End-to-End Cold Chain Safety & Security Monitoring

for

1. Real-Time Alerts of Exceptions
2. End-to-End Verification and Certification
3. “FEFO” vs. “FIFO” vs. Unverifiable “History”

AVANTE International Technology, Inc.
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“Fresh and Safe” are the Goals of all Asian Cold Chain Food Retailing
End-to-End Pedigree & Life History of Vaccines and Some Healthcare Products can be Life-critical
Processed foods may have a “larger window” in maintaining the goals of “Fresh and Safe”
Documented and Verifiable “Temperature-Humidity Directly “On-and-Of” the Produce and Products Starts when they are “Harvested” and “Processed”
Verifiable “temperature-humidity” directly “on-and-of” produce and products monitoring may need to go beyond the refrigerated storage space monitoring.
Traditional Cold Chain Monitors the “Environment” Near the Measuring Zones and Not on Products

Verifiable End-to-End Cold Chain Monitoring must include “Temperature-Humidity” Directly “On-and-Of” Produce and Products during Transits
Verifiable End-to-End Cold Chain Safety & Security Management

**Product Source Safety-Security:**
1. Harvest date-time, temperature-humidity?
2. Manufacturing temperature-humidity and water-chemical environment?
3. Who are performing the function?

**Display-Shelving to Consuming:**
1. On product temperature-humidity-time Control and Log of product?
2. First-Expire-First-Out logistics?

**Inland, Air and/or Sea Transport:**
1. Temperature-humidity of products inside the container-trailer box?
2. Who transported the products?
3. Efficiency and possible theft, loss & damages?

**Cold Storage & Warehouse:**
1. Temperature-humidity uniformity and mapping of the storage facilities in all time?
2. Corrective action alerts in real-time?
3. Direct temperature-humidity on special products or products requiring special care?

**Additional Domestic Transport:**
1. Temperature-humidity of products inside the container-trailer box?
2. Who transported the products?
3. Efficiency and possible theft, loss & damages?

**Display-Shelving to Consuming:**
1. On product temperature-humidity-time Control and Log of product?
2. First-Expire-First-Out logistics?
Inland Cold Chain Transportation:
1. Controlled and verifiable temperature-time (and optionally moisture) log
2. Theft, loss and damage prevention with real-time alerts for exceptions

Trucking Transportation & Warehousing:
1. Controlled and verifiable temperature-time (and optionally moisture) log
2. Theft, loss and damage prevention with real-time alerts for exceptions

Cold Chain Container: Transport:
1. Controlled and verifiable temperature-time (moisture) log
2. Loss, damage and theft prevention with real-time alerts for exceptions

Retail Consumer Shelving and Display:
1. Documented and verifiable temperature & time
2. First-Expire-First-Out Management whenever product time-temperature pedigree are known

Harvesting-Manufacturing-Processing:
1. Documented and verifiable temperature & time for each batch
2. Personnel, machinery, processing (chemical, water, etc.) accountability

End-to-End Cold Chain Safety & Security Management
Traditional Electronic Track-and-Trace Technologies and Solutions Offer Little Benefits to Cold Chain Management

In a recent piece in Seapower magazine by David W. Munns here, Mr. Munns posits a scenario in which containers passing through Pakistan have had their contents stolen by thieves who un-weld the seams of the metal containers, took the products from inside the container, and then re-weld the seams, apparently without breaking the seals on the boxes.
RELAYER™
(Mounted on Outside of Container Monitoring: Sensors-RSSI data via RFID incorporating GPS and Satellite Communications)

RELAYER™
(Placed inside truck cab: Monitoring: Sensors-RSSI data via RFID, GPS and GPRS Communications)

ZONER™ Tags
(Sensors-RFID INSIDE Container monitoring temperature-humidity on-and-of the products)

When container is “closed”, RELAYER receives Lower RSSI & Temperature-humidity Sensors conditions from ZONER tags inside the container

When container is “open”, RELAYER receives Higher RSSI & Temperature-humidity Sensors changes and report exceptions from ZONER tags inside

ZONER™ Badge for Personnel

NORMAL
Status: CLOSE

EXCEPTION
Status: OPEN

Monitoring Temperature ON the Products for Real-Time Alert from End-to-End
Multiple Sensors of Multiple ZONER Tags (at least two each) & Multiple Data Reading (at least 3 sets) Eliminated the Dreaded False Positives During Harsh Container Shipping and Transportation.
RELAYER™
Mounted every 300 ft apart inside the warehouse monitoring: Temperature-Humidity of Product-Produce
Directed Mounted with ZONER tag-Sensor along with its locations deduced from its RSSI

ZONER™ Tags Temperature-Humidity-Shock Sensors Embedded RFID Mounted ON Product-Produce to Achieve “End-to-End” Documentation that is Verifiable

ZONER™ Badge for Personnel
AVANTE Verifiable End-to-End Cold Chain Safety & Security Monitoring Services:

1. GPRS and/or Satellite as primary communications during wide-area transit
2. RFID network for Cold Chain Storage and Processing Plants
AVANTE  Verifiable End-to-End Cold Chain Safety & Security Monitoring Services:

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AVANTE Verifiable End-to-End Cold Chain Safety & Security Monitoring Services:

1. GPRS and/or Satellite as primary communications during wide-area transit
2. RFID network for Cold Chain Storage and Processing Plants
Easy to Use & Integrate Web-Based System that can be Role-Based Accessed from Anywhere
Google Earth Shows the Area When Temperature and/or Humidity Exceeded the Limits, Doors are Open, High Shock, etc.
Verifiable End-to-End Cold Chain Safety & Security Monitoring Services

