RFID in the Packaging World

Dr Peter Harrop
Chairman IDTechEx
p.harrop@idtechex.com
www.idtechex.com
IDTechEx is an independent strategic analyst on **RFID smart labels, printed electronics and smart packaging**. Our core services provide:

<table>
<thead>
<tr>
<th>Consultancy</th>
<th>Publications/Research</th>
<th>Conferences and Exhibitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients include:</td>
<td>• Independent market and technology research reports covering RFID, printed electronics &amp; smart packaging topics</td>
<td>Global Conferences: USA, Europe and Asia</td>
</tr>
<tr>
<td>Shell Oil</td>
<td>• Smart Labels Analyst journal, Printed Electronics Review and the world’s largest RFID case study knowledgebase</td>
<td>RFID Smart Labels Active RFID Printed Electronics</td>
</tr>
<tr>
<td>Hewlett Packard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rexam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whirlpool Europe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guinness UDV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thin Film Electronics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PolyTechnos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schiphol Airport…</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
$3 trillion yearly
$1 trillion may be unnecessary
Theft, fraud, damage, loss, error, expiry, overpackaging (slow delivery), ignorance of needs…………..
RFID can tackle about $400 billion yearly
The world’s supply chains are out of control

- “CPG shrinkage is $60 billion yearly of $3 trillion turnover.” *ECR Europe*

- “75% of the cost of a retail product is getting it there.” *MIT*

- “Up to 20% of foods are discarded due to spoilage through the supply chain.” *Food and Drug Administration*

- We are still searching for foods containing the Sudan B carcinogen three years later.
• Stockouts at retailers cost six percent of sales. One third of these are items in the retailer’s store. *Procter & Gamble*

• “Medication non-compliance costs the US alone approximately $100 billion and 125,000 deaths yearly” *US National Pharmaceutical Council*

We need packages that record what was taken when, prompt us, display performance.

• **Counterfeits**: Perfume 15%; Aircraft and automotive parts 10%; Pharmaceuticals 10% (In third world 30%); *Thousands of deaths every year* 

*Industry estimates*

RFID has few problems of obscuration, orientation or reading many at a time.
RFID is an enabling technology like the wheel or paper.
In healthcare it prevents errors and counterfeiting and locates people and assets.
In retailing/CPG it reduces costs and increases sales.
Short Range Passive RFID Examples
Example: Gillette razor packs
Omron, Avery Dennison etc use gravure to print RFID antennas NOW

- Higher speed printing = lower cost per tag

- RFID cost per tag:
  - Flat-bed screen: 100's million
  - Rotary screen: Tens of billions

- Print Speed:
  - Flexography
  - Gravure
The Electronic Product Code (EPC) System – unique electronic ID for everything

**EPCglobal:**

- Managed by GS1
- Standardisation of EPC tag types and common infrastructure
- Over 1000 sponsor companies
Example: Smart Shelves

A smart shelf system for DVDs in a Tesco supermarket in the UK that has increased sales by 4% (10%?) due to reducing stockouts
Retail Mandates for pallets and cases

Wal-Mart ($200Bn +):
RFID enabled 475 stores, 1000 by year end
300 suppliers tagging cases and pallets of top products
Currently receive 3 million tagged cases per week (May 06)

Massive payback for Wal-Mart: Out of Stocks reduced by up to 48%; stores with RFID 63% more effective at replenishing items

Major competitive advantage for retailers

Usually no benefit for CPG companies supplying them
Retail Mandates – pallet and case RFID

Procter & Gamble
Fusion blades – sales increase 19% by timely arrival at shelf

Hanna Candle company
90 pallets worth $12.6M went missing but were found

Altria Group ($97Bn), owner of Miller, Kraft, Philip Morris
“Pallet/case tagging is a pain barrier – item level tagging is our utopia”

CONTRAST
The US Military shares the benefit with the CPG company
Some European retailers seek mutuality of benefit
Item level tagging (mainly packages) benefits everyone
Passive RFID: Main operating frequencies

125KHz=LF  13.56MHz=HF  UHF  2.45GHz

Inductive antenna - flooding  Electric antenna - beaming

Very Popular
UHF tags need very different antennas for different applications
Trials of this primitive form of RFID by Mreal Finland, Acreo Sweden and Somark USA
Printed Thin Film Transistor Circuits on Plastic Film (and eventually packaging)

60+ companies
Philips, Plastic Logic, Epson, Canon, Xerox, IBM, PolyIC, OrganicID, Infineon, 3M...
Experimental fully printed RFID labels - insulating, semiconducting, conducting and protective patterns

Offset litho, flexo, ink jet and gravure being tried
8-128 bits read only – 52 companies working on this
High volume item level RFID tagging
History will repeat itself - almost

The peak in numbers is later
Total Asset Visibility – Active RFID in the military

Continuous visibility of items while nested inside packaging & conveyances

- Any Class 1 EPC Tag
- Active RFID Tag (with Security)
- Active RFID Tag (with GPS/Satcom)
- Active RFID Tag (with Sensors)

16 Items per Carton
16 Cartons on a Pallet
288 Items on a Pallet
<table>
<thead>
<tr>
<th>Global Potential (Billion/Year)</th>
<th>RFID Leadership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library 0.1</td>
<td>Singapore</td>
</tr>
<tr>
<td>Laundry 0.1</td>
<td>Europe</td>
</tr>
<tr>
<td>Animals 1</td>
<td>Thailand, S America, US, Eur.</td>
</tr>
<tr>
<td>Tires 1</td>
<td>Europe</td>
</tr>
<tr>
<td>Tickets 1</td>
<td>Japan, Europe</td>
</tr>
<tr>
<td>Cards 2</td>
<td>China</td>
</tr>
<tr>
<td>Military items 2</td>
<td>US</td>
</tr>
<tr>
<td>Blood 2</td>
<td>Europe/US</td>
</tr>
<tr>
<td>Test tubes 2</td>
<td>Europe/US</td>
</tr>
<tr>
<td>Archiving paperwork 2</td>
<td>US</td>
</tr>
<tr>
<td>Air baggage 2</td>
<td>US, China</td>
</tr>
<tr>
<td>Air freight 2</td>
<td>US</td>
</tr>
<tr>
<td>Drugs 30</td>
<td>US</td>
</tr>
<tr>
<td>Pallets, cases 40</td>
<td>US, Europe</td>
</tr>
<tr>
<td>Books 50</td>
<td>Japan</td>
</tr>
<tr>
<td>Cigarette packets 100</td>
<td>China, US</td>
</tr>
<tr>
<td>Postal 650</td>
<td>Europe</td>
</tr>
<tr>
<td>Retail items 10,000</td>
<td>Europe/Japan/US</td>
</tr>
</tbody>
</table>

ITEM LEVEL IN RED
IDTechEx Forecast For RFID 2006

(Range over 0.5cm, digitally-encoded)

2006

• $2.71 billion
• 45% tags (passive and active)
• 43% passive RFID systems (excluding tags)
• 12% active RFID systems (excluding tags)

Printed transistor circuits making little impact as yet
RFID Forecasts, Players, Opportunities 2006-2016
Active RFID 2006-2016
Item Level RFID 2006-2016
Real Time Location Systems 2006-2016
The RFID Knowledgebase

Over 2100 case studies listed and growing every month.
Covering more than 2200 companies, 82 countries
Learn from the successes and failures of others

www.idtechex.com
Tel: + 44 (0) 1223 813703