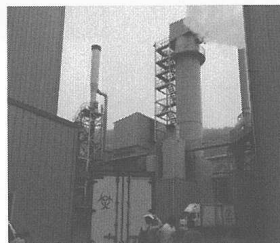
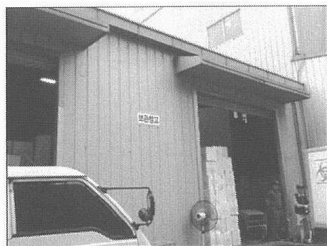




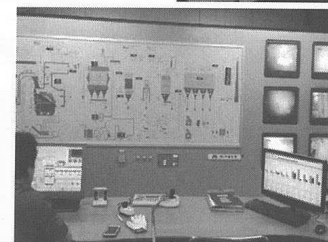
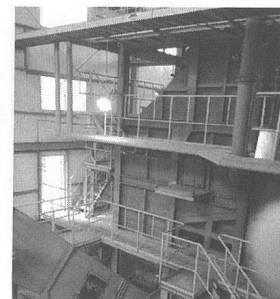
Regulations for Disposal

- **Should have entrusted company treat it unless they have on-site treatment facility (i.e., sterilization/shredding)**
- **Final disposal through entrusted company is incineration.**
 - Containers as a whole should be put into an incinerator.
 - Entrusted company should use the incinerators only for medical wastes.
- **Temporary storage before incineration**
 - <5 days or <5 days' amount

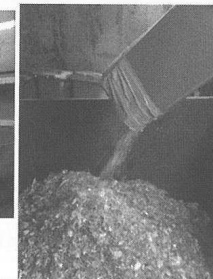
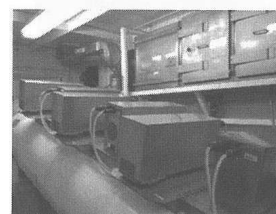
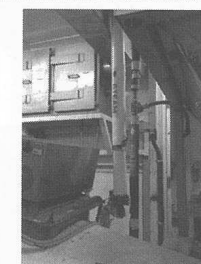
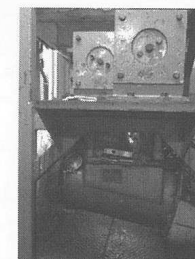
Entrusted company for transportation & incineration



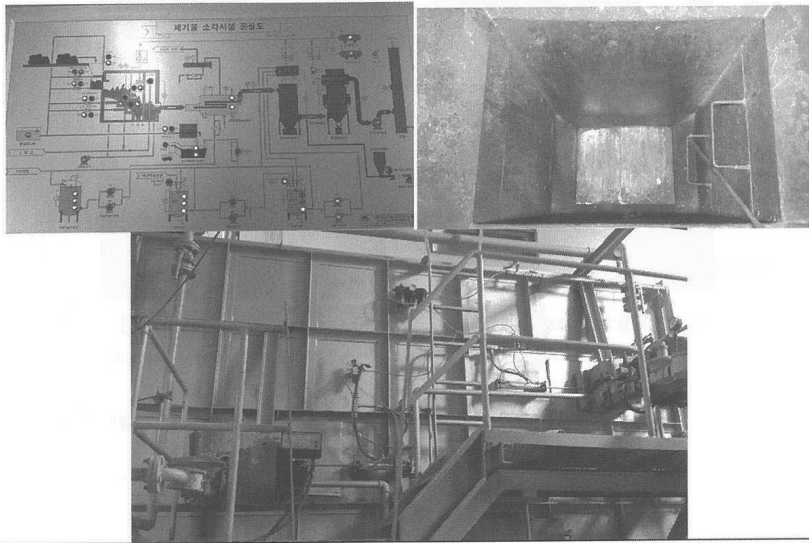
Specialized Incinerator for Medical Waste: Off-site



Microwave Sterilization/shredding Facility: On-site



On-site Incinerator in a general hospital



Statistics of medical waste in Korea

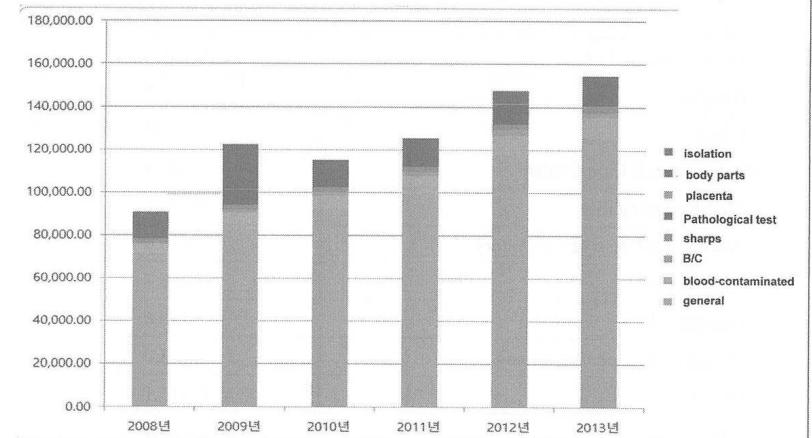


Generation of Medical Wastes in 2012 by Classification

Data from Year 2012 (unit: ton)

		Generated (unit: ton)	%
1	General	117,577.2	79.6
2	Pathological test	9,359.9	6.3
3	Blood-contaminated	9,087.4	6.2
4	Body parts and fluids	5,732.0	3.9
5	Sharps	2,881.6	2.0
6	Biological/Chemical	2,593.5	1.8
7	Isolation	413.8	0.3
	Placenta	12.7	0.0
	Total	147,658.1	100

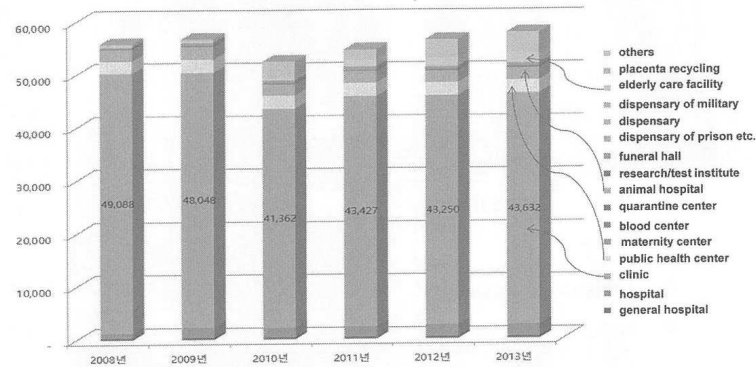
Increasing Trend of Medical Waste in Korea



Generation of Medical Wastes in Korea (unit: ton)



