



Recovery of Mercury from Fluorescent Lamps

Background

Article 11 of the Minamata Convention on Mercury requires each Party to take appropriate measures so that mercury waste is managed in an environmentally sound manner. Mercury contained in waste products such as fluorescent lamps and batteries need to be recovered to the extent possible, in order to prevent contamination of the environment from improper handling of these products. However, mercury is an element, and unlike other organic pollutants cannot be treated easily with conventional treatment measures.



Website of UNEP

Overview of the Technology

This technology involves the recovery of mercury from fluorescent lamps. This involves the separation of the components (glass, fluorescent powder, aluminum, etc.) followed by a process to increase the purity of the mercury. Although this general process is the same across all companies, the exact process may slightly differ according to the process adopted by each company.

The process employed by the largest recycler of fluorescent lamps in Japan is described below. In this plant, fluorescent lamps brought into the facility are pre-treated in a crusher and sorting facility where the glass, cap and fluorescent powder are separated. Aluminum is recovered while the glass is washed and reutilized as a product. The mercury sludge generated from the process of crushing, sorting and washing is passed onto a multiple hearth furnace (Herreshoff furnace), where it is treated at a temperature of 600-800 degrees Celsius and the mercury is vaporized. The mercury vapor then passes through a condenser, where it is cooled and returns to liquid mercury. The collected mercury is refined and reused as 'high purity' mercury.

Used Fluorescent Lamp Recycling System



Source: Website of Nomura Kohsan Co., Ltd. (http://nkcl.jp/wp-content/uploads/2014/07/recycle_flow1.pdf)

Advantages/Strengths

High recovery rate of mercury

The recovery rate of mercury is quite high, meaning that very little mercury contained in the fluorescent lamps is discarded into the environment. Furthermore, the mercury recovered is of high purity, and this is recycled through means allowed by the Minamata Convention.

Recycling of components

In addition to mercury, this process allows for the recovery of other materials like aluminum and glass. The collected aluminum is also recycled whereas the remaining fluorescent powder after mercury extraction is used as a raw material for rare earth elements. Collected glass can be recycled to make raw materials for fluorescent lamps, glass wools, etc. These processes ensure that the fluorescent lamp is treated in an Environmentally Sound Manner as required by the Minamata Convention.



Photo provided by Nomura Kohsan Co., Ltd

Safety

Although the most of the process is automated, the workers carrying out some manual works use gloves and masks to prevent their exposure to any fugitive mercury; hence the process is considered very safe.

Applicability

No restriction on shape or size

The treatment facility can accept fluorescent lamps of any shapes or sizes, including circular lamps, linear lamps, ball shaped lamps, CFLs, CCFLs (some manual work is required to remove the coatings for lamps with anti-shattering coatings)

Proven Track record

This treatment method of fluorescent lamps is currently successfully being practiced in Japan. Furthermore, fluorescent lamps have been brought from other countries into Japan, through the procedures required by the Basel Convention, for the purpose of treatment and recovery of mercury. This arrangement has helped ensure an environmentally sound treatment of fluorescent lamps generated overseas, which otherwise may not have been possible.

The Japanese recycling companies have installed lamp crushers in the partner countries to reduce transportation cost by volume reduction, subsequently supporting to promote the recycling of fluorescent lamps in the partner country.

Japanese lamp crusher installed in the Philippines



Photo provided by Nomura Kohsan Co., Ltd

Further Reading

UNEP, Practical Sourcebook on Mercury Waste Storage and Disposal

(<http://www.unep.org/chemicalsandwaste/global-mercury-partnership/mercury-waste-management/activities-and-projects/practical-sourcebook>)

Published in:
Edited and published by:



October, 2023
Office of Mercury Management
Environmental Health Department
Ministry of the Environment, Japan
1-2-2 Kasumigaseki, Chiyoda-ku Tokyo, 100-8975, Japan
Tel: +81-(0)-3-5521-8260, E-Mail: suigin@env.go.jp
<http://www.env.go.jp/en/chemi/mercury/mcm.html>