

Electronic Manifest System for Industrial Waste

July, 2010

Japan Industrial Waste Information Center

1. Introduction

The legal manifest system uses a multi-fold manifest (fill-in items are regulated) to manage the movement of waste "from the cradle to the grave". This kind of system is in widely use in various countries and regions, primarily for hazardous wastes. In Japan, the Waste Management Law requires businesses to check the proper treatment by contractors commissioned their waste in order to prevent illegal dumping or improper disposal. In this respect, the manifest system is a kind of tracking method, because it tracks the flow of the waste from the generation (cradle) to the final disposal (grave). This kind of manifest system was also enacted into law in Germany in 1978, the Netherlands and Austria in 1979, England in 1980, and the United States and Norway in 1984, and other major countries in Western Europe in the late 1980s.

In Japan, full-fledged implementation of this system began with an administrative directive issued by the Ministry of Health and Welfare (currently the Ministry of the Environment) in 1990. In 1991, the "control manifest for industrial waste" (hereinafter "Manifest") was established based on an amendment to the Wastes Management Law, and then the use of Manifest was made obligatory for specially controlled waste from the beginning of April, 1993. A subsequent amendment to the Waste Management Law in June 1997 made obligatory the use of Manifest for the contracted treatment of all industrial wastes. At the same time, the world's first legal system of electronic Manifest (hereinafter "e-Manifest") system was implemented to reduce the burden on businesses generating waste. Japan Industrial Waste Information Center (hereinafter "JW") was designated exclusively as "Information Processing Center" as stipulated in Paragraph 1, Section 2, Article 13 of the Waste Management Law, and the operation of the e-Manifest system started on December 1, 1998. Currently in Japan, businesses must use either the paper type manifest or the e-Manifest.

This paper describes the outline of e-Manifest use and the system development in Japan and also presents the implementation activities of e-Manifest overseas.

2. Outline of the e-Manifest system

2.1 System structure

The e-Manifest system is a system for the generator, the transporter, and the disposer of waste to digitize Manifest information and transmit for the registration, reporting and notification of such information via the Information Processing Center (Fig.1).

Methods for accessing the system include a new Web-based method (that can also be used from a mobile telephone) introduced on May 4, 2010, and an EDI* method using the in-house system of subscribers.

EDI: Electronic Data Exchange: business transaction message exchange method between computers of different organizations via communication lines

2.2 System features

The e-Manifest takes advantages of IT, those are “information sharing” and “efficient transmission of information”, and provide the following features:

(1) Legal compliance

- (a) Preventing uncompleted fill-in.
- (b) Manifest creation starts only when a generator makes registration (initial data input).
- (c) Automatic notification of the deadline for the treatment of waste commissioned by a generator helps him to remind the confirmation required.

(2) Data transparency

- (a) Manifest information is managed and stored by the third party, Information Processing Center.
- (b) Records of changes and deletions to manifest information are managed in the system.
- (c) Falsification of Manifest is prevented.

(3) Paper work and cost reduced

- (a) Registration and reporting are performed easily from a computer or a mobile phone.
- (b) Manifest data stored can be easily retrieved and processed
- (c) Streamlining of paper work process leads to a reduction in labor costs.
- (d) Administrative reporting required (Annual status report of Manifest-creation) is exempted.