Number of facilities which generate medical waste



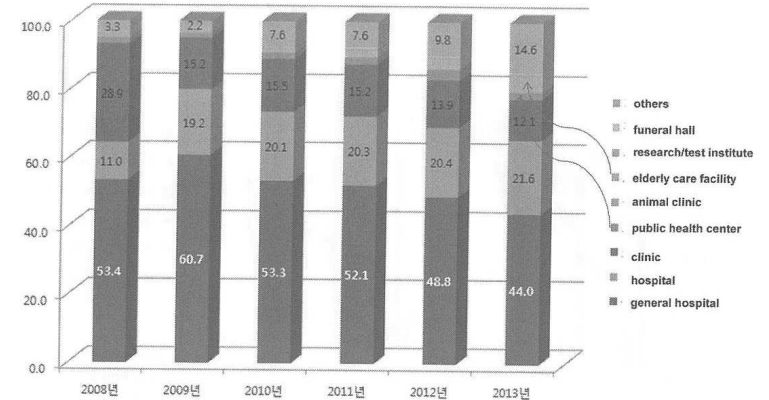
Number of dischargers of medical wastes by type in Korea (unit: ton)

Generation of Medical Wastes by Facility type

	Amount (ton)	%
General hospital	72033.7	48.8
Hospital	30124.7	20.4
Clinic	20467	13.9
Public Health Care Center	4621.0	3.1
Elderly care facility	3902.1	2.6
Testing institution & Laboratory	1636.6	1.1
Animal clinic	256.3	0.2
Funeral hall	198.6	0.1
Dispensaries including prison	3.0	0.0
Others	14415.1	9.8
Total	147658.1	100.0

Data from year 2012 (unit: ton)

Generation of Medical Wastes by Facility type



Generation of Medical Wastes by Facility type in Korea 2008-2013 (unit: ton)

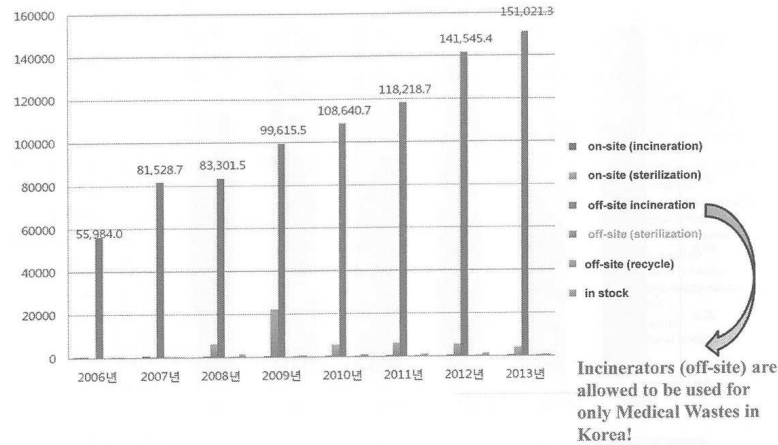
Amount of Medical Waste: Generated and Treated

Data from Year 2012 (unit: ton)

	Generated		Treated					Stored
	Carry-over from 2011	Generated in 2012	On-site		Off-site			
			Incineration	Others*	Incineration	Sterilization/Shredding	recycled	
Total	935.3	147,658.1	333.2	5,448.3	141,545.4	0.0	12.7	1,253.8
Isolation	1.2	413.8	0.0	0.0	411.0	0.0	0.0	4.0
Pathological test	59.5	9,359.9	0.0	520.5	8,849.2	0.0	0.0	49.7
B/C	3.7	2,593.5	0.0	2.8	2,579.1	0.0	0.0	15.3
Sharps	32.8	2,881.6	0.0	64.8	2,827.3	0.0	0.0	22.3
General	754.5	117,577.2	314.7	517.9	116,417.1	0.0	0.0	1,082.0
Body parts and fluids	20.2	5,732.0	18.5	3,422.9	2,285.6	0.0	0.0	25.2
Placenta	0.0	12.7	0.0	0.0	0.0	0.0	12.7	0.0
Blood-contaminated	63.4	9,087.4	0.0	919.4	8,176.1	0.0	0.0	55.3

*Sterilization/Shredding or Treated in the Waste Water Disposal System

Disposal of Medical Wastes in Korea

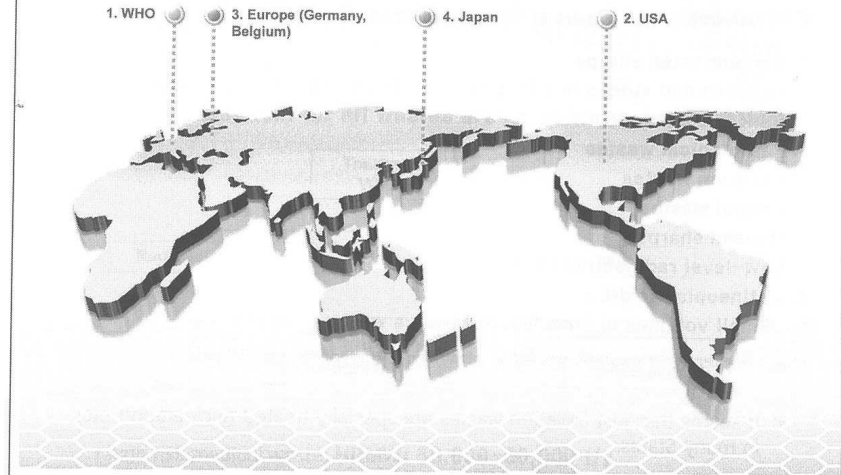


Amount of Medical Wastes by the Methods of Disposal in Korea (unit: ton)

International Comparison



Selected Countries



U.S. EPA

- 'Model Guidelines for State Medical Waste Management', (<http://www.epa.gov/waste/nonhaz/industrial/medical/programs.htm>)
- EPA Guidelines. Medical waste - storage, transport, and disposal. 2003

- ✓ 'regulated medical waste' (NY, RI, VA etc.)
- ✓ 'infectious waste' (CO, NE, NV etc)
- ✓ 'biomedical waste' (CT, FL, GA, ME, WA etc)
- ✓ 'special medical waste' (MD etc)

U.S. ENVIRONMENTAL PROTECTION AGENCY
Wastes - Non-Hazardous Waste - Industrial Waste
 Search: All EPA This Area
 You are here: EPA Home > Wastes > Industrial Waste > Medical Waste > State Programs

Medical Waste Home | Disposal | Medical Waste Tracking Act of 1991 | Publications | Frequently Asked Questions | 2009 HINT Kit

Where You Live - State Medical Waste Programs and Regulations

Medical waste disposal is primarily regulated at the state level. To determine what laws apply in your state, use the map below or scroll down the page for links to information about state medical waste regulations and programs. Or visit the [State Program of EPA's WASTE1000 site](http://www.epa.gov/osw/industrial/medical/programs.htm).

