Utilizing X-ray Portals to Maximize Detection and Throughput at Ports and Borders

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Overview

- Challenges of Customs Screening
- Commercially Available X-ray Screening and Inspection Tools
- High-Throughput Portal Systems Available Today
- Case Studies of Effective Interdiction
Challenges of Customs Screening

Various Points of Entry
- Land borders
- Airports
- Sea ports

Broad Array of Contraband
- Drugs
- Security threats (explosives, weapons, etc.)
- Stow-aways (people)
- Tax evasion (import duties and tariffs on tobacco products, alcohol, automobiles, etc.)
- Smuggling (art, treasures, money)

Broad Array of Conveyances
- Containers
- Cars
- Trucks
X-ray Screening and Inspection Tools

Mobile Systems

Gantry Systems

Drive-Through Portals

Transmission X-ray

Backscatter X-ray
Combined Systems: Transmission & 3-sided Backscatter X-ray

Combined Gantry Systems

Combined Drive-Through Portals
Trade-offs

- **Mobile Systems**
  - Good flexibility – can move system to screening site
  - Typically good imaging performance
  - Penetration through steel = 320mm (12.6 inches)
    - Wire resolution = 0.8mm (0.03 inch)
  - Low throughput – Approximately 25 trucks per hour
  - High maintenance cost – vehicle

- **Gantry Systems**
  - Highest imaging performance
    - Penetration through steel – up to 400mm (16 inches)
    - Wire resolution – as small as 0.8mm (0.03 inch)
  - Slowest throughput – typically about 20 trucks per hour
  - Highest first cost – Usually requires a building
Portal Systems (Drive-through)

- **Transmission X-ray Portal**
  - Good imaging performance
    - Penetration – 300mm (12 inches)
    - Wire resolution – 3mm (0.12 inches)
  - High throughput – 200 trucks per hour
  - Low first and maintenance cost

- **Backscatter X-ray Portal**
  - Lower penetration
  - Multi-sided views
  - Organic materials easily identified
  - High throughput – 250 trucks per hour
  - Low cost of ownership
What’s Best for Your Customs Applications?

Three important questions:

1. What’s the mission?
   - What are you looking to find? (drugs, weapons, stolen goods, humans, money, etc.)
   - What is the conveyance? (Vehicle, Container, Pallet, etc.)
   - Is a comprehensive inspection required or is rapid screening sufficient?
   - Is the contraband likely to be physically small or large?

2. What’s the Location?
   - Ports, borders, airports?
   - Is high-throughput required?

3. What are the ConOps?
   - How many operators are required?
   - How much space is available?
   - Would you ever want to move it?
   - What other information is important? – (manifest, license plate, container ID, etc.)
Where Maximum Detection and Throughput Is Important

Transmission, Backscatter or combined X-ray portal systems may be a good solution.
Transmission X-ray Portal Cargo System

- Penetrates 300 mm of steel
- 200 Trucks per hour
- Dual-Energy Material Discrimination
- Radiation Safe
  - Cab exclusion option turns on X-rays after the cab and driver have passed the beam. Extremely low scattered radiation dose to driver.
  - Cab Scan option uses low dose X-rays to scan the cab, then increases dose for container only.
  - Safe dose to driver in either case:
    - <0.05 μSv per scan
    - Below ANSI N43.17 dose limit
High Energy Transmission X-ray Image
Dual-Energy Transmission Images (Material Discrimination)

Organics = Orange
Metals = Blue

Mixed cargo
Farm Tractors
Backscatter X-ray Portal

- Highlights organic materials (drugs, explosives, etc.)
- 400 cars or 250 trucks per hour throughput
- Fits within a standard vehicle toll booth lane
- Top, Left and Right side Backscatter Imaging
- Optional top-down Transmission Imaging with Dual-Energy Material Discrimination
- Radiation Safe for passengers, cargo, operators and the environment
  - <0.05 μSv per scan
  - Below ANSI N43.17 dose limit
Sample Backscatter Car Portal Image Set

Top-down Transmission

Left Side Backscatter

Top-down Backscatter

Right Side Backscatter
44 Kilos of Cocaine in 5 tires

44 Kilos of Cocaine in all 5 tires
Truck Portal - Bus
Contraband in Cargo
Currency Seizure

Currency inside door panels
30 lbs. Methamphetamine in False Truck Bed
Combined Transmission and Backscatter X-ray Portal

- All features, benefits, and images of both Transmission and Backscatter portals
- Co-located in series for seamless operation
- 200 trucks per hour
- Drive through up to 12 kph
- Can be operated to exclude cab from X-rays
- Can be used for screening air cargo
- Radiation safe for passengers, cargo, operators, and the environment
Images from a Combined Portal System

Dual-energy Transmission X-ray

Left side Backscatter

Top down Backscatter

Right side Backscatter
Air Cargo Application of Combined Portals

Taiwan International Airport

Mexico City International Airport
Examples of Air Cargo Seizures

Backscatter X-ray Imaging

Money found inside air conditioners

Cocaine found in palletized rock grinders

Transmission X-ray Imaging
Managed Services

Global Scanning Solutions – BOT Model

- **Build**
  - No capital investment
  - "pay as you go"
- **Operate**
  - Operational Efficiency
    - 50+ years knowledge base
  - Highly Trained Operators
    - expert image analysis
  - Remote Diagnostics
    - maximum uptime
- **Transfer**
  - 24x7 Technical Support
    - from Parent Co.
  - Performance Reporting
    - Ensures scanning volume accuracy
Passenger Vehicle Border Crossing Concept

- Drive-through Backscatter portals are embedded into multiple lanes of traffic
- Automated gates control traffic flow
- Vehicle is scanned and license plate is read and recorded
- Data file is networked to Central Analysis Station
- Analysis is performed while driver goes through Customs/Passport control
- Disposition determined and noted in file
- Vehicle proceeds to second gate, license plate read
- If file corresponding to license plate is “clear to go”, light blinks **GREEN** and vehicle returns to traffic flow
- If file indicates otherwise, light blinks **RED** and vehicle is directed to secondary inspection
- Officer types license plate number into wireless tablet to retrieve data file with suspicious region noted
- X-ray image can be used to aid secondary search
Summary

- Transmission and Backscatter X-ray screening portals fit into standard operations
- High throughput and maximum detection with multiple technologies available
  - High-energy Transmission X-rays
  - Dual-energy material discrimination
  - 3-sided Backscatter X-ray imaging
  - Top-down view in both Transmission and Backscatter
- Proven technologies
- Ideal for border crossings, sea ports, and airports
- Radiation safe for passengers, cargo, operators, and the environment
- Can be networked
- Available as part of a Managed Services BOT