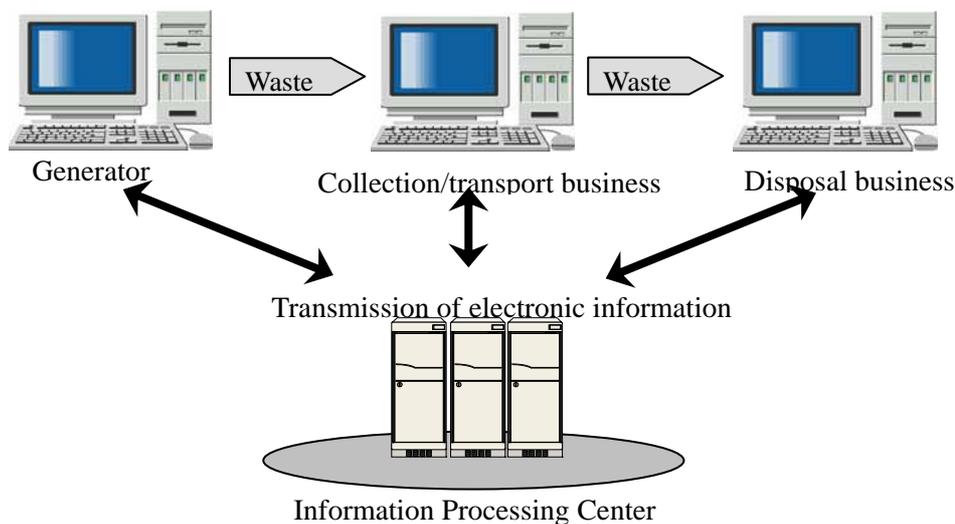


Fig. 1 Scheme of the e-Manifest system in Japan

3. Management situation of the e-Manifest system

3.1 Subscription in the e-Manifest system

Number of subscribers as of the end of March 2010 was 55,797 (generators: 43,009, transportation businesses: 7,891, disposal businesses: 4,897), a 28% increase over the

same period of the previous year (Table 1 and Fig.2). Approximately 90% of all generators consists of the following four business types: health care and welfare (76%), construction (8%), manufacturing (6%), and wholesale/retail (3%).

Table 1. E-Manifest subscription and number of Manifest creations as of March 31, 2010

Fiscal year	Total subscribers	Breakdown of subscribers			Number of Manifest creations annually
		Generator	Transportation business	Disposal business	
2007	30,705	4,083	4,300	3,241	4,076,448
2008	43,493	23,164	5,775	4,000	6,415,296
2009	55,797	3,3718	7,891	4,897	8,390,114

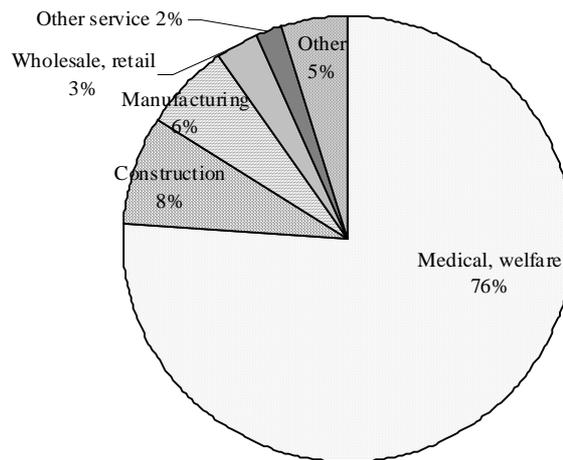


Fig.2 Percent distribution of subscription by business type of generators (FY2009)

3.2 Number of e-Manifest creations

The number of e-Manifest creations has increased rapidly since FY2007, reaching 8.39 million registrations in FY2009, a 30% increase over the 6.42 million creations made in FY2008. The e-Manifest share rate (ratio to the total number of e-Manifest creations plus the number of paper Manifest distributed) was annually 19% for FY2009 and monthly 23% for March 2010 (Fig.3).

As to the business type of generators, construction business has the share of 62%. This is

followed by manufacturing (9%), wholesale/retail (7%), health care/welfare (7%), and real estate/rental (4%), with these four types making up approximately 90% of the total (Fig.4).