Note: All of the following links are outside of EPA (EXTERNAL LINKS).

<http://www.epa.gov/osw/industrial/medical/programs.htm>

U.S. EPA

• Classification of Medical Wastes: Model Guidelines

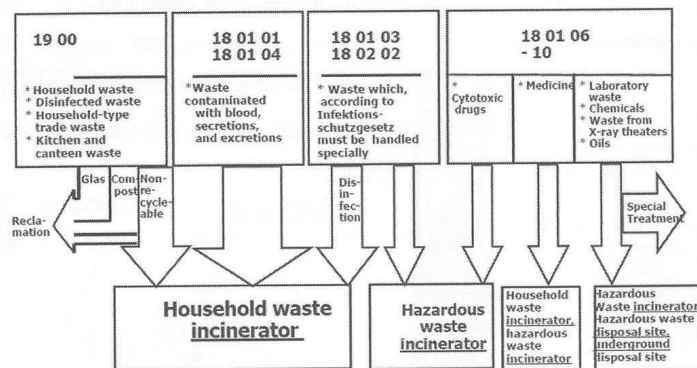
1. Contaminated sharps
2. Cultures and stocks of infectious agents and associated biologicals
3. Bulk human blood
4. Pathological wastes
5. Isolation wastes
6. Animal wastes
7. Unused sharps
8. Low-level radioactive waste
9. Antineoplastic drug
10. Small volumes of chemical hazardous waste

<http://www3.epa.gov/epawaste/nonhaz/industrial/medical/mwpdfs/modguidl/2.pdf>

- ✓ It seems that just isolation wastes are specially treated (incineration etc) in many States.

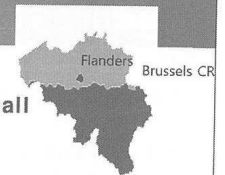
Strategy for health care waste in Germany

• Health care wastes are classified to EU Guidelines: 6 digit code



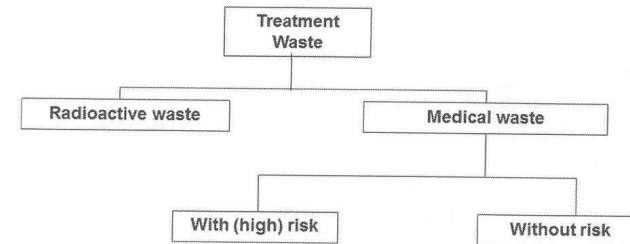
- Recycle as much as possible! Extract energy from wastes as much as possible!
- When disinfected, it can be disposed in household waste incinerator.

Belgium: Flanders



- Very centralized management is possible due to small territory.

- Main type of disposal for all wastes are recycling or incineration.



- high risk medical waste; HRMW: 50,000~60,000 t/y
- ordinary medical waste; OMW: 6,000~7,000 t/y

Belgium: Flanders

Criteria for HRMW

- ✓ precautionary principle
- ✓ acceptable risk

• Infection

• Poisoning

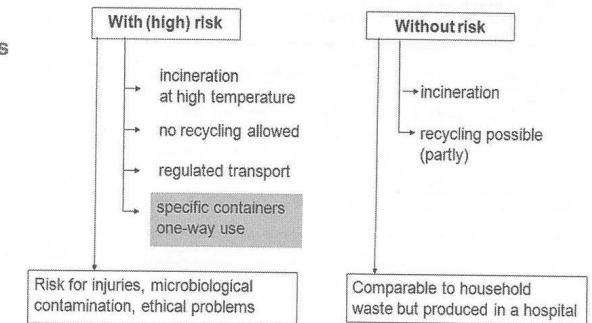
• HRMW+OMW=HRMW

• waste from intensive care => HRMW

• Injury

• Ethical concerns

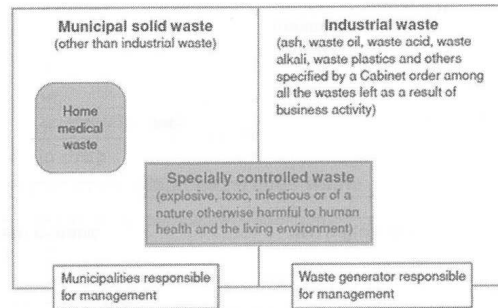
• GMO



Japan

Classification of 'Infectious Waste'

- infectious industrial waste ⊂ specially controlled industrial waste
- infectious municipal waste ⊂ specially controlled municipal waste

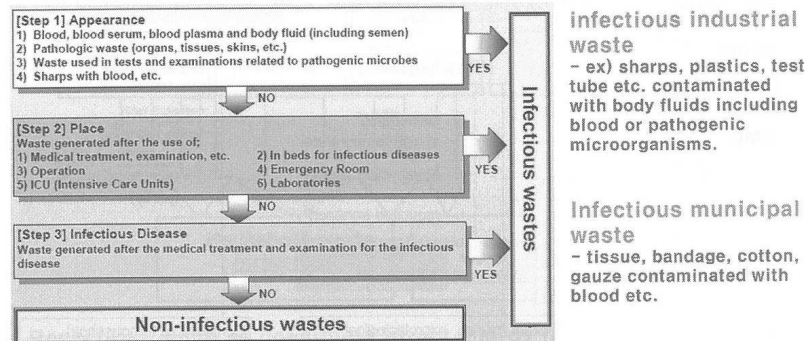


Hanashi, 2011. Investigation into the proper disposal of home medical waste

Japan

Judgement flow for infectious waste

- Criteria: Appearance, Place, Infectious Disease



Imamura, 2006. Doctor's efforts toward appropriate medical waste management. Asia 3R conference

Comparison of Classification of Medical Wates

	EU	WHO	US (EPA)	Japan	Korea
EU AS code	Health Care Waste	Health Care Waste	Medical Waste	Infectious Waste	Medical Waste
18 01 01/ 18 02 01	Sharps	Sharps	Contaminated sharps/ Unused sharps	Infectious Industrial	Sharps
18 01 02	Body parts and organs including blood bags and blood preseres	Pathological	Bulk human blood/ Pathological wastes	Infectious Municipal	Blood contaminated/ Pathological test/ Body parts and fluids
18 01 03*/ 18 02 02*	Waste whose collection and disposal is subject to special requirements in order to prevent infections.	Infectious	Isolation / Cultures and stocks of infectious agents and associated biologicals/ animal wastes	Infectious Industrial / Infectious Municipal	Isolation
18 01 04/ 18 02 03	Wastes whose collection and disposal is not subject to special requirements in order to prevent infection (e.g., dressings, plaster casts, linen, disposable clothing, diapers contaminated with blood etc.)	Infectious	×	Infectious Municipal	General
18 01 06*/ 18 02 05	Chemicals consisting of or containing dangerous substances	Chemical	×	×	Biological/Chemical
18 01 07/ 18 02 06	Chemicals other than those mentioned in 18 01 06*	Chemical	Small volumes of chemical hazardous waste	×	
18 01 08*/ 18 02 07*	Cytotoxic and cytostatic medicines	Cytotoxic	Antineoplastic drug	×	
18 01 09/ 18 02 08	Chemicals other than those mentioned in 18 01 08*	Pharmaceutical	Small volumes of chemical hazardous waste	×	
18 01 10	Amalgam waste from dental care	Chemical	×	×	×
	EU Proposal: COM(2003) 32 final	Radiological	Low-level radioactive waste	×	×