1. Verifiable End-to-End Temperature-Moisture Documentation “on-and-of” Products

2. Verifiable End-to-End Temperature-Moisture Exceptions-and-Durations and Verifiable Chain-of-Custody

3. Actionable Real-Time Exception Alerts on Temperature-Humidity: Along with Shock and Security Bridges for Corrective Actions


Farmer / Raw Material Supplier → Processor / Manufacturer → Retailer / Food Service Provider
“Verifiable End-to-End Cold Chain Safety & Security Monitoring”

1. Costs of Implementing?
2. Who will be willing to pay for them?
## Verifiable End-to-End Cold Chain Safety & Security Monitoring

<table>
<thead>
<tr>
<th></th>
<th>Consumer</th>
<th>Gov’t</th>
<th>Retailer</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOOD SAFETY</strong></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td><strong>LESS WASTE &amp; SPOILAGE</strong></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td><strong>HIGHER EFFICIENCY</strong></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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### Everyone Wins!!!
"Supply chain executives estimated the total average benefit derived from supply chain visibility per container is approximately $1,150(1)"; Yet very few “buy in”.

### Key Findings

1. **Approximately 94% of the total benefit derived from the resulting savings**
   - Reduced inventory carrying costs
   - Reduced out-of-stocks
   - Reduced lead time variance
   - Increased manufacturing uptime
   - **Total “value”: US $1,081**
   - **However, most aspects already achieved with existing logistics management**

2. **Increasing security (2%), preventing lost containers (1%), Reducing labor and fees (3%), and reducing insurance costs (0%) combined for 6% of the total benefit: US $69 (6%)**
   - **Cannot be achieved by visibility alone!**

Note: (1) Reducing insurance costs showed zero benefits or the benefits could not be provided, according to the interviewees

Source: A.T. Kearney Interviews; A.T. Kearney analysis
# Enabling End-to-End Supply Chain Security Services

## Covering Intrusion, Theft, and Loss to Pay for Itself

<table>
<thead>
<tr>
<th>Transportation Method</th>
<th>% of Total</th>
<th>$20B+ (US) to $50B+ (Worldwide)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inland Truck Transport</strong></td>
<td>87% (93%)</td>
<td>$26.1 Billion (i.e. &gt; $260/Trip for 100 million container trips)</td>
</tr>
<tr>
<td>Marine Container Ship</td>
<td>8% (1%)</td>
<td>$2.4 Billion</td>
</tr>
<tr>
<td>Rail Cargo</td>
<td>4% (5%)</td>
<td>$1.2 Billion</td>
</tr>
<tr>
<td>Air Cargo</td>
<td>1%</td>
<td>$300 Million</td>
</tr>
</tbody>
</table>

### Some figures
- Global transit losses. $30 to $50 billion per year.
- Typically 2% to 8% income reduction for Fortune 500 companies.
- Probably 80% of cargo thefts are “made to order thefts”
- Threat rated “severe” in Brazil, Russia, South Africa, Indonesia, Nigeria and Malaysia.
- Cost of an effective terrorist attack using the supply chain as a vehicle is incalculable but would probably bankrupt some businesses in the chain.

## $30 Billion for 200 million container trip worldwide = $130/container trip
Companies reported achieving multiple benefits, although they had difficulties to quantify them.

**Importance of Benefits**

The most important benefits include:
- Improve company image and credibility
- Anti-smuggling
- Anti-theft
- Reduce supply chain vulnerability
- Improve supply chain performance
- Anti-loss and damage
- Fast/stable/predictable border crossing process
- Quick recovery from direct disasters
- Anti-counterfeit
- Quick recovery from general disasters
- Better Customs regulations & processes compliance
- Preferential treatment in post-disaster situations
- Preferential treatment in alert situations
- Direct cost savings
- Indirect cost savings
- Reduction of insurance premiums

The least important benefits:
- Not applicable
- Not so important

Average 50-70% agreed they are highly important.

Average 60% agreed they are not so important or not applicable.
AVANTE End-to-End Cold Chain Safety & Security Monitoring Services incorporating “End-to-End” Tracking & Monitoring with Real-Time Alert for temperature-humidity exceptions and intrusion into Container along with Personnel Association with all Operations <US$1/Day
1. Good Manufacturing Processes ("GMP")

2. Hazard Analysis Critical Control Point ("HACCP")

3. Traceability

4. Transportation and cold-chain monitoring procedures


3. Recordkeeping: Requires documentation & chain of custody information.
AVANTE End-to-End Cold Chain Safety & Security Monitoring Services ensure compliances to:

1. **ISO 22000**: Required Food Management System for any organization in the food chain
2. **ISO 28000**: Supply Chain Security Practices and Management

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**RELAYER™** (GPS RSSI-Sensors Detector: GPRS Communicator and/or Satellite Communicator)
THANK YOU!

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Company History

- AVANTE headquarters is located in the company owned complex in Princeton Junction, New Jersey with close to 52,000 square feet office and manufacturing facilities within a 16 acre site. In addition to the New Jersey headquarters, the company has offices in California, Hong Kong, China and the Philippines. AVANTE has approximately 80 employees world-wide. AIT/AVANTE is an ISO 9001:2000 quality management certified manufacturing company.

End-to-end article, asset, personnel, supply chain, cold chain and container tracking and monitoring:

3. US 7,319,397: “RFID device for object monitoring, locating, and tracking”
5. US 7,098,793: “Tracking System and Method Employing Plural Smart Tags”
7. US 6,883,710: “Article Tracking System and Method”
8. US 11/749,976 (and other pending patents)

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