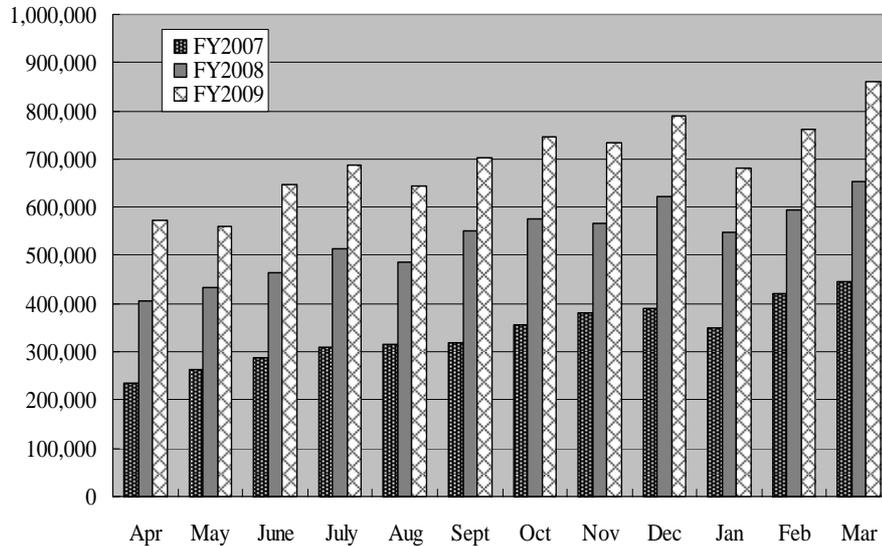


Fig.3. Trend in monthly number of e-Manifest creations

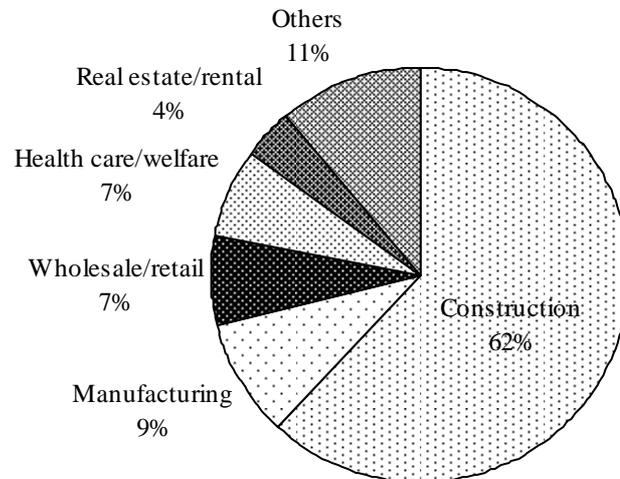


Fig.4. Percent distribution of number of e-Manifest created by the business type of generators in FY2009

3.3 Development of the e-Manifest system

(1) History of the system development

In order to comply with the amendment to the Waste Management Law in 2000, where generators were required to confirm the status of their waste from the generation to the completion of final disposal, the complete revision of the 1st e-Manifest system was

carried out. And further, with the developments in IT such as broadband connections like ADSL, the system was revised again between FY2004 and FY2006 to improve user convenience such as the speed-up of communication and processing. The system developed in FY2008 and FY2009 (4th system) was made improvement in safety and reliability in order to cope with the increasing use, and it was brought online on May 4, 2010 (Table 3).

Table 3 History of the development of e-Manifest system in Japan

Fiscal year	1997, 1998	2000	2004 to 2006	2008, 2009
Needs	Implementation of e-Manifest system	Amendment to the Waste Management Law	Internet becomes available	Improvement of safety and reliability to cope with increasing use
Start of operation	December 1998	April 2001	June 2006	May 2010
Communication network	KDDI (telephone line)	KDDI & Internet	Internet	Internet
Access method	C/S	C/S, Web, EDI mobile phone added in February 2001	Computer, mobile phone, EDI	Web, EDI, mobile phone

(2) Features of the newly developed 4th system

The primary features of the newly developed system are as follows:

(a) Improvement in system stability

In the 4th system, processing response improvement in online and EDI connections and performance stability improvement with preventing measures against interruptions such as processing delays. The system can now process 4 million Manifest creations per month and the subscription of 150,000. In addition, the system monitoring function is strengthened.