International Comparison

	Korea	Germany	Belgium (Flanders)	US	Japan
Extent of special care	broad	narrow-medium	broad	narrow	broad
Temperature at which infectious wastes are stored (°C): Regulation	4 (7 days)	<15 (7 days)	7	Mississippi: < 6	X
Incinerator allowed for only medical waste	O	X	Δ	X	X
Dependence on incineration	very high	high	very high	low	medium (getting higher)
Dependence on on-site treatment	very low	Low	very low	medium (getting higher)	medium (getting lower)
Method of on-site treatment allowed	microwave etc. (only 1 hospital)	steam (autoclaving etc), microwave	autoclaving	chemical, steam, microwave etc.	melting, steam, dried sterilization etc.
On-site incinerator allowed	O (only 1 hospital)	X	X	O	X

International Comparison

	Korea	Germany	Belgium (Flanders)	US	Japan
Distance from hospital to incinerator	Long (~350km; ~4 hours)	Medium (about 100 km; <2 hrs)	Short (<1.5 hrs)	Long	Medium (about 100 km; <2 hrs)
Temperature at which infectious waste are transported (°C): Regulation	4	There are regulation on pressure difference rather than temperature: practically kept at 0 degree	X: Vehicle with cargo will be OK.	X: Vehicle with cargo will be OK.	X: Vehicle with cargo will be OK.
Transporting vehicle allowed for only medical waste	O	X	X	X	X
Landfill allowed after on-site treatment (sterilization)	X: should be incinerated	O: but recycle and incineration as much as possible	X: should be incinerated	O	O
Disposal of 18 01 04/ 18 02 03	Special container -> incineration	Can be disposed as municipal waste	Wastes contacted by blood are assumed as HRMW; Others are disposed as municipla waste.	Can be disposed as municipal waste	Wastes contacted by blood are infectious municipal waste; Diaper without blood are treated as non-infectious municipal waste.

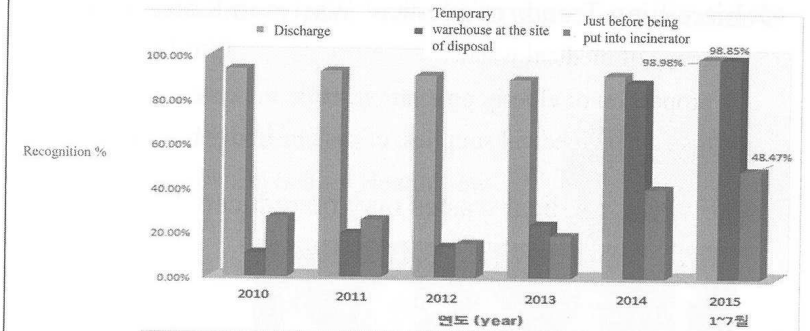
International Comparison

	Korea	Germany	Belgium (Flanders)	US	Japan
Electronic manifesto	O (RFID)	Δ	X	X	Δ (cell phone based)
Overall extent of regulation	Strong	Medium	Relatively strong	Weak	Medium

Issues raised for the management system of medical waste in Korea



Recognition % for RFID between 2010 to 2015



- ✓ It has been high at the site of discharge: 89~93% (~2014)
- ✓ In 2015, recognition % at the site of discharge and at temporary warehouse at the site of disposal became close to 100%.
- ✓ However, it is 40~60% just before being put into incinerator.



What is the factor for low recognition percentage (%)?

- Re-consignment
- Substitute input
- Structure of warehouse
 - Should be first-in first out.
- Compatibility of program
 - Windows 7 -> Windows 8
- Issues of tag itself etc.

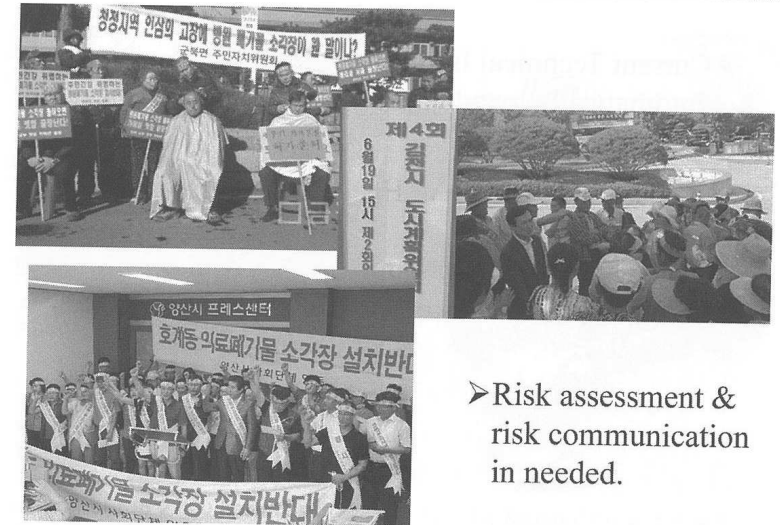
Can Medical Wastes be Reduced?

- Increasing Trends of Medical Wastes in Korea
 - scope of medical waste
 - proportion of elderly population: cf. home care
 - disposable medical supplies: cf. risk of injury by sharps
- However, medical wastes may be reduced!



cf. Green Hospital

Difficult to Construct Incinerator: NIMBY

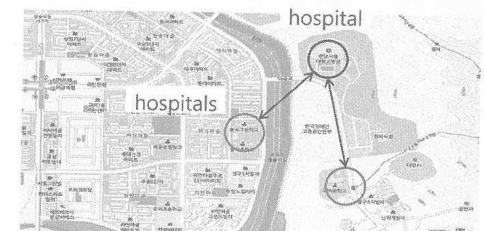


➤ Risk assessment & risk communication in needed.

On-site Treatment

- Current Issues related to (microwave) sterilization & shredding
 - breakdown caused by sharps
 - disposal of remnants
 - legal issues: School Health Law
 - odor and noise

School Health Law prohibits on-site treatment facility for medical waste treatment within 200m from school.





