

RFID Technology and Developments in Smart Packaging

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Agenda

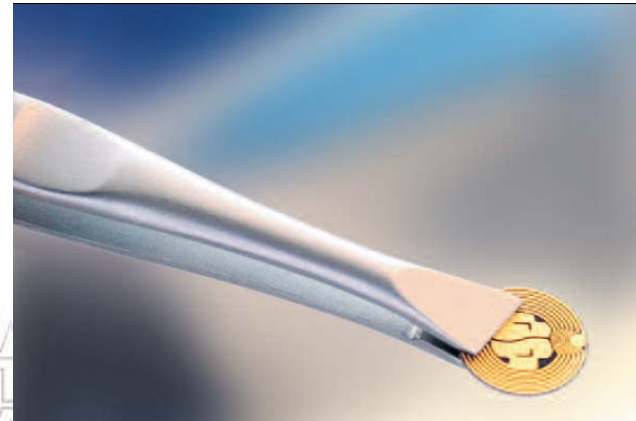
- Overview of RFID Technology
- RFID in Smart Packaging
- Printed Electronics
- About TCS RFID Offerings



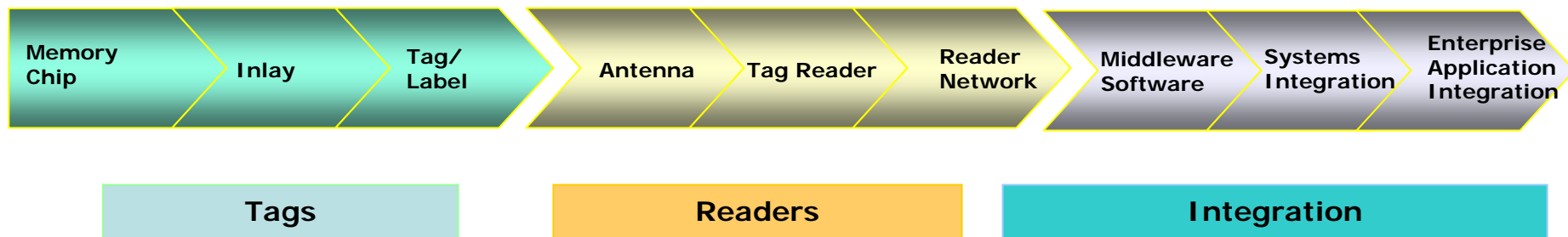
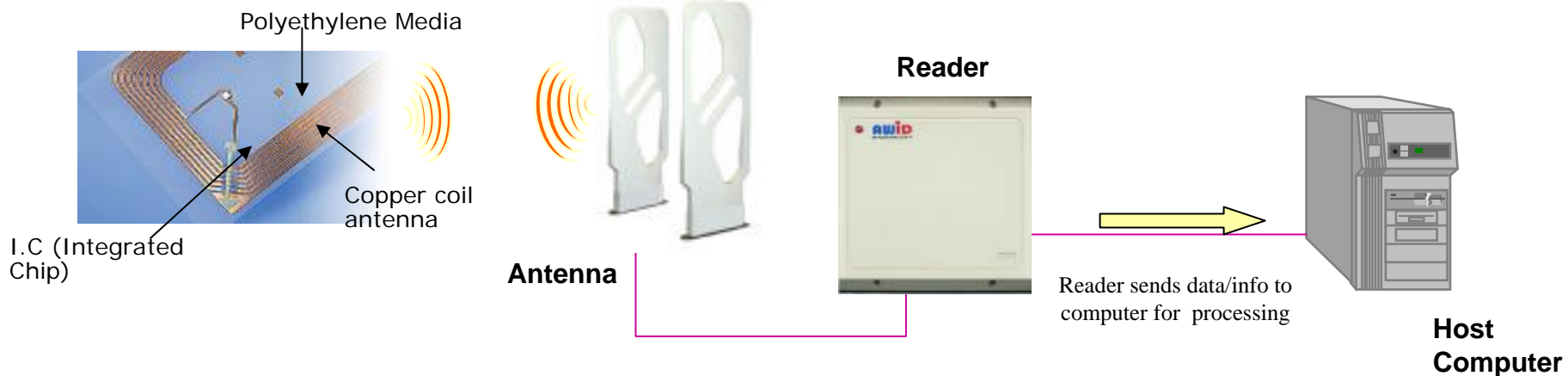
Overview of RFID Technology

