[Data E] Environmental protection, marketing field and RFID

- Categories of environmental protection field
- Example of environmental protection promotion by means of RFID
  - Example of Fukuoka Prefecture
  - IBM Japan and Kureha Environment
  - KDDI and I.T.4
- Technologies to build a recycling-oriented society
  - Law for the Promotion of Sorted Collection and Recycling of Containers and Packages
  - Personal Computer Recycling Law
  - Automobile Recycling Law
- Roles of public demonstration experiments for conversion to recycling-oriented society
- Security of enforceability of law and verification experiment
- Traceability and security of safety
- Controls of production, inventory and distribution
- Utilization in marketing fields
- Movements to international standard-izing in U.S.A. and Europe
- Movements to international standardizing in Japan
- Use of rewritable type ones in Japan
- Use of ROM type ones in Japan
- Risk in employing locally optimum specifications in Japan
- International standardizing in the midst of global competitions
- Classification based on the subjects to application of RFID
- Examples of category and typical case

Japanese version of this document was created by Prof. Kiyoshi NAKANO and Prof. Yoshiki ANDO, Osaka City University and was translated into English by JICA as an ODA program. If you would like to use it, e.g. in publications, please send an e-mail to the mail address in the following :

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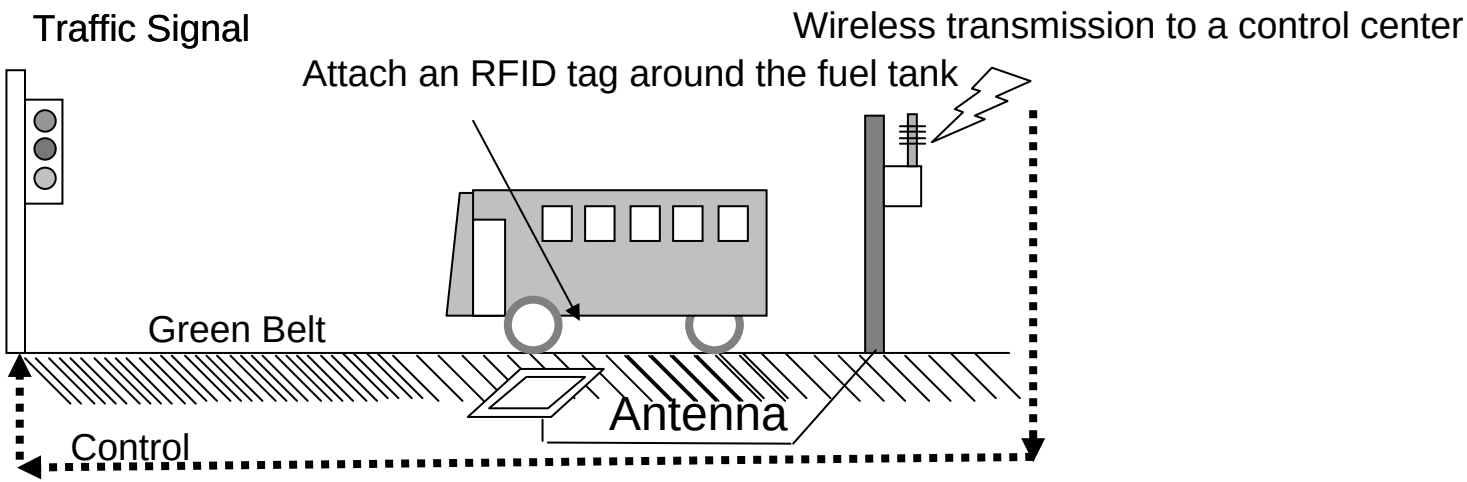
Reduction of energy consumption by cities with the help of RFID