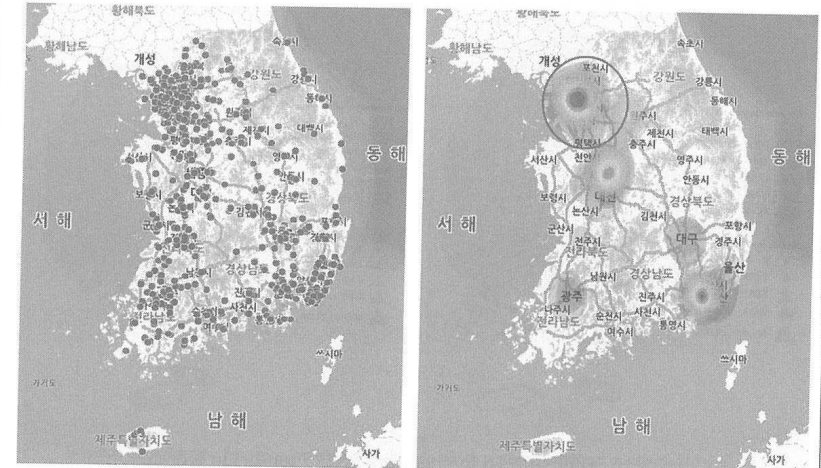
On-site Treatment

- Current Technical Issues may be resolved automatically by adopting up-to-date technology. However, ...
- Revision of the School Health Law is essential.
- And, active risk communication is required with community near hospital and school authorities.

Spatial imbalance between generation and treatment



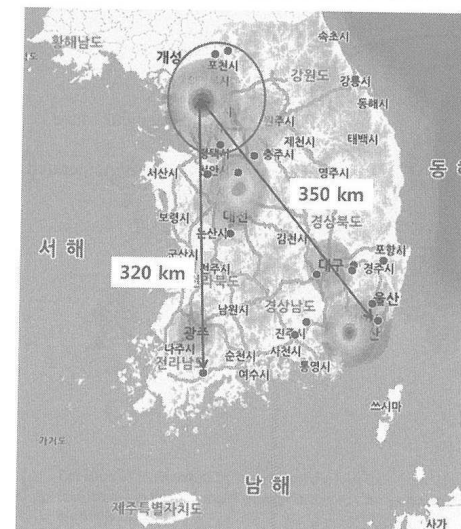
Distribution of Medical Waste from Hospitals (n=2000)



Location of top 2,000 hospitals in terms of medical waste generation

Seoul + Kyunggi Province: 50%

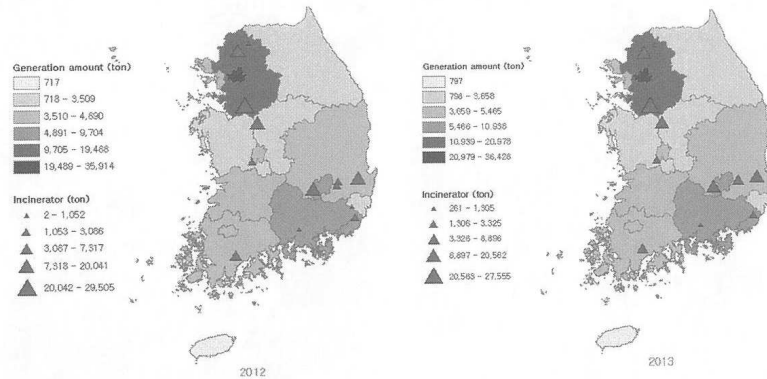
Distribution Medical Waste Incinerators



Only three incinerators are located in Seoul + Kyunggi Province

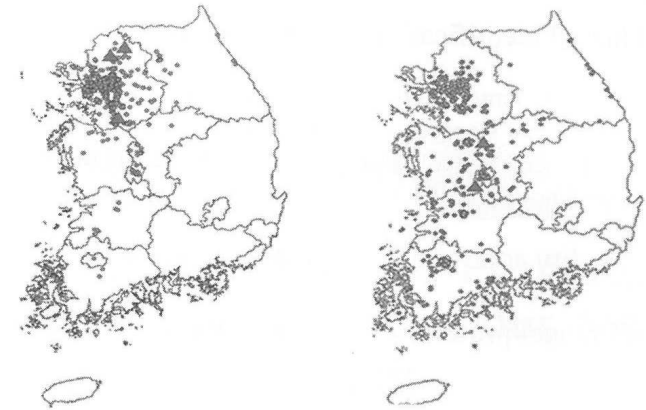
In some cases, distance for medical wastes to be transported are about 300km.

Amount generated and incinerated (data from 2,000 hospitals)



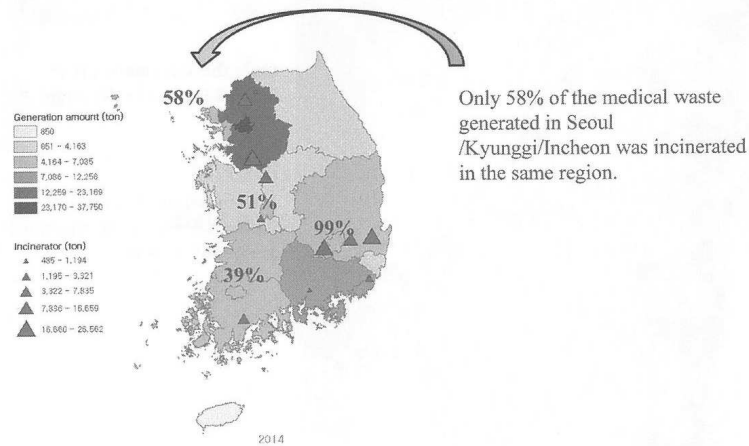
There are 16 incinerators (24.35 ton/hr) in Korea.

Amount generated and incinerated (data from 2,000 hospitals)



Location of incinerators by region and the hospitals from which medical wastes are transported to and incinerated in them: Seoul/Kyunggi/Incheon, Chungcheong, Gyeongsang, and Jeolla (data from 2,000 hospitals in 2014)

Amount generated and incinerated (data from 2,000 hospitals)



Only 58% of the medical waste generated in Seoul /Kyunggi/Incheon was incinerated in the same region.