(b) Operation of e-Manifest via web

In the previous system, it was necessary to install specific JWNET software onto a user's computer, and also to input and save basic information required for entering Manifest information (location of waste generation, etc.) in advance. The newly developed system uses JWNET server to perform all of these operations via web.

(c) Increased search capability

The previous system set the search capability up to 300 for transport completion reports or disposal completion reports. The newly developed system allows it up to 5,000.

(d) Adaptation of sub-user number log-in

Previously, only a single number could be used to log in to the e-Manifest system, when up to 5 users accessed from multiple computers simultaneously. Strengthened information security in the newly developed system integrates a log-in procedure with sub-user numbers. When logging in, a representative (transport business, etc.) issues user-sub numbers (user number + sub-ID) to each user. A maximum of 99 sub-numbers can be provided for a single user number.

(e) Improvements in basic setting information

Previously, basic setting data was stored on a user's computer. This made sharing difficult when the basic settings would be different on each computer. With the newly developed system, basic settings are stored in JWNET server as shared information. This arrangement allows sharing basic information with respect to a user number.

(g) Addition of function for preparing the certificate of Manifest creation.

In the previous system, a service to prepare the record of user's e-Manifest information on an electronic media upon user request was provided. Instead, in the newly developed system, a digitally-signed PDF file with those requested by a user is provided.

4. Approach of e-Manifests overseas

4.1 Status in other countries

Regarding Manifests used in various countries, there are a wide variety of types of waste, Manifest formats, number of sheets, and methods of use. There also are not necessarily three types of users (generator, collector/transport businesses, and disposal businesses) in contrast to the manner in Japan. In many cases, information is shared by submitting Manifest to governmental agencies, such as municipalities.

As there is an increase in the number of businesses that use computers to enter manifest information, an improvement in efficiency through the use of such electronic information will be observed in each country along with the progress of information technology.

Currently, countries such as South Korea, Taiwan, Malaysia, Singapore Austria and Germany, and several states of Australia and Canada have so far implemented electronic manifest systems, and efforts are being made to introduce such systems in the United States of America (U.S.A.) and China.

4.2 South Korea¹⁾

Development on an e-Manifest system in South Korea began in 2000. Trial operation was performed in 2001, followed by the start of business operation by the Korea Environment and Resources Corporation (ENVICO, currently integrated with Korea Environment Corporation (KECO) through restructuring) in 2002. Although the system was first used together with the paper manifest (introduced in 1999) in the beginning, the use of electronic manifests only was required starting in August 2008. The process flow of

this system is shown in Figure 5. As shown in the figure, in addition to users and the information center (ENVICO), Manifest information can also be accessed by supervisory agencies (environmental departments, regional environmental agencies, and regional administrative departments). Other major differences with Japan include the national government being responsible for system operation costs, and the requirement that delivery reports be submitted within a single day.

