Challenges in food cold chain management: Global Standard and Traceability 4.0 - Barcode, RFID, IoT

ASEAN Warehouse 2018

GS1 Thailand, The Federation of Thai Industries
11 October 2018
Contents

❖ Introduction to GS1 Standards and Traceability 4.0
❖ Traceability regulations or recommendations in Thailand
❖ Challenges in food cold chain management
❖ Traceability case in the real world: “Japanese sake traceability”
❖ GS1 Thailand Services: e-Catalog, SmartBar application and Commercial service
Introduction to GS1 Standards and Traceability 4.0
A retail business:
Modern trade Era
Modern Trade with internal barcode

Point of Sale (POS)
Modern Trade with internal barcode

Same product with different product numbers

I want 123456
Retailer 1

I want 654321
Retailer 2

I want 000001
Retailer 3

Brand Owner
Manufacturer / Distributor
Modern Trade with internal barcode

Different products with the same product number
When the barcode is not standard
Global Standard Barcode = Trade Agreement

Brand owner

Global Standard Barcode

Retailer

The Global Language of Business

© GS1 Thailand 2018
GS1 Organization

1990

120 GS1 Member Organizations (MO)

Not-for-profit

150 countries served

Close to two million user companies

2,500 people helping us

The first of Global Standard

Uniform Code Council
UPC: Universal Product Code
America/Canada

EAN: European Article Numbering System
Europe/Asia

The Global Language of Business
© GS1 Thailand 2018

11
GS1 Thailand

1988: TANC (Thai Article Numbering Council)
สถาบันรหัสแท่งไทย

1993: EAN Thailand Institute
สถาบันรหัสสากล

2005: GS1 THAILAND
สถาบันรหัสสากล

2018 – The 30th Anniversary
Our **vision** is a world where goods and related information move efficiently and securely for the benefit of businesses and people’s lives.

Our **mission** is to be the neutral leader enabling communities to develop and implement open global standards.

We act as a registry to issue GS1 Identity Numbers and EPC Identity Numbers to members.
Who should apply for product barcode?

- Manufacturer?
- Brand owner?
- Distributor?
- Retailer?
Who should apply for product barcode?
Do you know GS1 Barcode?

Over 6 billion transactions a day!
GS1 System of Standards

Identify

GS1 Standards for Identification

- GLN Global Location Number
- GTIN® Global Trade Item Number
- SSCC Serial Shipping Container Code
- EPC Serialized Global Trade Item Number

Capture

GS1 Standards for Automatic Identification & Data Capture

- GS1 BARCODES
  - EAN/UPC
  - GS1-128
  - ITF-14
  - GS1 DataBar
  - GS1 DataMatrix
- GS1 EPC/RFD
  - EPC HF Passive
  - EPC UHF Passive

Share

GS1 Standards for Automated Data Exchange

- MASTER DATA
- GLN Registry for Healthcare®, Global Data Synchronization Network® (GDSN®)
- TRANSACTIONAL DATA
- eCom (EDI)
- EVENT DATA
- EPC Information Services (EPCIS)
GS1 System of Standards

Selecting the right barcode

Trade item that will be scanned at Point of Sale (Retail)

- GTIN-12 / UPC-A
- GTIN-13 / EAN-13

Barcode for outer case / carton (Wholesale)

- GTIN-14 / ITF-14

Barcode for Logistics unit

- GS1-128
- GS1 DataMatrix
- GTIN: 01-08851234500017 (00)353912345678910118
- SSCC: AI(00) / GS1-128
- (01)08851234500017(10)ABC123 (17)151209
- BATCH/LOT: (10)ABC123
- EXPIRY: (17)151209

Barcode with variable information (Traceability/Visibility)

- Al(10), (21) / GS1-128

Barcode for PR

URL website / QR Code

www.fb.com/gs1thailand

GTIN: 01-08851234500017
BATCH/LOT: (10)ABC123
EXPIRY: (17)151209
GS1 System of Standards

Barcode for retail product

GTIN-13 / EAN-13

<table>
<thead>
<tr>
<th>GS1 Country Prefix</th>
<th>Company Number</th>
<th>Item Reference</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8858888000016</td>
<td>000001</td>
<td>6</td>
</tr>
</tbody>
</table>
GS1 System of Standards

Barcode for wholesale product

GTIN-14 / ITF-14

<table>
<thead>
<tr>
<th>Indicator</th>
<th>GTIN-13 Identification Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GS1 Country Prefix 8 8 5 1 7 2 7 0 0 0 0 9 0</td>
</tr>
</tbody>
</table>

