

# Japan's policy on the environmentally sound management of mercury wastes (recommended by the Central Environment Council in February 2015) [tentative translation]

## 1. Wastes consisting of mercury or mercury compounds

### (1) Designation as “industrial waste requiring special management”

- To ensure the environmentally sound management of wastes consisting of mercury or mercury compounds, wastes consisting of mercury or mercury compounds will be designated as “industrial waste requiring special management” due to their toxicity. Specific requirements will be determined by the status of the discharge.
- \* Industrial waste requiring special management: Among industrial waste, those having a property such as explosive, toxic, infectious, and others, that may have a risk of causing damage to human health or to the living environment. Incineration residues, dusts or sludge discharged from designated facilities and contain mercury or its compounds, and their treated products which do not meet the acceptance criteria.

# 1. Wastes consisting of mercury or mercury compounds

## (2) Methods of collection and transportation

- For collection and transportation of wastes consisting of mercury, it is appropriate to add the following requirements to the existing standards of collection and transportation of industrial waste requiring special management, considering the characteristics of mercury (liquid at room temperature and volatile).
  - Wastes should be collected and transported in a container designed for transportation.
  - Containers for transportation should be air-tight, easily stored, and durable.

# 1. Wastes consisting of mercury or mercury compounds

## (3) Storage method

- As for the storage of waste elemental mercury, it is appropriate to add the following requirements to the existing storage standards for “industrial waste requiring special management”, considering the mercury characteristics which are liquid at a room temperature and tend to volatilize.
  - Waste elemental mercury should be stored in an air-tight container.
  - Records of treatment and storage should be displayed on the container and kept for a long time.
  - Take necessary measures to prevent the container from exposure to high temperatures.
  - Take necessary measures to prevent the container from corrosion.
- As for storage facilities, requirements necessary to ensure environmentally sound storage will be provided (the requirements may include: 1) the storage facilities can be locked with a key, 2) measures to prevent fire and leakage of mercury should be in place).

# 1. Wastes consisting of mercury or mercury compounds

## (4) Methods of treatment and final disposal of waste elemental mercury

- Based on the knowledge obtained so far, it is confirmed that the result of the elution test (see Annex) of mercury with a purity of 99.9% or higher stabilized as mercury sulfide ( $\beta$ -HgS) and further solidified by sulfur polymer is below 0.005mg/L.
- It is appropriate to set treatment and disposal methods in Japan as shown in the table below.

Final disposal site	Treatment methods	Additional measures
Landfills for industrial wastes (leachate-controlled type)	Purification + Sulfurization + Solidification (satisfies the leaching standards)	<ul style="list-style-type: none"><li>➤ Prohibition of different wastes to be mixed in a landfill site</li><li>➤ Prevention of rainwater inflow during operation</li><li>➤ Prevention of mercury releases</li><li>➤ Long-term archiving of landfill records</li><li>➤ Prevention of rainwater inflow by putting the impermeable layer at the top of the landfill (capping, etc.) upon closure</li></ul>
Landfills for hazardous industrial wastes (isolated type)	Purification + Sulfurization + Solidification	<ul style="list-style-type: none"><li>➤ Long-term archiving of landfill records</li></ul>

# 1. Wastes consisting of mercury or mercury compounds

## (4) Methods of treatment and final disposal of waste elemental mercury

### Future tasks

- As for waste elemental mercury, it is necessary to continue examination of methods of treatment and final disposal including long-term monitoring and institutional arrangement from the view point of ensuring long-term management in an environmentally sound manner.
- In the United States, the interim guidance on the long-term storage of elemental mercury has been developed, and elemental mercury has been stored in steel containers at in the designated facility complied with the standards. Taking into consideration of such measures in other countries, it is necessary to conduct a technical and institutional review.

## 2. Waste contaminated with mercury or mercury compounds

- To ensure environmentally sound treatment and final disposal of waste contaminated with mercury or mercury compounds, such wastes with mercury concentrations higher than a certain level will be designated as “industrial wastes contaminated with mercury”, and standards for handling such wastes will be clarified in the permitting conditions for corresponding collection/transport, treatment operation, and treatment/disposal facilities.
- In addition, the waste category and the standards for handling will be indicated in the Waste Data Sheet and will be required to be included in the consignment agreement and the waste manifest.
- These measures could control mercury emissions from waste treatment facilities.