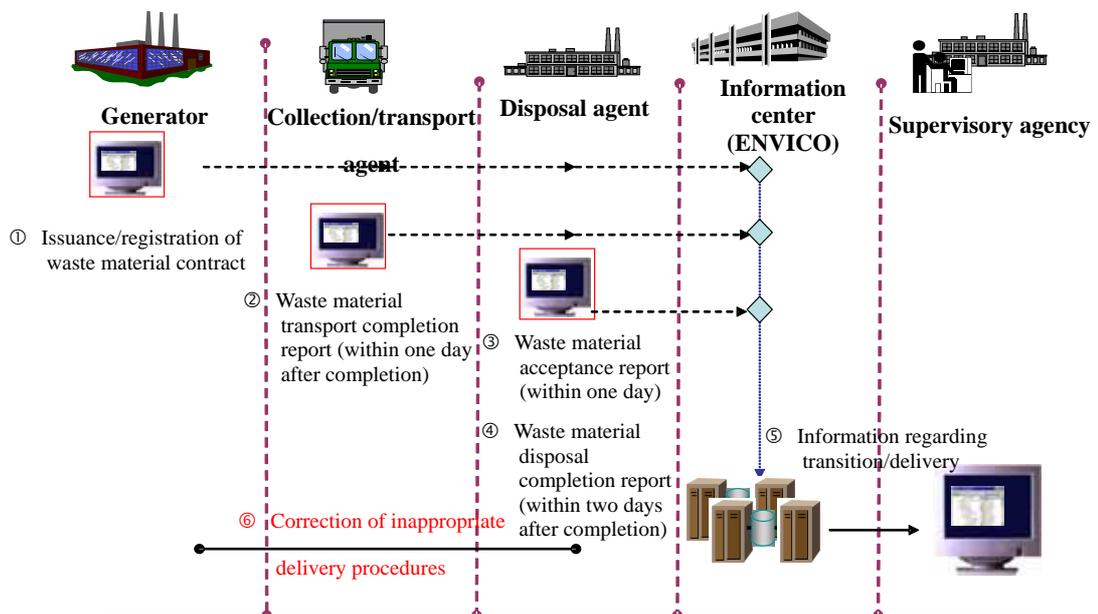


Figure 5 Process of the e-Manifests in South Korea

The dissemination of the e-Manifest by type of industrial waste is shown in Table 5. Based on the enrollment rate, designated waste material is 79% and infectious waste is 52%, while general waste and construction waste amount to only a small portion of those numbers. In addition, when looking at numbers based on disposal volume, both designated waste and infectious waste are at high levels of 80% and 85%.

Table 4 Dissemination of the e-Manifest in South Korea

Item	FY2002	FY2003	FY2004	FY2005
Target waste	Hazardous (designated) waste	Hazardous waste	Hazardous waste General waste	Hazardous waste General waste Construction waste
Target businesses (No. of businesses)	Businesses generating 200 tons or more of waste annually (1,476)	Businesses generating 100kg or more of waste per month (7,382)	Businesses generating hazardous or general waste (19,146)	Businesses generating any industrial waste (33,956)
Enrollment (enrollment rate)	1,476 (100%)	6,311 (85%)	11,061 (58%)	17,973 (52%)
N0. of users	1,476	3,733	6,434	8,423
No. of e-Manifest creations	81,023	255,009	331,158	467,725