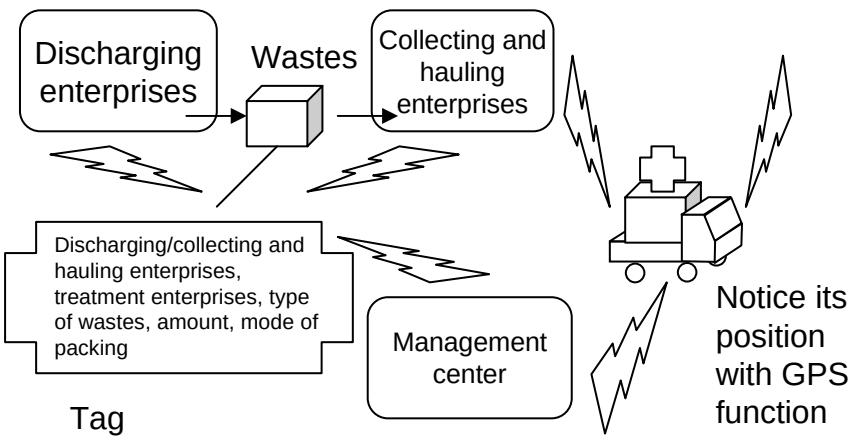
- In Edinburgh, UK, RFID installed under the floor of a bus and antennas attached along the streets detect each other. Buses turn the traffic signals ahead to “GO” to increase their average speed. This will help people to switch their travel method from private cars to buses.
- There are, in general, two ways to locate a person or car. One is that a reader/writer held by person or mounted on a car will read the RFID attached to a road or a building. The other is that a reader/writer attached to a road or a building will read the RFID attached to a person or a car.



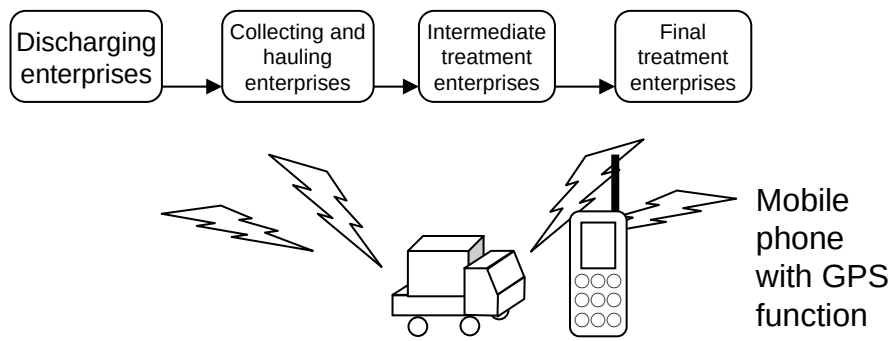
Traffic system of Edinburgh City that gives priority to buses

Promotion of environment protection with RFIDs

- Fukuoka Prefecture
  - put RFID tags to wastes
  - track waste transport track with GPS
- NPO “EKO TEKURU”
  - “Environment guard system”
  - put RFID tags to industrial wastes



- Nippon IBM and Kureha Environment
  - track medical wastes with RFID tags
  - experiment at waste treatment site of Kureha Environment at Iwaki City, Fukushima Prefecture.
  - proving test at Kureha Hospital
- KDDI, IT-Four
  - tracking and managing sysytem of collecting and hauling with GPS (this function would be supplied in ASP service) (it does not use RFIDs)



Recycling of containers and packages and RFID

- Law for the Promotion of Sorted Collection and Recycling of Containers and Packages (Enforced in April 1997)
  - "Law for the Promotion of Sorted Collection and Recycling of Containers and Packages"
  - Sorted collection and storing by city/town/village = Heavy burden to financial condition at city, town or village
    - PET bottle, food tray, can
  - Merits of using RFID marking on containers
    - Easier identification of source = It is so arranged that materials, manufacturing condition, etc. can be identified.
    - Easier sorting = Sorting can be automated.
    - Easier computation = It makes easier the calculation of cost born by a local government. This is the case also when a vendor is obliged to bear the cost.
- Law for the Promotion of Sorted Collection and Recycling of Containers and Packages (Continued)
  - Problem = Containers and packaging materials are easily fouled and destroyed.
    - Improvement on RFID scanning accuracy
    - Establishment of practical installation method for high-speed batch scanning technology
  - To turn it a competitive merchandise against other Asian countries
    - Necessity of verification experiment sponsored by public funding