RFID – Radio Frequency Identification

- An automatic way to collect information or data on :
 - Products
 - Places
 - Times of operations
 - Transactions
- ID “Tags” / Transponders that can:
 - Store unique ID information
 - Read/Write on the tags for items inside container
 - Maintain historical information
- Technological Advantages of RFID:
 - Passive operation
 - Non Line of sight
 - Simultaneous Identification
 - Read-write capability & Data Storage
 - Durability
 - Difficult to replicate
 - Embedded identification



RFID Technology Spectrum



Applications

Manufacturing	Transportation	Retail & CPG	Healthcare & Life Sciences	Others
Supply chain management & distribution	Airlines baggage handling	Inventory management	Hospital management	Contact-less payment (Banking)
Production management	Boarding pass	Warehouse operation	Patient ID and monitoring	Access Management
Factory Automation	Package Tracking	Supply Chain Management	Medical error prevention	Library Management
Maintenance / condition monitoring	Container Tracking	Interactive Kiosk	Equipment authentication/maintenance	Product/document Authentication
Asset management	Yard Management	Self check out at POS	Medical Device ID	Auto immobilizer
	Toll collection	Electronic Article Surveillance	Drug Pedigree & anti-counterfeiting	Laundry Tracking
	Fleet tracking	Item Level Track & Trace		Animal identification
	Rail car ID			Parking Control

Levels of RFID tagging

Pallets



Cases



Trays



Items



Passive RFID based smart label

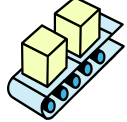
Electronic Product Code

EPC information service data links four dimensions - what, where, when, and why

What

Manufacturing Data

e.g.: Lot/Batch, Expiration Date



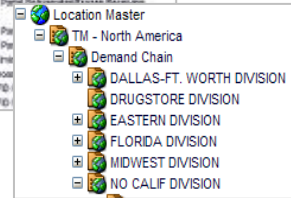
EPC and Product Master Data



Location Master Data



Where



When

Timestamp



Transactional Data

e.g.: PO, Invoice, Point of Sale

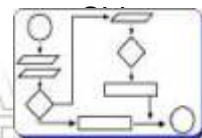


Product State

e.g.: Saleable, Inactive



Business Process Step



Why



ELECTRONIC PRODUCT CODE			
01	0000A89	00016F	000169DC0
Header 0-7 bits	EPC Manager 8-35 bits	Object Class 36-59 bits	Serial Number 60-95 bits

RFID is a fast emerging technology poised for rapid growth...

Total Market Size Data – 2007 to 2017 – available from IdTechEx

Source: IDTechEX Report, 2007

Smart Packaging

Smart Packaging

- Definition
 - Item Level
 - Incorporates a disposable device
 - Interacts with environment
 - Interacts with consumer
- Provides Customer benefits
 - Protection
 - Information
 - Availability



Examples of Smart Packaging

- Smart primary packaging materials
 - Indication of pathogens
 - Enhancing preservation
- Smart consumer interfaces
 - Touch sensitive
 - Self lit moving images
 - Play back of recorded audio
- Sensors and event recording
 - Temperature monitors
 - Event recorders
 - Playback



Picture Courtesy: IDTechEX Smart Packaging White Paper

- **Smart Labels with embedded / printed RFID tags**

RFID in smart labels

- RFID smart labels
 - Provides ID and memory to labels
 - Does not affect the tagged product
- Benefits for consumers and suppliers
 - Product Safety
 - Brand protection
 - Improved shopping experience
 - Information Delivery capability
 - Improved availability
- Applications in food and drink packaging
 - Track & Trace
 - Dynamic quality tracking
 - Enables Nearest Expiry – First Out (NEFO)
- Applications in Pharmaceuticals
 - Counterfeit Detection
 - Drug pedigree tracking
 - Traceability and recalls
 - NEFO



Printed Electronics

The Holy Grail – the sub 1 Cent RFID tag

Projections Number of tags sold and tag price – 2007 to 2017
- available from IdTechEx

Source: IDTechEX Report, 2007

Printed Electronics

- A new technique for manufacture of electronic circuits
 - Use of printing press
 - Use of deposition of “functional inks”
 - Use of Organic and Inorganic semi conductive materials
 - Deposition on thin flexible substrates – polymer or paper
- Main application areas
 - Simple electronic circuits and devices – e.g. RFID
 - Electronics involving large areas – display billboards, smart shelves
- Market Size
 - Currently about \$1.8 B
 - Expected to be \$48.2 B by 2017

