RFID in Rail
From pilot to implementation

Swedish Transport Administration

Lennart Andersson / Gunnar Ivansson
RFID Proof of Concept, 2005-2008

- RFID testing for many years with active and semi active solutions
- About 500 wagons has been tagged
- Great results with RFID reading (but no real application developed)

Suppliers has been:
Tagmaster    Adage    (Amtrac/Transcore)
Rail traffic in Europe

- 60-70% of wagons in Sweden come from other European countries

Need:
- European standard for RFID system
- Standard for information exchange
RFID demands for a pre-study (2009)

- Speed over “160” km/h
- Open standard
- Potential EU-standard
- Easy to maintain
- Competitiveness
- Robust
- Possible to use in other transport systems
Pre-study results:

Go for passive UHF, ISO 18000-6C

Upgrade TSI

• Upgrade air interface standard to ISO 18000-6 type C
• Speeds up to max speed of the wagon
• Not just for shunting yards but also trackside detection
• Recommend RFID transponder/tag on rolling stock – freight wagons

Position paper

• Finland (RHK) and Sweden (BV)
• EIM – ERA – Commission

Published on EIM website: www.eimrail.org/techpapers.html
RFID pilots for proof of concept – Passive tags
UHF gen 2 class 1 / ISO18000-6 type C

Stockholm – Göteborg
- Post train - 160 km/h
- 9 post wagons
- 2009 –

Stockholm – Göteborg
- High speed train - 200 km/h
- 30 Engines (X2000 Train set), SJ
- 2010 –

Falköping – Göteborg
- Container wagons
- Dry Port project, EU
- 2009 –

Olofström – Göteborg – (Gent, Belgium)
- Container train for Volvo
- 210 wagons (Green Cargo)
- 2010 –
RFID detector

Axle counters / Wheel sensors
- detect vehicles/wagons without transponders/tags
- speed
- direction
- distance between axles

RFID antenna
app. 3 m from nearest rail
RFID-detector
Tag placement

- Two tags on each wagon
- Left side mounted
- Height is 0.5-1.1m from the rail
RFID pilots for Proof of Concept

RFID transponders/tags from
- Scirocco
- Siemens
- Confidex
- OmniID

RFID in Rail

Göteborg
Port
Tagmaster
Intermec
Tagmaster
Siemens
Scirocco
Falköping
Tagmaster
Siemens
Olofström
Tagmaster
Siemens
Procurement of RFID readers

Trafikverket has signed a general agreements for 3 + 2 years with 3 suppliers

- Swarco (Tagmaster), Sweden
- Scirocco, Sweden
- Maintag, France

for suborders up to 630 RFID readers
So, the most important is to use open STANDARDS

Air interface:
ISO18000-6 type C
UHF Gen2 Class1

EPC
GIAI96

Tag/Transponder

Reader

EPCIS
What
Where
When
Way

Identifikering
Informationsbåra
Elektronisk handel

STANDARDS
## EPC

### Transponder/tag

<table>
<thead>
<tr>
<th>Tag number</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPC-code: GIAI 96</td>
</tr>
</tbody>
</table>

| User memory |

- **Company Prefix*), Side indicator, Individual Asset Reference**

- **Company prefix, A/B + Wagon number**
  
  1/2 + 12 digits

*) Swedish Transport Administration - information and details about the vehicle/wagon
EPCIS – information exchange

EPC IS concept with 4 attribute

- **WHAT**: vehicle/wagon/ tag
- **WHEN**: exact time
- **WHERE**: place for reading point
- **WHY**: activity at the reading

EPC – wagon number
Date and timed
RFID-detector
Train direction
EPCIS – for information exchange

- Information systems at the Port
- Information system at Trafikverket
- Information system of the Terminal

EPCIS Information
- What
- Where
- When
- Why
Structure of RFID system in Trafikverket

Tags | RFID readers

EPC

EPC = Electronic Produkt Code
EPCIS = EPC Information Services

Middleware

Data exchange with EPCIS-functionality

EPCIS

External user
- Operators
- Wagon owner
- Logistics
- Terminals
- Workshops
- Transport buyers
- etc

Pull functionality
- SMS
- Webb
- e-mail
- XML
- External RFID readings

Internal System
- Loranga etc

Fosstrak
(open source)

Train composition

Database

Webb Internal

Webb External

Other Systems

RFID in Rail
RFID - "Proof of Concept" for evaluation

Göteborg

RFID in Rail
RFID – Benefits for the Port and Inland Terminals

- Correct train composition
- Improved information in advance
- Production efficiency
  - Save 30 – 60 min/train set in the port
- Track and trace of containers and wagons
RFID – Pilot project with Volvo

Volvo cars Gothenburg

Volvo cars GENT - Belgium

24 trains / week
Approx. 3600 containers / week
RFID – Pilot project for Volvo

Benefits

- Correct train composition
- Improved pre-information
- Production efficiency
- Track and trace of containers and wagons
RFID will be able to support intermodal transport chain

EPCIS Information
What
Where
When
Why

Train → Terminal → Train + Container → Port → Ship → Port → Train + Container → Truck → Customer

Common standards for more than just rail
Deployment of RFID detectors

• Build an infrastructure of 300-600 RFID detectors along Swedish tracks

First phase

• 2012: installation och evaluation of approx. 100 RFID detectors
• 2013: additional installation of approx. 200 RFID-detectores

Second phase

• 2013 – 2014: installation of approx. 300 RFID-detectors
Deployment of RFID detectors

- Along freight corridors
- Customer demands and wishes
- Locations for Wayside Monitoring Systems (app. 150) (hotbox/hotwheel, wheel flat, ...)
- Strategic locations (eg, at ports, terminals, rail yards ...)

![Map of Sweden with RFID detection points](image)

- Göteborg – Mid Sweden (Bergslagen)
- Olofström – Göteborg (Volvo)
- Øresund bridge – Stockholm
- Mid Sweden – North Sweden
- Norwegian and Danish border

- A whole net of RFID detectors in Sweden
Why RFID in the European Railway?

- Track and trace wagons and gods over Europe
- Proactive wagon maintenance
- Support intermodala transports
- Better use of resources/wagons
- Reduced transport costs
- Reduced environmental impact
RFID in Rail
- a European network

Finland, Norway, France, England, Austria, Czech Republic, Slovakia, Switzerland, Russia, Spain, The Netherlands…..

Tunisia, New Zealand, Denmark…..
Summary

Main Success factors:

• ISO18000-6C / UHF Gen 2 Class 1
• Cooperation with GS1
• Established European Network

A Great project success so far!!

➢ Thanks GS1 for all the help and support!

Do not hesitate to contact us if we can be of any assistance……
Thank you!

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