Amount generated and incinerated (data from 2,000 hospitals)



Location of incinerators by region and the hospitals from which medical wastes are transported to and incinerated in them: Seoul/Kyunggi/Incheon, Chungcheong, Gyeongsang, and Jeolla (data from 2,000 hospitals in 2014)



Other issues

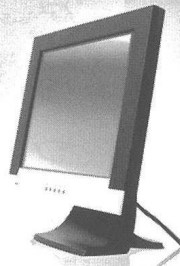
➤ Hazard identification => Risk assessment

- factors: temperature, type of wastes (solid vs. liquid), duration of storage, frequency of collection, type of containers, state of packaging, temperature and distance of transportation

➤ Quality control of containers

➤ Personal protective equipment and code of conduct

**Thank you very much
for your attention!**



Session 2-2

JW's Efforts for the Promotion of Appropriate Infectious Mgt in Japan

Ms. Sato, Akiko,
Staff, Business Promotion Division,
Japan Industrial Waste Information Center,

<http://www.iwnet.or.jp/iwnet/>

JW's efforts for the promotion of appropriate infectious waste Management in Japan



Public Interest Incorporated Foundation

Japan Industrial Waste
Information Center

Akiko SATO

1

<http://www.iwnet.or.jp/iwnet/>

- I. Management and operation of the e-Manifest for the infectious waste**
- II. Education and training for proper industrial waste management**
- III. Assessment of performance of containers for infectious waste**

2



<http://www.iwnet.or.jp/iwnet/>

I

Management and operation of the e-Manifest for the infectious waste

3

<http://www.iwnet.or.jp/iwnet/>

1. Generators' responsibilities

- When generators commission on the disposal of their wastes to others, they are requested to confirm that their wastes have been disposed properly by using the e-Manifest or paper manifest.
- JW carries out the management and operation of the e-Manifest system and the preservation of the data registered.

4

<http://www.iwnet.or.jp/iwnet/>

2. History of the manifest system

Year	Regulations
1991	Manifest system was started on trial. (The form was only paper type Manifest.)
1993	The legal Manifest system was started for only hazardous industrial waste(including the infectious wastes).
1998	The legal Manifest system was introduced for all kinds of industrial waste. The e-Manifest system was introduced.



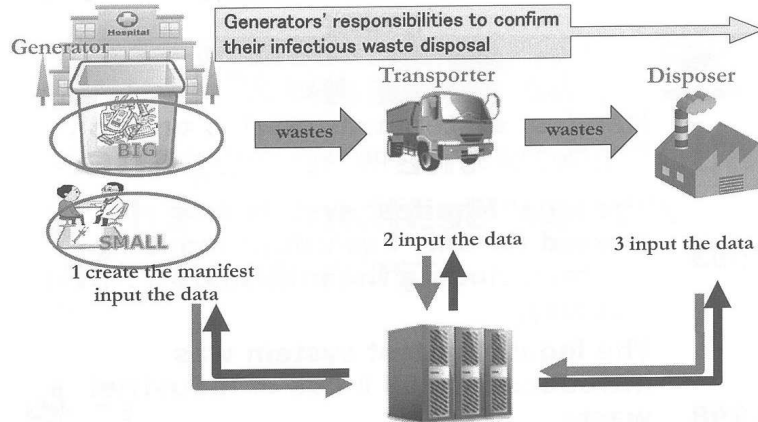
5

<http://www.iwnet.or.jp/iwnet/>

Year	Regulations
2001	The report of the final disposal confirmation was obligated to use the Manifest.
2005	The penal regulations corresponding to the Manifest management were reinforced.
2010	All generators have preservation duty of the paper Manifest for 5 years.

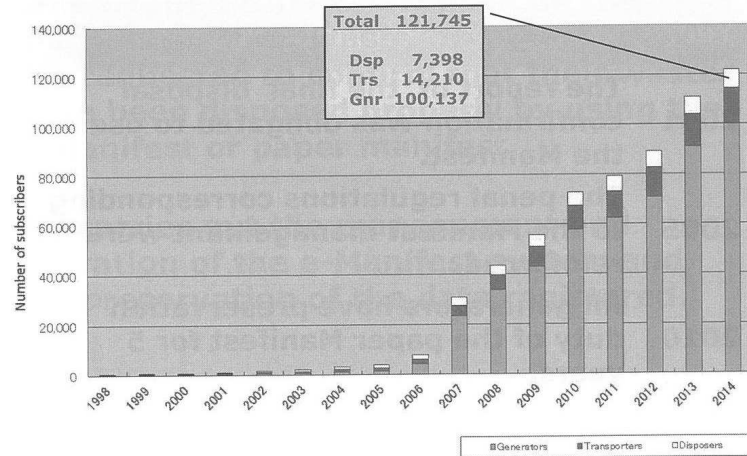
6

3. Management of the infectious waste disposal by the e-Manifest System



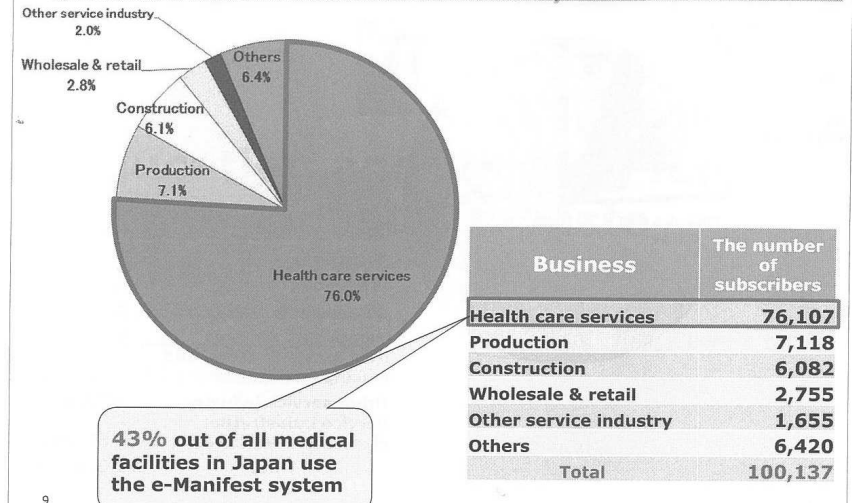
□ The operation of the management of infectious waste for the e-Manifest is the same as other industrial wastes.

