

## Removal of Mercury from Flue Gas using Activated Carbon

### Background

Control of emission of mercury and its compounds to the atmosphere from various industrial sources is essential in decreasing the total emission of mercury. Article 8 of the Minamata Convention requires for the control and reduction of mercury and its compounds to the atmosphere through measures to control emission from point sources falling within the source categories listed in Annex D of the convention (Coal-fired Power Plants, Coal-fired Industrial Boilers, Smelting and roasting processes used in the production of non-ferrous metals, Waste Incineration facilities and Cement Clinker production facilities).

For countries that are in a phase of transition to industrialized economy, increase in the number of facilities specified in Annex D of the Minamata Convention can be expected. In order to prevent and alleviate atmospheric pollution from these facilities, application of BAT is deemed to be essential.

### Overview of the Technology

Facilities with combustion processes like incinerators, boilers, cement kilns etc. are typically equipped with a combination of various flue gas treatment devices like denitrification devices, Fabric Filters (FF), Dry or Wet Scrubbers, Flue gas Desulphurization (FGDs) units etc.

Although these devices are effective in reducing the emission of mercury to a certain extent, they are designed for the treatment of NO<sub>x</sub>, SO<sub>x</sub>, PM etc. and not specifically for the removal of mercury from flue gases.

In Japan, after the bitter experience with Minamata disease, an increase in public awareness to mercury has resulted in the development of various products that utilize activated carbon and now it is deemed to be a proven and effective technique for controlling the emission of mercury from flue gas. Due to their high degree of microporosity, activated carbons have a large surface area and hence mercury present in the flue gas is adsorbed into the activated carbon, thus preventing its emission. Activated carbon can either be installed in the form of pellets in an activated carbon tower, or through the injection of activated carbon into the flue gas (activated carbon sorbent injection). In Japan, various types of gas treatment devices that utilize activated carbon are used in incineration plants to control mercury emissions.

#### Granular Activated Carbon

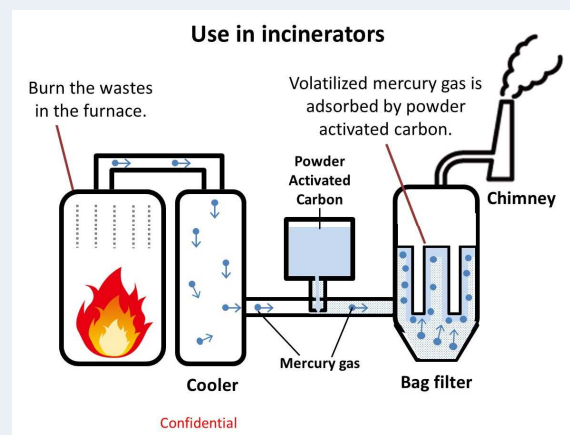
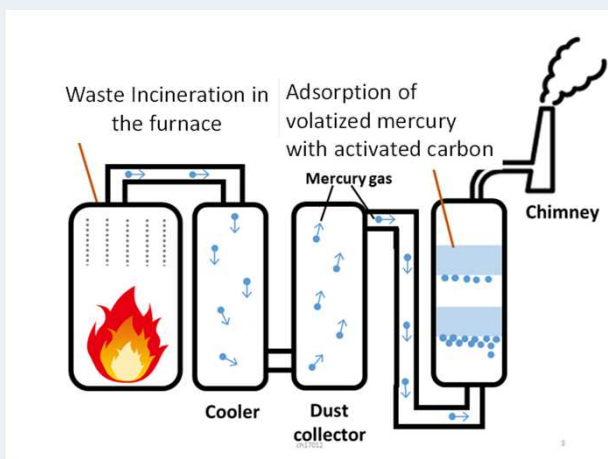
#### Powder Activated Carbon



Photos provided by Ajinomoto Fine-Techno Co., Inc.

#### Mercury removal from a typical incineration plant using Granular activated carbon

#### Mercury removal from a typical incineration plant using Powder activated carbon



# Mercury Technology Bulletin Series:

## Advantages/Strengths

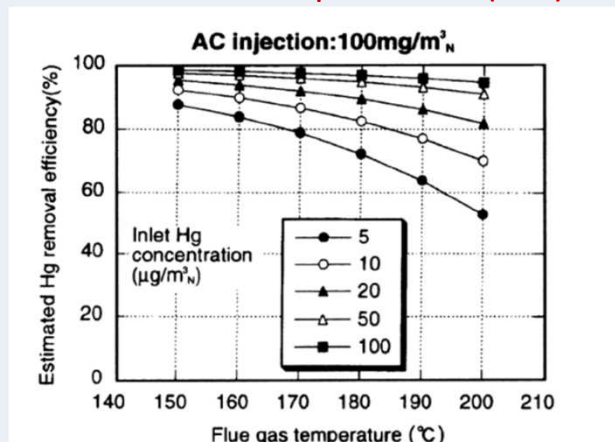
### Effective Removal of Mercury

Activated Carbon is very effective in the removal of mercury and although factors like temperature, inlet mercury concentration impact the performance, the removal efficiency of mercury can reach to over 90%. Using Activated Carbon, in conjunction with other flue gas treatment methods, can further improve mercury removal efficiency.

### Products with Enhanced Performance

Activated Carbon products that provide enhanced performance compared to traditionally used ones have been developed. These products have a comparatively higher adsorption potential (up to 1000 times) ensuring that the flue gas treatment device can be smaller in size. As these products last longer, they do not need to be replaced as often. This helps in reduction of the amount of waste generated, contributing to the reduction of the total operation cost of the flue gas treatment devices. These products also provide improved stability at higher temperature.

### Mercury Removal Efficiency of Activated Carbon Injection in incinerators of municipal solid waste (MSW)



Source : Japan Environmental Facilities Manufacturers Association

### Activated Carbon products with enhanced performance

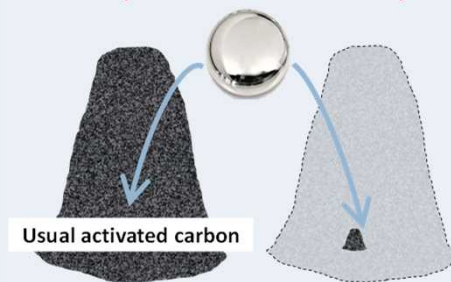


Photo provided by Ajinomoto Fine-Techno Co., Inc.

## Applicability

Mercury control needs to be considered as part of a comprehensive pollution control measure that includes other pollutants. From the viewpoint of mercury removal, activated carbon is considered to be one of the most effective methods for the removal of mercury and is being successfully used in facilities like incinerators to control emission of mercury from flue gas.

Activated Carbon products come in various forms like granular (crushed type/pellet type), powders which have been engineered into various forms like towers or sorbent powders. Depending upon the requirement, the appropriate product can be chosen and applied.

## Further Reading

MOEJ, Technologies for the treatment of flue gas from incinerators (Japanese only)  
([https://www.env.go.jp/council/07air-noise/y079-03/mat02\\_7.pdf](https://www.env.go.jp/council/07air-noise/y079-03/mat02_7.pdf))

Published in:  
Edited and published by:



June, 2018  
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