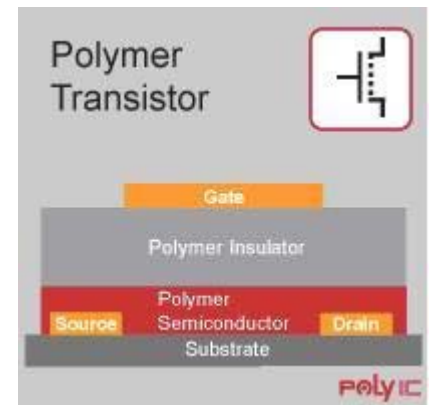


Roll to Roll printing of electronics

Source: ACREO

Printed Electronics - Components

- Semi-conducting Polymers/Organic and inorganic materials
 - Polysilcons, Continuous grain polysilcons, amorphous silicon, soluble polymers
 - Chemical doping required to make conductive
- Electronic Circuit components
 - the substrate: flexible polyester film
 - the conductor: electrical conducting polymers
 - the semiconductor: electrical semi conducting polymers for transistors and diodes
 - the dielectric: electrical insulating polymers
- Production Techniques
 - Flexoprinting
 - Offset printing
 - Gravure printing
 - Rotary screen printing



Polymer Transistor

Source: PolyIC

Printed Electronics – Key Benefits

- Low Cost of Material and manufacture
 - Costs much lower than Silicon based electronics
 - Ultra low cost electronics is made possible
- Circuits can be deposited on flexible substrates and films
- Large footprint electronics is economical
- High resolution printing is possible with inkjet, lithography and gravure
- Enables new applications and business models
- Enabling mass market adoption of RFID and the *“internet of things”*



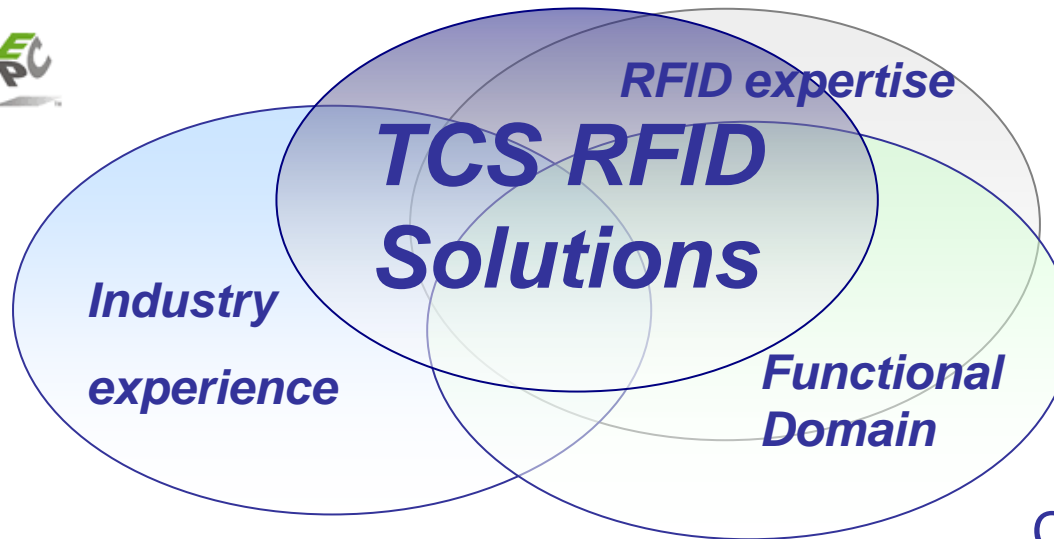
Interactive Paper

Source: ACREO

About TCS RFID

TCS RFID Solution Overview

- RFID Lab in India since 2003
- RFID Technology Center in Chicago
- Hardware & middleware expertise
- Tools & assets



Partners

- IBM
- Microsoft
- OAT Systems
- Oracle
- TIBCO
- Printronix
- Texas Instruments
- Tagsys



Solutions

- Inventory Tracking
- Product Track & Trace
- Returnable Asset Tracking
- IT Asset Tracking
- Vehicle Tracking
- Cold Chain Tracking
- RFID Middleware

Customers

- Manufacturing
- Retail Chain
- CPG
- Government & Defense
- Airlines
- Oil & Gas

Thank you