4. Trend of the number of e-Manifest subscribers



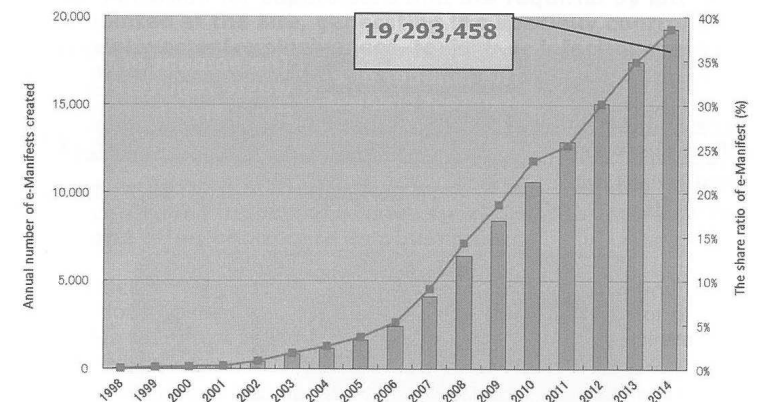
8

5. Ratio of business categories of generator subscribers at the end of March, 2015



9

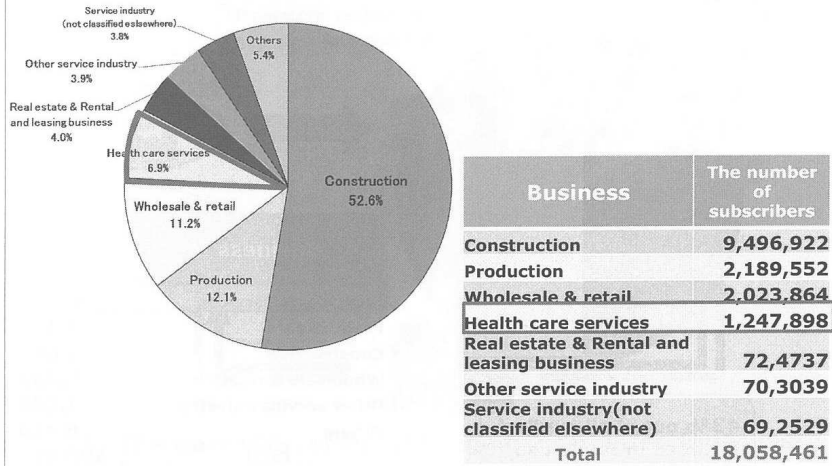
6. Trend of number and share of the e-Manifests registered



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<http://www.iwnet.or.jp/iwnet/>

7. Ratio of business categories by e-Manifests created , in FY 2014

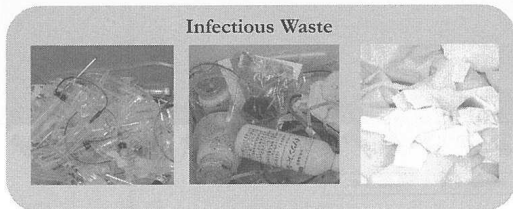


11

<http://www.iwnet.or.jp/iwnet/>

8. Performance of the use of the e-Manifest system for infectious waste , in FY 2014

	The number of e-Manifest created	The amount of the waste registered to the e-Manifest system
Infectious waste	619,671	107,117 t
Total industrial waste	18,066,860	55,514,750 t



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<http://www.iwnet.or.jp/iwnet/>

II

Education and training for proper industrial waste management

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<http://www.iwnet.or.jp/iwnet/>

1. For generators

JW provides 2 education and training courses for acquiring the qualification for supervisors that are required by law to be appointed at the site, generating the specially controlled industrial wastes(explosiveness, toxicity or infectiousness).

- 1 Course for qualified supervisors of the specially controlled industrial wastes
- 2 Course for qualified supervisors of the specially controlled industrial wastes specialized for medial and other healthcare establishments

- Facilities which generate "specially controlled industrial and infectious wastes" are required to allocate a supervisor for proper wastes treatment called a "Specially Controlled Industrial Waste Supervisor".
- The sessions are also opened to the qualified supervisors who want to enhance their knowledge and expertise.

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<http://www.iwnet.or.jp/iwnet/>

Subjects	Contents
Law and regulation on wastes	Responsibilities of generators, definitions of wastes, outline of the treatment criterion, contracts, penalties, etc.
Treatment and management on wastes	Criterion of safekeeping and treatment Plans of infectious waste treatments Contracts, manifest, etc.
Basic acknowledgements on infectiousness →only for the applicants for medial and other healthcare establishments	Basic acknowledgements of infection and infectious disease , prevention against infection, safety measures, etc.

- JW is issuing a certificate when the applicants pass the examination conducted after the training lectures and the applicants are certified as specially controlled waste supervisors.



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<http://www.iwnet.or.jp/iwnet/>

2. For collectors/transporters and disposers

JW provides training courses to acquire the "adequate knowledge for proper management" for collectors/transporters and disposers.

For new applicants	<ol style="list-style-type: none"> 1. Course for the collection and transportation of industrial wastes 2. Course for the disposal of industrial wastes 3. Course for the collection and transportation of <i>specially controlled wastes</i> 4. Course for the disposal of <i>specially controlled wastes</i>
For update applicants (For continuing business licenses)	<ol style="list-style-type: none"> 1. Course for the collection and transportation of industrial wastes or <i>specially controlled wastes</i> 2. Course for the disposal of industrial wastes or <i>specially controlled wastes</i>

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<http://www.iwnet.or.jp/iwnet/>

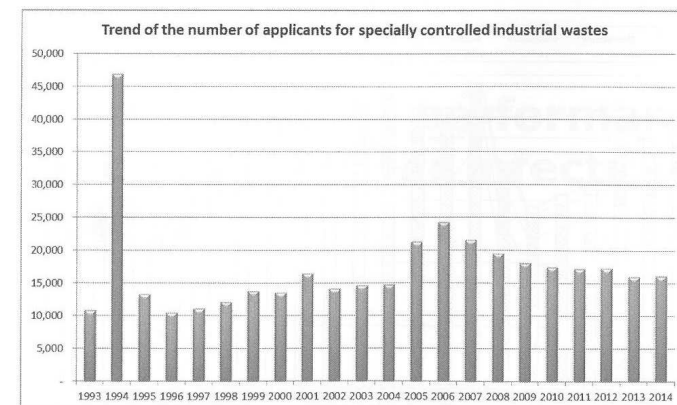
Main Subjects

- Law and regulation on wastes
- Environmental issues
- Operation of the waste management
- Safety and health management
- Outline of business for the collectors/transporters
- Outline of intermediate treatment
- Recycling
- Final disposal
- Outline of the specially controlled industrial wastes
→only for the course for the collection/transportation and disposal of specially controlled wastes
- JW is issuing a certificate when the applicants pass the examination conducted after the training lectures. It's used for application for a business license of industrial waste management.