Recycling of personal computers and automobiles, and RFID

- Personal Computer Recycling Law (Enforced in October 2003)
  - "Law for the Promotion of Utilization of Recycled Resources"
  - Personal Computer 3R Promotion Center (an intermediate limited company)
    - Unable to extend to automated sorting and recycling of PC parts
  - Merits of attaching RFID to parts
    - Automated sorting
    - Automatic counting
  - It is required technologies to solve various social problems arising from applications = Necessity of verification experiments sponsored by public funding

- Automobile Recycling Law (Enforcement in January 2005)
  - "Law for the Recycling of End-of-Life Vehicles"
  - Obligation of delivery/recovery to manufacturers, etc.
    - CFC gas, airbag, shredder dust
  - There are movements by carmakers providing unified managements of inspection/service logs for customers.
    - Measures that take entire life cycle into consideration
  - Merits to attach read-only RFIDs to parts
    - Accuracy of invoices from CFCs recovery vendors, disassembly vendors and crushing vendors
  - Necessity of verification experiments sponsored by public funding

Roles of public verification experiment for conversion to recycling-oriented society

- Problems in recycling fields
  - Many unfavorable conditions
  - Many enterprises do not see any reason to commit them other than the sense of duty. = Incentive to start technical development is so weak.
  - Negative feedback

Unfavorable conditions

It is desirable to solve with technologies.

Fouling, damage

Various sizes, various materials, difficult to sort, difficult to count

Difficult to automate = Labor force intensive operations

3K work

Smaller investment cost as whole society = Cost to produce a new car is likely being cheaper than the total recycling cost.

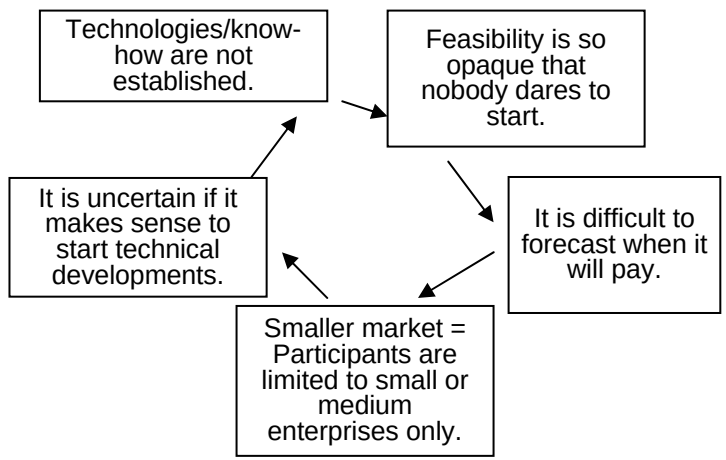
Factors inhibiting realization

There are many things, which are unknown till they are verified actually.

In many cases, it is unknown what kinds of operation are required till it is verified actually.

In many cases, it is unknown what kinds of measure should be taken by the administration, manufacturers, disposing vendors, consumers, etc. till it is verified actually.

- To break free from negative feedback
  - To cut off the chain by verification experiment
- Contents of technology/know-how
  - Basic technologies
  - Technical ingenuity in practical applications
  - Know-how of human behaviors
  - Know-how of organizational behaviors
  - Know-how of cost allocation



K.Nakano & Y.Ando [Data E]

Security of enforceability of law and verification experiment

	Are there sufficiently concrete provisions in the law?			Is there a possibility for a private enterprise to go into the black under the current situation?		
	Are there sufficiently effective penal provisions to persuade abiding by the law?				Is there a possibility for a private enterprise to go into the black in future?	
	Is there usefulness for society?					Countermeasures
[A]	No	–	– –	– –	– –	Excluded from this study.
[B]	Yes	No	– –	– –	– –	Severe punishment
[C]	Yes	Yes	No	– –	– –	Addition of article (s), establishment of enforcement regulations
[D]	Yes	Yes	Yes	No or unknown	No or unknown	It is necessary to make the administration being responsible to perform or let the administration with a compulsory authority make the industries being responsible.
[E]	Yes	Yes	Yes	No or unknown	Yes (Only depending on experiences)	(Regardless which of a public organization or private enterprise should take the initiative) It should be effective to conduct verification experiments sponsored by public funding.
[F]	Yes	Yes	Yes	Yes (Only depending on experiences)	Yes	It will be effective to develop technologies that could solve problems such as cost, etc. by verification experiments sponsored by public funding.
[G]	Yes	Yes	Yes	Yes	Yes	It will progress even if it is let alone with principles of market.