## 2. Waste contaminated with mercury or mercury compounds

- Depending on a form of mercury in wastes, if waste contaminated with mercury or mercury compounds with mercury concentrations higher than a certain level is treated by chelate or solidified by cement, there is a risk that mercury releases from such wastes could not be controlled to be low enough.
- A new policy will require mercury recovery before other treatment processes from wastes with high mercury concentrations discharged from designated sources, as there are possibilities that wastes contaminated with mercury are landfilled without mercury recovery due to decreased incentives for mercury recovery in the future although it is a common practice to recover mercury from such wastes at present.

### 3. Waste mercury-added products (1) Municipal waste

- Appropriate collection of waste mercury-added products discharged from households will be promoted, along with public awareness-raising through providing a list of mercury-added products, to ensure environmentally sound management of such wastes. In addition, the expansion of separate collection efforts by municipalities will be promoted through introducing good practices, and the development of a collection scheme in collaboration with relevant stakeholders will be pursued.
- Points to consider for managing waste fluorescent lamps and mercury thermometer will be clarified. Upon the collection and transportation of these wastes, they include, but not limited to,
  - 1) separate collection and transportation in order to avoid risks of mixing them with other types of wastes
  - 2) employing specific collection/transportation methods to avoid breakage, which increases a risk of scattering of contained mercury by damaging the equipment.
- Upon disposal of these wastes, the points would be to avoid mercury releases during the crushing or cutting of these wastes.
- Measures to facilitate the dissemination of information about the mercury-added products are necessary.



### 3. Waste mercury-added products (2) industrial waste

- Out of waste mercury-added products such as measuring equipment, lighting equipment, button cells, waste products containing a certain amount of mercury or mercury compounds will be designated as "industrial waste containing mercury". To ensure environmentally sound treatment, indication of such wastes in consignment agreement and waste manifest will be required.
- Points to consider for managing waste mercury-added products will be clarified. Upon the collection and transportation of these wastes, they include, but not limited to, 1) separate collection and transportation in order to avoid risks of mixing them with other types of wastes, and 2) employing specific collection/transportation methods to avoid breakage, which increases a risk of scattering of contained mercury by damaging the equipment. Upon disposal or recycling of waste measuring/lighting equipment, the points would be to avoid mercury releases during the separation, crushing or cutting of these wastes.

### 3. Waste mercury-added products (2) industrial waste

- A new policy will clarify that waste glass and metal to which mercury is adhered should not be disposed of in landfills for stable industrial wastes.
- As for measuring equipment containing elemental mercury such as sphygmomanometers, it is appropriate to recover mercury from such wastes and treat/dispose the recovered mercury.
- As for lighting equipment and button cells, it is appropriate to promote recovery of mercury utilizing the existing collection network.
- Disposal or recycling of waste mercury-added products should be conducted in the facilities with measures to control mercury emissions and scattering.

# Others

- Unused mercury thermometers and mercury manometers stored at homes and medical institutions
  - The Minamata Convention does not set a time limit for the use of existing mercury-added products as far as they are used.
  - As for unused mercury-added products stored at homes and medical institutions such as thermometers and sphygmomanometers, discharge of these products upon becoming wastes will be promoted in order to minimize risks of environmentally unsound treatment in the future.
  
- Labeling on products and other measures
  - It is necessary to have upstream measures such as developing a list of mercury-added products and labeling of mercury use on products.

# Future Challenges

- Stabilization and disposal technologies with certain prospects for practical use for treating waste elemental mercury have been identified; however, continuous examination is necessary with respect to their applications because they are new and have not been proven in practice so far.
- While carefully watching the trends of mercury uses and carrying out research and verification of the technologies, we will continue necessary examination to optimize the entire mechanism to ensure long-term management of waste elemental mercury, which includes institutional arrangement for treatment and long-term monitoring with appropriate role sharing of stakeholders including the national government.