18 851727 00009 0
## GS1 System of Standards

### Barcode for Traceability

#### Application Identifiers (AIs) / GS1-128, GS1 DataMatrix

<table>
<thead>
<tr>
<th>AI</th>
<th>Data field</th>
<th>AI</th>
<th>DATA</th>
<th>DATA TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Serial Shipping Container Code</td>
<td>N2</td>
<td>N18</td>
<td>SCCC</td>
</tr>
<tr>
<td>01</td>
<td>GTIN of Trade Item</td>
<td>N2</td>
<td>N14</td>
<td>GTIN</td>
</tr>
<tr>
<td>10</td>
<td>Batch or Lot Number</td>
<td>N2</td>
<td>X..20</td>
<td>BATCH/LOT</td>
</tr>
<tr>
<td>17</td>
<td>Expiration Date (YYMMDD)</td>
<td>N2</td>
<td>N6</td>
<td>USE BY or EXPIRY</td>
</tr>
<tr>
<td>21</td>
<td>Serial Number</td>
<td>N2</td>
<td>X..20</td>
<td>SERIAL</td>
</tr>
</tbody>
</table>

* N: numeric digit, X: Alphanumeric digit

**GS1-128**

**GS1 Data Matrix**

GTIN(01): 03453120000011
EXPIRY(17): 2009-11-25 (yyy-mm-dd)
BATCH/LOT(10): ABCD1234
GS1 System of Standards

RFID (Radio Frequency Identification)

Four main ‘globally established’ frequencies on which RFID operates:

• Low Frequency (LF): 125 - 132 kHz
• High Frequency (HF): 13.56 MHz
• Ultra High Frequency (UHF): 850 - 950 MHz
• Microwave .2.4 GHz

Thailand: 920-925 MHz
GS1 System of Standards

Barcode vs RFID

Scanning Bar Codes

Scanning EPC Tags
GS1 System of Standards

VDO: EPC/RFID technology for Stock taking in Norway
GS1 System of Standards

RFID | Tag Environment

- Reflection
- Absorption

Metal

Liquid
GS1 System of Standards

RFID | Implementation

- Animal identification
- Brand Protection
- Asset Management
- Laundry Management
- Retail Inventory
- Cross Border
- Race Timing
- Logistics/Security

Source: Impinj
Do you know the Internet of Things (IoT)?
Internet of Thing: IoT - Definition

IoT is a vision, not a technology

The IoT is not any single, specific new technology. It is a framework for integrating digital technologies associated with identification, sensing and data management.

Web of Things  Internet of Everything  Cloud of Things
Industry 4.0  Smart Manufacturing  Digital Manufacturing
Machine to Machine Communications (M2M)  Automation  Made in China 2025

Source: GS1 AISBL - GS1 and the Internet of Things
Internet of Thing: IoT - Technologies

IoT Sensor types

- Machine Vision / Optical Ambient Light
- Position / Presence / Proximity
- Motion / Velocity / Displacement
- Temperature
- Humidity / Moisture
- Acoustic / Sound / Vibration
- Chemical / Gas
- Flow
- Force / Load / Torque Strain / Pressure
- Leaks / Levels
- Electric / Magnetic
- Acceleration / Tilt

Source: www.postscapes.com
Internet of Thing: IoT - Technologies

Wi-Fi

Source: www.networkworld.com
LoRaWAN

LoRa™ End-Node Solution
For Long Range and Low Power IoT Networks.

- Millions of nodes
- 15-20 km long-range coverage
- 10-year battery life
- Low infrastructure cost
- Small form factor
- Fast time to market

Source: www.microchip.com
Internet of Thing: IoT - Technologies

Radio Frequency Identification (RFID)

Source: www.impaxafrica.com
Internet of Thing: IoT - Technologies

Application Programming Interface (API)

**API Definition**
An application program interface that provides a developer with programmatic access to a proprietary software application. A software intermediary that makes it possible for application programs to interact with each other and share data.

**Source:**
- www.microchip.com
Internet of Thing: IoT - Technologies
Internet of Thing: IoT - Technologies

Artificial Intelligence
Early artificial intelligence stirs excitement.

Machine Learning
Machine learning begins to flourish.

Deep Learning
Deep learning breakthroughs drive AI boom.

Since an early flush of optimism in the 1950's, smaller subsets of artificial intelligence - first machine learning, then deep learning, a subset of machine learning - have created ever larger disruptions.

Source: www.quora.com
Internet of Thing: IoT - Technologies

GS1 Standards: Identification keys

UNIQUE!
What is Traceability?

**World Scenario**

The more there are partners in the supply chain the more business processes and information systems are complex.

Many actors in many countries!
What is Traceability?