Measures to strengthen enforceability law

Traceability system and security of safety

- Use of ID (identifier) for wireless communication
  - Factory automation
  - Retailing = Unit price-base ID for dishes served on belt conveyor at a turn table serving type sushi shop
- It could produce a big chance to extend uses to secure the traceability of foods.
  - News of mad cow disease (BSE)
  - Necessity of a system to check history/safety of foods
  - Some of trials
    - Information of the place of production for vegetables and fruits
    - Checking the history of foods at the distribution stage
    - Management of data concerning the place of birth and growth for individuals
- Extension of application ranges after establishment of systems
  - It will become a common practice that producers record histories of production.
  - Tie-up between production and distribution
    - Interface between RFID tags at shipment of agricultural/livestock products and product labels at shops (dressed meat, etc.)
    - Interface with the control of foods processed at food factory
    - When any accident occurs, affected plants, date, product name, distribution route, etc. can be identified = It is not necessary to recover entire lots.

Controls of production, inventory and distribution

- Influence over production or inventory control
  - It makes easier the counting related to shipping and sales.
  - Inventory adjustment = Avoidance of disposal after shipping adjustment
  - Reduction of various costs
  - Quality control = Feed, fertilizer, etc. as well
  - Extended affinity with e-commerce
- Influence over distribution control
  - Applications to distribution/transportation control = RFID was used initially for the transport control and location finding by U.S. Army.
  - Tracking of containers
    - Study by ISO TC204/WG7
    - Study for use of UHF band
  - Tracking of individual cargoes
    - Trial with the home delivery service
    - Organic interface with shared information of traffic congestion or traffic control
    - Application to requests for cargo collection via portable terminal
    - Notification of delayed arrival/delivery (also for container tracking)

Marketing fields

- Possibility to interface with the context marketing
  - Selling of products or services in accordance with date, place and behavior patterns of customers or consumers

Field	● Service to present merchandises or services depending on situations, taking conditions of customers and consumers
Customer level	● Level of comparatively rich customers
Merits to user enterprises	● Sales can be promoted in real time according to inventory condition. ● Cost can be reduced by narrowing down on particular target
Merits to platform providing enterprise	● Management of new context information ● Business for adaptation to individuals' privacy

Table Features of context marketing

- Context marketing and RFID
  - Users' behaviors are monitored with sensors and RFID reader/writer configured in a ubiquitous environment.
  - Purchasing history analysis, inventory control
  - Service selection analysis, comparison with individuals' attributes
  - Data mining
- Risk and new business
  - Control and protection of context information could create new businesses.
  - System configuration as well
  - Also an agent service that balances the adaptation fit to individuals against the privacy protection

Measures for international standardizing employed in U.S.A. and Europe

- Movements in U.S.A.
  - Auto-ID Center
  - Development of data processing software
    - ePC
    - PDML
    - Object Naming Service Concept
  - Frequency band = 13.56MHz
  - Example of merchandises to be tested = Vehicle, personal computer, razor blade, grains
  - Example of cooperating enterprises = P&G, Wal-Mart, Dainippon Printing, etc.
- Movements in Europe
  - EU = Vision 2020 (Publicized in 2004) = Concept of European creative cities in future
  - Trial by Sainsbury's in U.K.
    - One of big retailers in U.K.
    - Sainsbury's and it suppliers formed a Tag group.
    - Control system to keep freshness of foods as a first step
    - By a combination of bar code and RFID
    - As shown by the following slide …