# Reference: Standards for collection/transportation of “industrial waste requiring special management”

Collection, Transportation	<ul style="list-style-type: none"> <li>▪ Wastes should not be scattered nor spilled.</li> <li>▪ Take necessary measures not to cause adverse effects to the living environment by generating odor, noise or vibration due to waste collection or transportation.</li> <li>▪ To ensure that damage to human health or the living environment are not caused by wastes.</li> <li>▪ Wastes should be separately collected and transported from other things to prevent being mixed with other things.</li> </ul>
Facility for collection and transportation	<ul style="list-style-type: none"> <li>▪ Take necessary measures not to cause adverse effects to the living environment.</li> </ul>
Transport vehicle and vessel	<ul style="list-style-type: none"> <li>▪ On the outside of the body (hull), the sign showing that the vehicle (vessel) is subjected to the collection or transportation of industrial waste and other matters should be clearly indicated, and the certification should be put in the vehicle (vessel).</li> </ul>
Transport vehicle, container	<ul style="list-style-type: none"> <li>▪ Waste should not be scattered nor spilled, and odor not be leaked.</li> </ul>
Pipeline	<ul style="list-style-type: none"> <li>▪ Pipelines should not be used for collection or transportation of wastes.</li> </ul>
Collector or Transporter	<ul style="list-style-type: none"> <li>▪ Collectors or transporters of wastes should carry the document describing types and other items of wastes that they collect or transport. However, if these items are displayed on the container for transport, this does not apply.</li> </ul>
Infectious waste, PCB	<ul style="list-style-type: none"> <li>▪ Wastes should be collected or transported in the container for transport.</li> <li>▪ The container for transport should be air-tight and has a structure specified by the Ordinance of the Ministry of the Environment.             <ul style="list-style-type: none"> <li>&lt;Structure of the container for transport prescribed by the Ordinance &gt;</li> <li>▪ Air-tight</li> <li>▪ Easy to store.</li> <li>▪ Durable</li> </ul> </li> </ul>

# Storage standards for “industrial waste requiring special management (IWSM)”

※Storage for transshipment for collection and transportation, storage for disposal or recycling by waste treaters.

Storage area	<ul style="list-style-type: none"> <li>▪ The area should be fenced.</li> <li>▪ The sign should be displayed that the area is designated as a place of storage for the transshipment of waste, and other necessary matters concerning storage of waste at the prominent position.</li> <li>▪ Measures should be taken to ensure that rats do not inhabit and that mosquitoes, flies and other pest do not hatch.</li> </ul>
Measures for control of scattering, spill, permeation to groundwater, and odor	<ul style="list-style-type: none"> <li>▪ In the case that wastewater is likely to be generated from the storage of waste, drainage and other facilities should be constructed, and the floor should be covered with impermeable materials, to prevent contamination of the public water and groundwater.</li> <li>▪ In the case of storing the waste outdoors without using a container, the height of the waste piled should not exceed the height prescribed by the Ordinance of the Ministry of the Environment.</li> <li>▪ Other necessary measures</li> </ul>
Measures to prevent mixing of wastes	<ul style="list-style-type: none"> <li>▪ Measures necessary to prevent mixing the waste with other matters, such as providing a partition, etc. should be taken for the transshipment area.</li> </ul>
Measures by waste category	<ul style="list-style-type: none"> <li>▪ According to waste category, the measures prescribed by the Ordinance of the Ministry of the Environment should be taken.</li> <li>◁ Necessary measures prescribed by the Ordinance ▷             <ul style="list-style-type: none"> <li>— Storage of waste oil (IWSM), wastes contaminated with PCB, or treated PCB wastes in an air-tight containers. Prevention of volatilization and exposure to high temperatures.</li> <li>— Prevention of corrosion for wastes contaminated with PCB or treated PCB wastes.</li> <li>— Prevention of perishable wastes from decomposition such as storage of the wastes in an air-tight containers.</li> </ul> </li> </ul>
Maximum limit of the storage quantity	<ul style="list-style-type: none"> <li>◁ Collection, Transportation ▷             <ul style="list-style-type: none"> <li>▪ Quantity of stored waste should not exceed the number obtained by multiplying the average daily discharge from the storage by 7, except for the cases specified by the Ordinance of the Ministry of the Environment.</li> </ul> </li> <li>◁ Final Disposal or Recycling ▷             <ul style="list-style-type: none"> <li>▪ Quantity of stored waste should not exceed the number obtained by multiplying the average daily capacity of the treatment facility by 14.</li> </ul> </li> </ul>
Maximum limit of the storage period	<ul style="list-style-type: none"> <li>◁ Final Disposal or Recycling ▷             <ul style="list-style-type: none"> <li>▪ The storage period should not exceed the period prescribed by the Ordinance of the Ministry of the Environment.</li> </ul> </li> <li>◁ Storage period prescribed by the Ordinance ▷             <ul style="list-style-type: none"> <li>- The period considered to be required for the environmentally sound disposal or recycling. 14</li> </ul> </li> </ul>

