:19:27	7620		2

Contact Reporter Software

FORTRESS TECHNOLOGY

OVERVIEW

- Windows applications
- Displays detector status
- Generates reports on information collected
  - Reports can be exported to PDF or EXCEL

- Multiple languages
  (English, French, Spanish, Portuguese, German)

PHANTOM

Contact Service

Database

CONTACT
REPORTER SOFTWARE

REPORTS : PRODUCT LIST

Provides a list of parameters for all defined products on a detector.

Product List

Product Number:	1	2
Product Name:	PRODUCT1	NUTS T1
Setup Start:	Nov-12-2007 08:49:49	Nov-12-2007 09:24:16
Setup End:	Nov-12-2007 08:56:25	Nov-28-2007 10:08:59
Phase Angle	91.39	91.4
Phase Fault	Enabled	Enabled
Phase Mode Hold	Off	Off
Phase Trigger Limit	6	6
Phase Trigger Threshold	3	3
Photo Calibration	Off	Off
Photo Eye Block Fault	Enabled	Enabled
Photo Eye Block Time (# x Package Length)	1.9	1.9
Photo Eye Distance	15 in	15 in
Photo Reject Mode	Off	Off
Product Memory Fault	Enabled	Enabled
Product Name	PRODUCT1	NUTS T1
Product Number	1	2
R Threshold	40	40
Reference Fault	Enabled	Enabled
Reject Check	Off	Off

Contacting Fortress Technology

Headquarter

Fortress Technology Inc.
Toronto, Canada
Phone: (416) 754-2898
Fax: (416) 754-2976
Email: info@fortresstechnology.com

Europe

Fortress Technology (Europe) Ltd.
Banbury, UK
Phone: +44 (0) 1295 256266
Fax: +44 (0) 1295 255987
Email: info-UK@fortresstechnology.com

South America

Fortress Technology
Sistemas de Inspeção Ltda.
São Paulo, Brazil
Phone: +55 11 3641 6153
Fax: +55 11 3641 6153
Email: brasil@fortress-iis.com.br

www.fortresstechnology.com

Thank you for your attention!