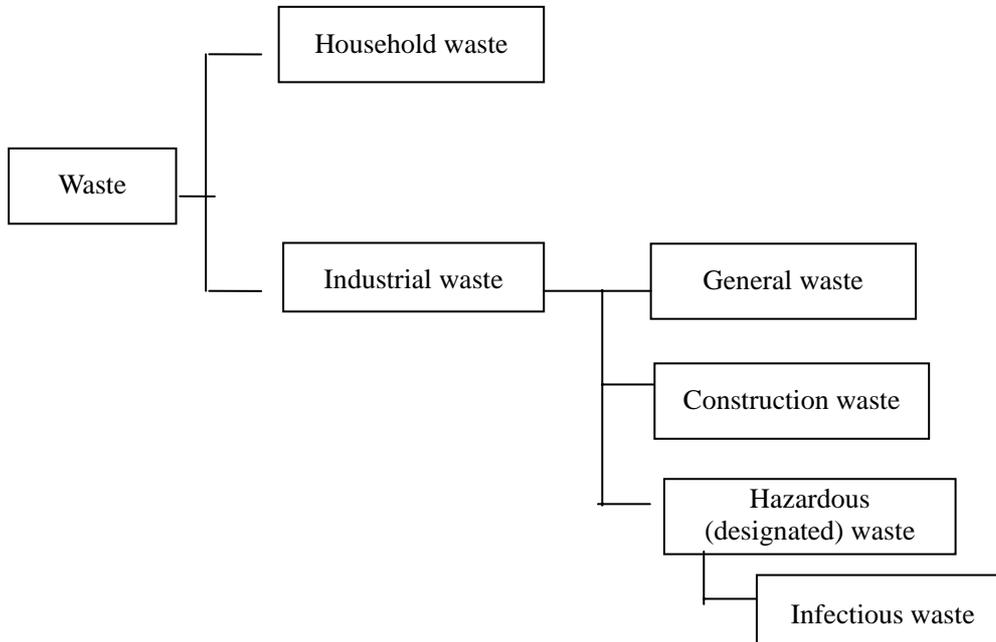


Figure 6 Classification of waste in South Korea

Table 5 Dissemination of e-Manifest by type of industrial waste

Item	Infectious waste	Hazardous waste	General waste	Construction waste
Enrollment rate for generators (%)	52.1	78.6	1.4	0.3
Ratio based on disposal volume (%)	85	80	2	-
Total contracted disposal quantity (1,000 tons)	41	2,548	26,116	-

The e-Manifest system in South Korea is called "Waste Transfer Control System". It is "Allbaro" system integrated from the following three systems: Waste Electronic Registration System, "Waste Statistics System", and "GIS (geographical information) System" (See Table 6). Waste Electronic Registration System is used to perform services related to application procedures and approval for waste management. This is used together with the information from the e-Manifest system to allow the statistical analysis of the allocation distribution of related businesses, disposal conditions, generation and transportation by type and disposal quantity by disposal method. Results are then utilized in waste management policy making. The GIS system is used to find and analyze transportation routes for waste.

Table 6: Structure of Allbaro System

System element	Details
Electronic Registration System	Authorization and authorization application, modification, and approval via the Internet
E-Manifest System	Delivery of waste registered via the Internet, and managed as electronic information
Statistical System	Consolidation and analysis of basic information regarding waste and e-Manifest information
GIS (geographic information) System	Search and analysis of transition routes for waste

4.2 Taiwan^{2),3)}

In Taiwan, there are 90,000 factories, 20,000 medical organizations, and 20,000 construction sites, generating 32 million tons of industrial waste annually. The classification system of waste in Taiwan is shown in Figure 7.

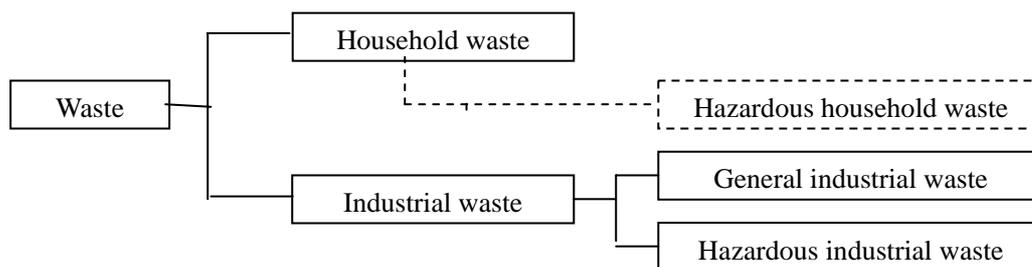


Figure 7 Classification of waste in Taiwan

The Industrial Waste Control Center (hereinafter “IWCC”) is an organization involved in waste management processes at the Environmental Protection Administration (EPA), which was established in October 2000 to operate “Online Reporting System”. Currently, more than 80% of waste generated annually is managed with this system, resulting in a dramatic reduction in illegal dumping.

(1) Online Reporting System

The outline of Online Reporting System is shown in Figure 8.