• **Storage standards for “industrial wastes requiring special management (IWSM)”**

✕ Storage by waste generators and storage of treated wastes by waste treaters

Storage area	<ul style="list-style-type: none"> <li>▪ The area should be fenced.</li> <li>▪ The sign should be displayed that the area is designated as a place of storage for the transshipment of waste, and other necessary matters concerning storage of waste at the prominent position.</li> <li>▪ Measures should be taken to ensure that rats do not inhabit and that mosquitoes, flies and other pest do not hatch.</li> </ul>
Measures for control of scattering, spill, permeation to groundwater, and odor	<ul style="list-style-type: none"> <li>▪ In the case that wastewater is likely to be generated from the storage of waste, drainage and other facilities should be constructed, and the floor should be covered with impermeable materials, to prevent contamination of the public water and groundwater.</li> <li>▪ In the case of storing the waste outdoors without using a container, the height of the waste piled should not exceed the height prescribed by the Ordinance of the Ministry of the Environment.</li> <li>▪ Other necessary measures</li> </ul>
Measures to prevent mixing of wastes	<ul style="list-style-type: none"> <li>▪ Measures necessary to prevent mixing the waste with other matters, such as providing a partition, etc. should be taken for the transshipment area.</li> </ul>
Measures by waste category	<ul style="list-style-type: none"> <li>▪ According to waste category, the measures prescribed by the Ordinance of the Ministry of the Environment should be taken.</li> <li>◁ Necessary measures prescribed by Ordinance ▷             <ul style="list-style-type: none"> <li>— Storage of waste oil (IWSM), wastes contaminated with PCB, or treated PCB wastes in an air-tight containers. Prevention of volatilization and exposure to high temperatures.</li> <li>— Prevention of corrosion for wastes contaminated with PCB or treated PCB wastes.</li> <li>— Prevention of scattering of waste asbestos such as packaging</li> <li>— Prevention of perishable wastes from decomposition such as storage of the wastes in an air-tight containers.</li> </ul> </li> </ul>

# Annex: Outline of Japanese Standardized Leaching Test No. 13

## Sample preparation

Size reduction (if required)

Leaching by shaking with distilled water  
(c.20 degree C, 6H, L/S=10)

Centrifugal separation & filtration (1 $\mu$ m MF)

Test solution

- Burnt residues, sludge and fall dusts: No change
- The other industrial wastes :  
Particle size in diameter
  - ≤ 5 mm: No change
  - > 5 mm: Size reduction to 0.5 - 5 mm by crushing

Alkyl mercury  
Method (1)

Alkyl mercury  
Method (2)

Total mercury  
Method (1)

Total mercury  
Method (2)

Extraction with benzene in the presence of HCl

Decomposition with H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub> & KMnO<sub>4</sub>

Column concentration

Hot bath ( 95 degree C, 2H)

Thin-layer chromatograph separation

Reduction

Extraction with dithizone

GC

CV-AAS or Heating Vaporized AAS

CV-AAS

Heating Vaporized AAS