Experiment in Sainsberry

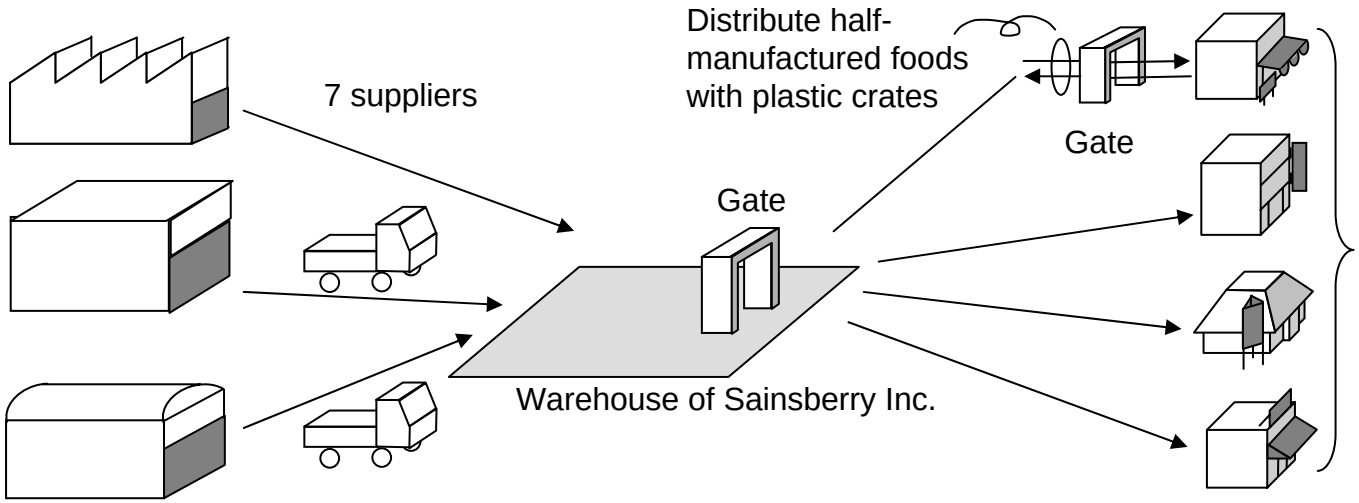
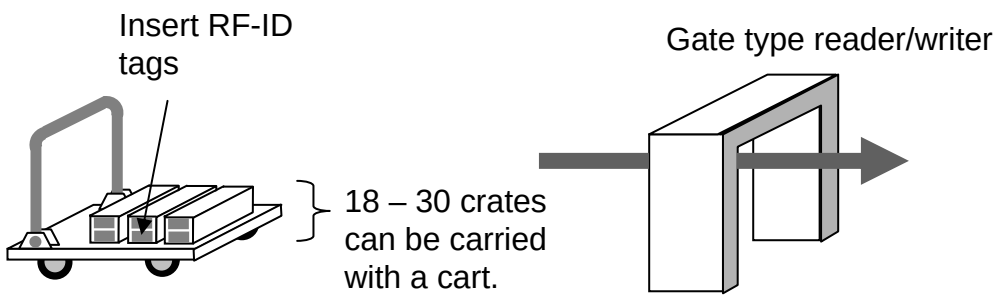


Fig. Overview of an experiment having Sainsberry as a center

Two crates can be overlapped. In other cases in Europe 4 crates are overlapped.



Information in the tags :
serial
manufacturing number
route number
limit term to be tasted
normally

Fig. Overview of system gates and peripherals

Process for products and items to which RFID will be introduced for control sometime in the future

Name of step	Procurement	Control of parts and parts materials	Assembly	Sales activity and placing/receiving order	Distribution	Repair, trade-in and collection	Discard, recycling, reuse, etc.
Process where introduction of RFID is possible	Shipment Delivery control	Inventory management	Process control	Factory inventory management	Shipment control	Distribution and warehouse management	Control of repair parts Control of collected items Inventory management of waste Control of waste transportation Control of final waste

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Other process

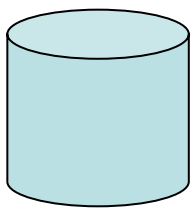
Design control

Procurement arrangement control

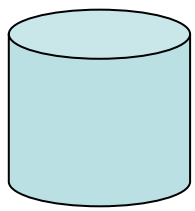
Control of placing/receiving order

Purchaser control

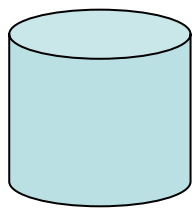
Control of maintenance and repair



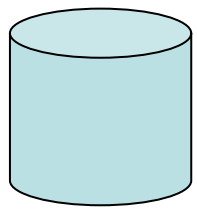
Design control, control of placing/receiving order for parts and parts materials, inventory management of parts and parts materials