Crisis and Impacts

1999: Soft Drink, Belgium & EU
- 5 months to recover the sales
- 249 cases of illnesses in Belgium
- Recall of 15 million cans and bottles
- Crisis cost $200 million in expenses and lost profit

2008: Milk Powder, China
- Milk powder tainted with the industrial chemical melamine.
- 13,000 babies affected
- More than 80% of the sick were toddlers under two.
- Products from 22 companies have been recalled for melamine contamination.

Off-quality CO₂ that affect the taste and odor and fungicide in dirty cans.
What is Traceability?

GS1 Traceability: Definition

“Traceability is the ability to identify the past or current location of an item, as well as to know the item’s history”
Trust starts with traceability.
Connect the dots with GS1 standards.
What is Traceability?

- Suppliers
- Packaging
- Packaging ingredients
- Manufacturers
- Product
- Distributors
- Product
- Retailers
- Product
- Consumers

Where is my shipment?
Was it sustainably sourced?
Is this safe to eat?
What is Traceability?

One step up and one step down principle

Traceability across the supply chain
What is Traceability?

Example: All parties involved in a cheese manufacturing supply chain.
Traceability 4.0
Traceability 4.0

Source: https://applicature.com
Traceability regulations or recommendations in Thailand
Traceability in Thailand

• **TAS 9028-2008**: Principle for traceability/product tracing as a tool within an agricultural commodity and food inspection and certification system") was launched by ACFS (The National Bureau of Agricultural Commodity and Food Standards, under the Ministry of Agriculture and Cooperatives)

• This **STANDARD** is used as guidance for **authority** concerned to utilize the design and application of traceability/product tracing for agricultural commodities and food. It also supports the **protection of consumers against hazards** from consuming agricultural products and food as well as to facilitate the trade on the basis of accurate product description

• Updated version: TAS 9028-2014

Source: www.acfs.go.th/eng/general_standard.php?pageid=1
3.2 DESIGN

3.2.1 The traceability/product tracing tool may apply to all or specified stages of the food chain (from production to distribution), as appropriate to the objectives of the agricultural commodities and food inspection and certification system.

3.2.2 The traceability/product tracing tool should be able to identify at any specified stage of the food chain (from production to distribution) from where the food came (one step back) and to where the food went (one step forward), as appropriate to the objectives of the agricultural commodities and food inspection and certification system.

3.2.3 The objectives, scope and related procedures of an agricultural commodities and food inspection and certification system that includes a traceability/product tracing tool should be transparent and made available to competent authorities of the exporting country upon request.

3.3 APPLICATION

3.3.1 It should not be more trade restrictive than necessary.

3.3.2 It should be practical, technically feasible and economically viable within an agricultural commodities and food inspection and certification system.

3.3.3 In deciding whether and how to apply the traceability/product tracing tool, in the context of an agricultural commodities and food inspection and certification system the competent authority should take account of the assessed food safety risks and/or the characteristics of the potential deceptive marketing practices being addressed.

3.3.4 It should be able to be implemented when and as appropriate on a case by case basis.

Source: www.acfs.go.th/eng/general_standard.php?pageid=1
Traceability in Thailand

• Current developments (2013): No. 365 Displaying of the term “Premium” on food labels

Clause 1 In this notification,
“Premium” means quality or standard or outstanding properties which are superior to foods in the same type.

“Agricultural products” means products from agriculture, fishery, animal culture or forestry.

Clause 2 Food labeled "Premium" must be approved by the Food and Drug Administration (Thai FDA).

Clause 3 Food labeled "Premium" on the label must comply with the following terms and conditions:

1) Quality and standards shall comply with the relevant notification of the Ministry of Public Health.

2) Meet the international standards or equivalent on conformity and certified processing system, from raw materials through to the finished product, including traceability.

3) Manufactured from raw material production site and food manufacturing facilities as follows:

3.1) Raw material production site

3.1.1) With respect to the place of producing raw materials which are agricultural products, it must be assessed by a government agency or an agency acknowledged by the government authority for Good Agriculture Practice: GAP or

Source: http://food.fda.moph.go.th
Traceability in Thailand

• Current developments (2013): No. 366 Displaying of the term “Premium” on labels of Pasteurized cows’ milk and Pasteurized full fat cows’ milk

Clause 2. Displaying of "Premium" on labels of Pasteurized cows’ milk and Pasteurized full fat cows’ milk shall comply with the following criteria and conditions:

(1) Quality and standards shall be complied with the Notification of the Ministry of Public Health; Re: Cows’ Milk.

(2) Compliance with the international standards or equivalent on conformity and certified processing system, from raw materials through to the finished product, including traceability.

(3) Manufacturing from raw milk production site and raw milk collecting facilities and Pasteurized cows’ milk and Pasteurized full fat cows’ milk production establishments as follows:

(3.1) Raw milk production site shall be certified by a government agency or an agency acknowledged by the government authority for Good Agriculture Practice (GAP) or Guidelines for the Production, Processing, Labeling and Marketing of Organically Produced Foods or other equivalent standards.