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<http://www.iwnet.or.jp/iwnet/>

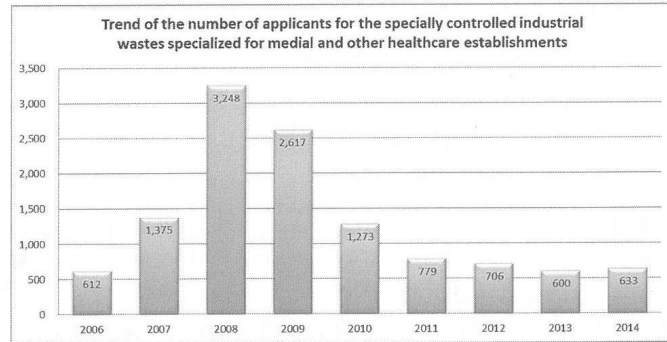
3. Trend of the number of the applicants



18



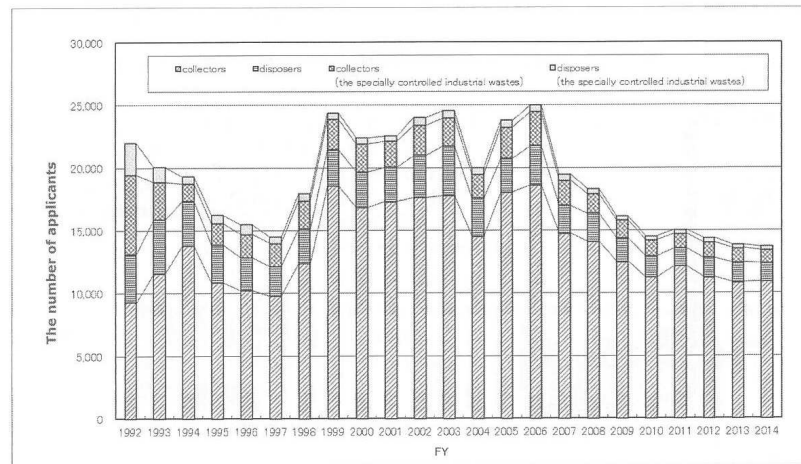
<http://www.iwnet.or.jp/iwnet/>



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<http://www.iwnet.or.jp/iwnet/>

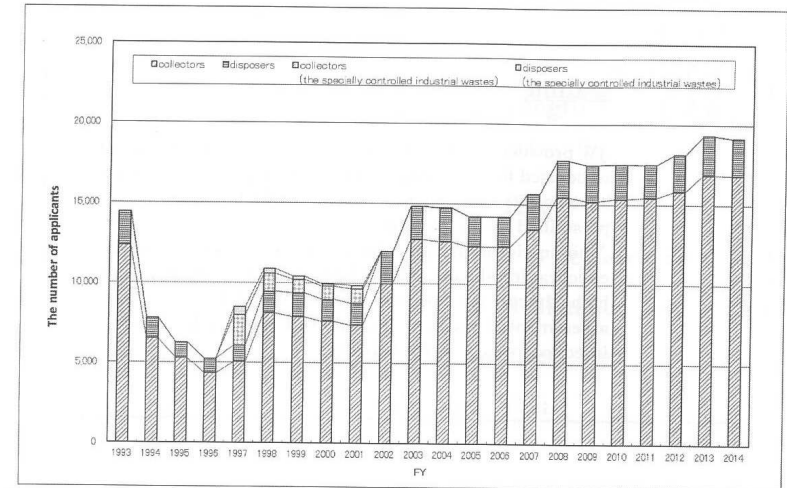
Trend of the number of new applicants for the collection/transportation and disposal



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<http://www.iwnet.or.jp/iwnet/>

Trend of the number of update applicants for the collection/transportation and disposal



21

<http://www.iwnet.or.jp/iwnet/>

III

Assessment of performance of containers for infectious waste

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<http://www.iwnet.or.jp/iwnet/>



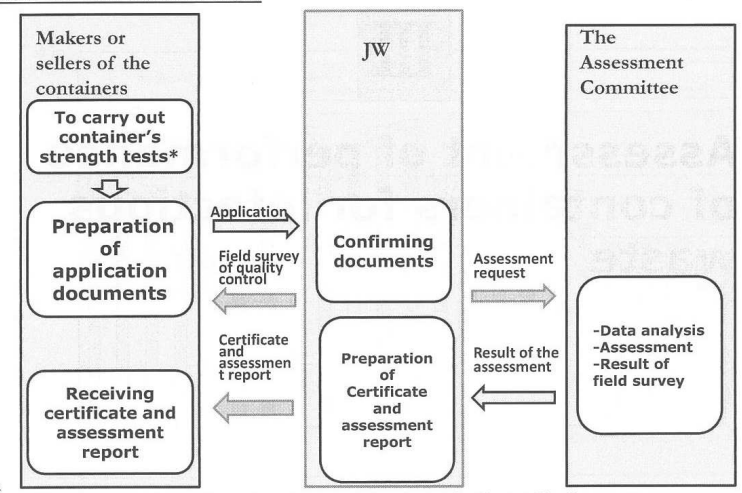
Outline

JW provides a service for the assessment of the containers to be used for collecting and transporting infectious waste based on its own concrete criteria within the range prescribed by the Manual.

This service aims at providing reference information for encouraging the use of special container for infectious waste by healthcare establishments, and JW publishes the assessment of the containers for different kinds of the infectious waste on JW website.

<http://www.iwnet.or.jp/iwnet/>

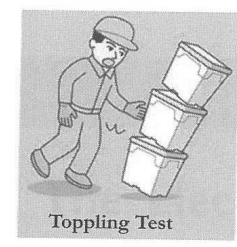
Flow of the assessment



*Container's strength tests: Penetration resistance test, Dropping test, Stacking test, Toppling test, etc.

<http://www.iwnet.or.jp/iwnet/>

Container's strength tests:

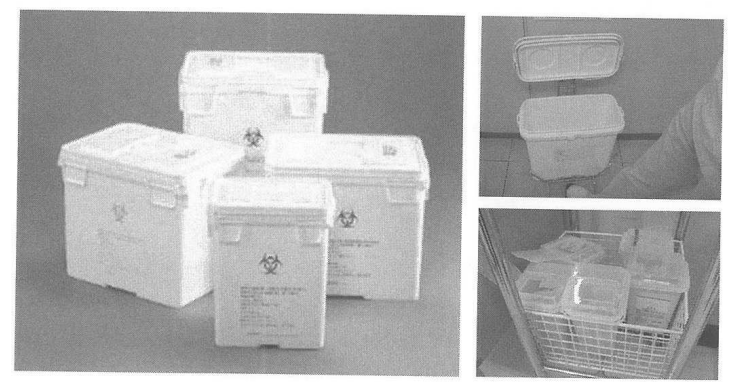


Toppling Test

- Handle Strength Test
- Drip Test
- Stacking Test
- Resistance to Leakage Test
- Puncture Resistance Test
- Waterproofness Test
- Toppling Test

<http://www.iwnet.or.jp/iwnet/>

There are 14 assessed corporations, and 47 containers as of September 30, 2015.





<http://www.iwnet.or.jp/iwnet/>

Thank you!

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Session 2-3

The Electronic Mgt of Waste in Taiwan

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Environmental Resource & Information Co., Ltd.