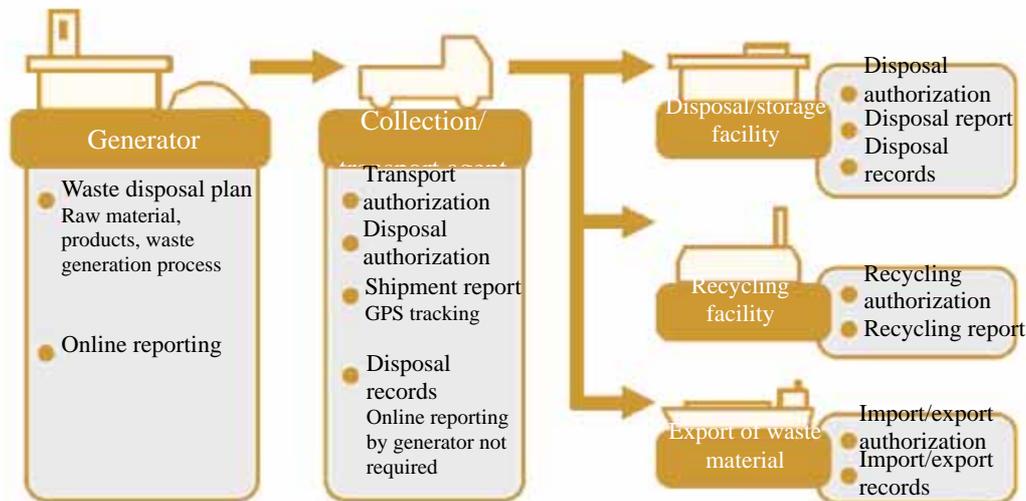


Figure 8 Outline of Online Reporting System in Taiwan

This system requires specified businesses to receive approval for waste through the Online Reporting System, regarding a generator, a collection/transport business, a disposal facility, or a recycling facility.

The application process is performed online, as shown in Figure 9. Approval and records for the export of waste are also subject to this process. This data is used to create an industrial

waste database, and access is allowed from entities involved.

During the dissemination of this online reporting system, business were designated gradually, starting with 10 government-operated businesses (76 facilities) , and followed by the top 1,000 corporations, hospitals with 50 or more beds, and then corporations that require approval to dispose of waste water, waste disposal businesses, and large-volume generators of hazardous waste. As a result, more than 40,000 generators (44% of the total) were registered in the Online Reporting System as of 2005, with more than 1 million reports made annually.