Source: http://food.fda.moph.go.th
Increasing request for traceability

- Regulations or trading partner requirements in many countries
- Driven by the need to increase patient safety, prevent counterfeit product entering the market
- For shared, enhanced supply chain control

Argentina
- 2015: Traceability System for Medical Devices

European Union

South Korea
- 2012, 2013, 2015: Batch variable / Serialisation

Turkey
- 2010: Track & Trace (Reimbursement Fraud, Traceability)

United States
Challenges in food cold chain management
Challenges in food cold chain management

How you choose a carrier

- On-time service
- Reliable transportation equipment
- Compliant protocols
- Knowledgeable drivers and dispatchers

Challenges in food cold chain management

How you manage cold chain information

21 CFR Part 11

During your inspections, review the following factors:
✓ Sanitation
✓ Pest control
✓ Standard operating procedures (SOPs)
✓ Temperature
✓ Security

Source: www.oceasoft.com
Challenges in food cold chain management

How you meet cold chain regulations

Increasing number of products requiring temperature control (‘cold chain’)

3/4 of biological drugs
10-15% small molecules
All vaccines
Biological samples & diagnostics tools

Challenges in food cold chain management

How you monitor products in the cold chain

Vehicle 1:
Temperature = 5°C
3G signal = 89%
Battery = 89%
Latitude = 41.636931
Longitude = -0.900879

Vehicle 2:
Temperature = 2°C
3G signal = 63%
Battery = 63%
Latitude = 41.657455
Longitude = -0.887146

Vehicle 3:
Temperature = 7°C
3G signal = 91%
Battery = 91%
Latitude = 41.635905
Longitude = -0.894012

Challenges in food cold chain management

How you deliver goods

Source: www.oceasoft.com,
Traceability case in the real world
“Japanese sake traceability”
Visibility is urgent matters

Infusion problems
- Vermin
- Someone mixed the poison

Quality Issues
- Genuine or not
- Unknown product’s root

Food traceability is highly required.
Food traceability is KEY

Customers want Secure, Safe and Good delicious food.
What is transportation visibility

What product are are reached to the point, with when, where and why data.

Global standards

Share the data
Sake traceability system

1. Sake brewery (Japan)
2. Transporter
3. Thermometer
4. Distributor (Thailand)
5. Cloud Service EPCIS
6. Consumers

Web Page

facebook

Genuine or not

temperature

Traceability

restaurant, retailer
Sake Brewery

Shata Shuzo Co., Ltd.

Masuda Shuzo Co., Ltd.

RFID

Packed

Read RFID

Preparation

Shipped

Thermometer

The Global Language of Business
Sake Reader (IT armed hand cart)

“IT armed hand cart”

Sake Reader

Reading results
Transporter (Narita airport warehouse)

Warehouse

Arriving

Stocking

Cut the tag intentionally

Read tags

Shipment
Distributor (Thailand Sake Agent)

Arrival → Warehouse → Receiving

Reading Tags
Restaurant & Retail store

Restaurant

Retail Shop

QR code

Sake page

Temperature

The Global Language of Business
Restaurants (Sake information)

Identify particular bottle

Sales points

Temperature

Traceability

Particular bottle’s data

Recipe

Production date

Lot number

Serial number

QR code

RFID & QR code identify particular bottle from serial #
Consumer (Facebook)

Feedback opinions

Like

facebook

I really love this Japanese Sake, especially this is best match for beef.
Collaborations with

GS1 Thailand

SCS trading
GS1 Thailand Services: e-Catalog, SmartBar application and Commercial service
e-Catalog Service: Final
e-Catalog Service: Phase I
SmartBar Application

"Download - Scan – Check"

Free Download

Food and Drug Administration
13-1-03938-1-0001

Coca Cola
GTIN : 8851959132012

Short description:
Ingredient:
Website: http://www.thainamthip.co.th
Catalogue price: $0

Thai Numthip Ltd.
GLN : 8851959999998

Business type: Beverages/Food
Country: THAILAND
Website: http://www.thainamthip.co.th/

Available on the
App Store

ANDROID APP ON
Google play
Commercial services
Contact

GS1 Thailand, The Federation of Thai Industries

Queen Sirikit National Convention Centre Zone C, 3rd Fl.,
60 New Rachadapisek Road,
Klongtoey, 10110 Bangkok, Thailand.

Tel: 02-345-1193-8, 1208
Fax: 662-345-1217-8
Email: info@gs1thailand.org
Website: www.gs1thailand.org, www.rfid.or.th
Facebook: gs1thailand, rfid.thailand
Q&A
Thank you