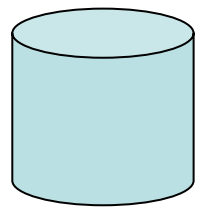
Production control and inventory management



Control of placing/receiving order for products and shipment control



Purchaser control



Control of waste

Japan's preparation for the standardizing

- Standardizing in Japan
  - Measures by the Ministry of Economy, Trade and Industry
  - ARP leader of ISO/IECJTC1/SC31 (of which theme is the international standardizing of bar code, 2-diemnsion code and RFID) WG4 is a Japanese.
  - ARP: Requirements for the international standardizing specification are summarized from the aspect of practical application.
- Cooperation with other organizations
  - Domestic countermeasures committee for IC104/TC122

    (International standardizing for container, transport unit, returnable box, packaging case and product)
  - Japan Trucking Association
  - Japan Automatic Identification Systems Association (JAISA)

Example of categories in the environmental preservation field

[A] Energy conservation	<i>	Optimum energy supply, etc. *1	[C] Waste disposal	<i>	Industrial waste
	<ii>	Traffic		<ii>	Medical waste
	<iii>	Transportation, distribution		<iii>	Living life waste, raw garbage, etc.
	<iv>	Production		<iv>	Drainage processing
	<v>	Others		<v>	Others
[B] Resource conservation, recycling	<i>	Metals	[D] Natural environment preservation	<i>	Ecology maintenance
	<ii>	Resin		<ii>	Protection of rare organisms
	<iii>	Paper, cloth, etc.		<iii>	Prevention of alien organisms from diffusion
	<iv>	Others		<iv>	Nature observation
				<v>	Others

*1: Optimum energy supply, co-generation, heat-source in block, alternate energy for petroleum

Table 1 Fields of environmental protection

Classification based on items and reporting contents for application of RFID

- Object to which information is added, and object to be measured
  - Artificial matter/human being
  - Environment/organisms
- Reporting contents
  - Position
  - Situation = Data of environment where RFID is placed and of measurement on one's own wearing RFID
  - Information = On the matter to which RFID is attached
  - Description = Data such as toll payment record or medical carte

Report Contents \ Object		Environment / Organisms		Artificial matter / Human being	
		Environment	Organisms	Artificial matter	Human being
Position		[II-B]	[II-A]	[I-B]	[I-A]
Situation / Information	Situation	[III-B-a]	[III-A-a]	[IV-B-a]	[IVA-a]
	Information	[III-B-b]	[III-A-b]	[IV-B-b]	[IV-A-b]

Table: Framework for RFID utilization in the environmental protection field

Typical example of each category

- [I-A] = Position finding on subject person = Approaching to site of illegal disposal by driver or disposing workers
- [I-B] = Tracking of waste itself
- [II-A], [III-A-a], [III-A-b] = Position, situation, types, blood-line, etc. of rare organisms
- [III-B-a] = Environmental measurement of disposal site or nature preservation area
- [III-B-b] = Notification on restricted matters, allowable matters, etc. concerning disposal or nature preservation area
- [IV-A-a] = Measurement of possible risk in the atmosphere around people
- [IV-B-a] = Measurement of the condition of cracks on artificial matter
- [IV-A-b] = Prohibition/permission concerning trespassing prohibited area
- [IV-B-b] = Reporting of the information on compositions of plastics or alloy

		Environment / Organisms		Artificial matter / Human being	
		Environment	Organisms	Artificial matter	Human being
Position		[II-B]	[II-A]	[I-B]	[I-A]
Situation / Information	Situation	[III-B-a]	[III-A-a]	[IV-B-a]	[IVA-a]
	Information	[III-B-b]	[III-A-b]	[IV-B-b]	[IV-A-b]

Table: Framework for RFID utilization in the environmental protection field

Traceability system and framework for security

[A] Energy conservation	<i>	Optimum energy supply, etc. *1	[C] Waste disposal	<i>	Industrial waste
	<ii>	Traffic		<ii>	Medical waste
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	<iv>	Production		<iv>	Drainage processing
	<v>	Others		<v>	Others
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