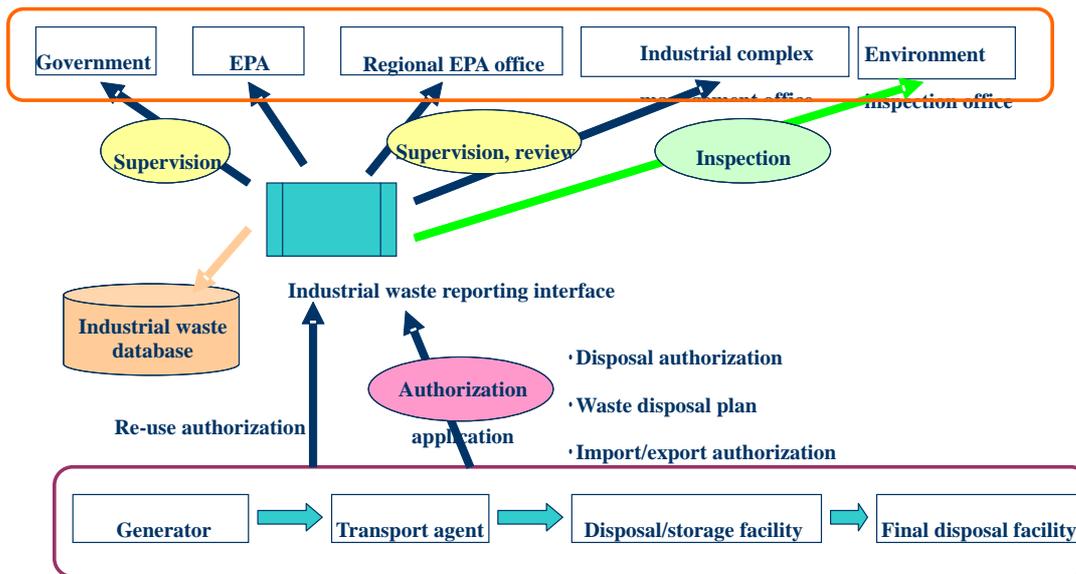


Figure 9 Structure and utilization of industrial waste database

(2) Waste transport vehicle tracking system

With the introduction of this system together with the Online Reporting System in Taiwan, measures against illegal dumping are being strengthened even further. GPS is required on transport vehicles, and the transport route of waste is monitored and inspected. Inspectors use a personal computer to review data such as business location, route used by transport vehicle, and vehicle information based on vehicle number. This allows them to efficiently monitor, stop, and inspect any suspicious transport vehicle. In addition, a collection/transport business can monitor information regarding the operation of their vehicles, and search for the most efficient route.

The installation of GPS on transport vehicles began with vehicles for the transport of hazardous waste (297 units) in 2002, and was expanded to vehicles for the transport of infectious waste in 2003, and has reached approximately 1,750 vehicles as of June 2007.

The plan is to add 4,000 more vehicles by 2010, which would cover a majority of the 6,000 vehicles targeted.

4.3 U.S.A.⁴⁾

The Environmental Protection Agency (EPA) of U.S.A. performed trials for the e-Manifest run jointly by waste bureaus and the policy bureaus for prompt and efficient tracking of the process for hazardous waste. The review of the system in U.S.A. proposed by President Clinton in 1995 led to a US government policy for the reduction of paperwork by at least 25% and the automation of reporting.

Manifest revision working group, consisting of EPA staffs and several state representatives, was formed in April 1996 and implemented e-Manifest trials in the following three phases.

(1) Phase 1: EDI (Electric Data Interchange)

A total of six companies participated in this phase of the trials, including waste generators and transport businesses and hazardous waste disposal facilities in Illinois, Indiana, and Minnesota. Manifest information was exchanged between waste handlers and state governments using EDI via a VAN service network. Unique ID numbers were used when signing Manifest. The results of this trial at its conclusion in December 1998 revealed that all paper Manifest operations could be converted to digital.

(2) Phase 2: EDI and digital signatures

Based on the results of the EDI trial in Phase 1, digital signatures using substitute cards were added to further improve security. It was discovered that this allowed the handling of even special cases where freight rejected at one disposal facility must be delivered to another.

(3) Phase 3: Web

Waste generators and transport businesses, hazardous waste disposal facilities, and state governments participating from Pennsylvania, New York, Illinois, and Indiana exchanged Manifest information via the Internet. Since the use of EDI requires an investment in hardware and software of more than \$2000, the promotion of a low-cost approach using the Internet was important to increase participation in electronic manifests among low-volume waste generators, and to promote dissemination of the system.

Based on the results of these trials for EDI and Web systems, the e-Manifest was evaluated as a part of Manifest improvements implemented by the EPA waste material bureau. The review implemented by the working group came to a conclusion in the autumn of 1999, and was followed by a final rule proposal in 2001 for a decentralized e-Manifest system to be implemented by each state.

Later, the EPA moved forward with a review of a centralized e-Manifest system, leading to a new pilot test in FY2008. Currently, they are moving forward with procedures to set up laws and a budget for the e-Manifest system within the federal government.

References

- 1) Japan Industrial Waste Technology Center: A 10-Year History, p.92-96 (1998)
- 2) Hironori Ozaki: Electronic Manifest and the Promotion of International Interchange, Cities and Solid Waste, Vol.38, No.4, p.53-59 (2008)
- 3) Hironori Ozaki: Report on Electronic Manifest in Taiwan, Japan Industrial Waste Technology Center Newsletter, Vol.7, No.3, p.32-33 (2007)
- 4) Haruo Matsumura: Manifest Systems in the World, INDUST, Vol.16, No.2, p.18-23 (2001)