

Reduction of Atmospheric Mercury Emission through Improvement of Efficiency of Coal Combustion

Background

In some cold countries, combustion of coal for heating purpose is a common practice. This results not only in the emission of CO₂ from households and buildings that contributes to global warming, but also increase in the emission of other pollutants, including mercury contained in coals, causing an aggravation of atmospheric pollution during cold months.

Although this particular source of mercury emission is not listed in Annex D of the Minamata Convention and therefore is out of the scope of Article 8, it is nevertheless an important issue that has been identified as a priority by some countries and requires action to alleviate air pollution and hence protect human health and the environment. This document introduces a technology, as exemplified with a project in Mongolia, that can be utilized for the reduction of atmospheric emissions of conventional air pollutants through improvement of efficiency of coal combustion.

Air pollution in Ulaanbaatar



Summer



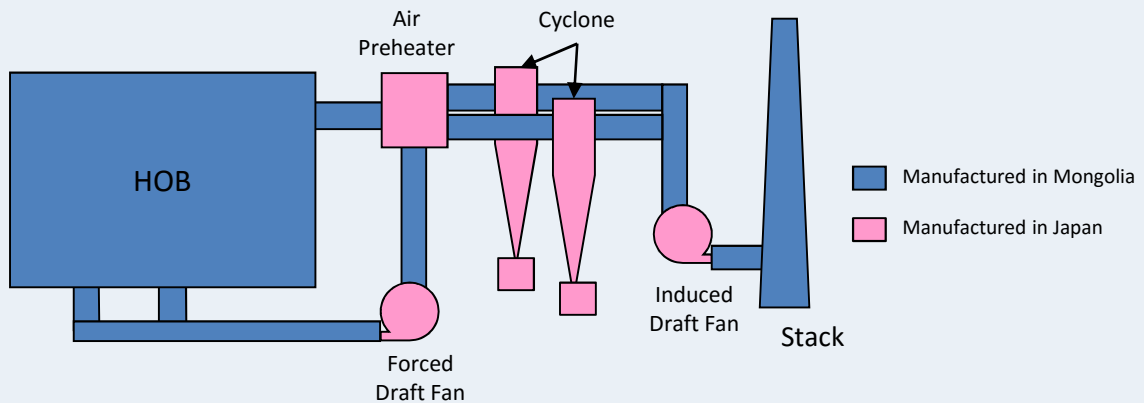
Winter

Overview of the Technology

In some countries with cold climate, a large amount of coal is used for the purpose of heating during winter time. In addition, in urban areas many apartment complexes and school buildings use HOBs (Heat Only Boilers) for heating purpose as well. These HOBs tend to be old and rudimentary with an inferior combustion efficiency which can lead to serious problems of atmospheric pollution resulting in restriction of visibility even during day time.

In addition to the mass consumption of coal, inefficiency of coal combustion by existing HOBs also contributes to the deterioration of air quality.

Overview of the Upgrade of HOB



Source: Overseas Environmental Cooperation Center, Japan

Existing Heat-Only-Boilers (HOBs) can be upgraded to obtain a stable combustion, to reduce coal consumption and emission of air pollutants, to improve thermal efficiency and to reduce HOB dust. The improvement includes the upgrading of Cyclone (improvement of flow dust collection), upgrading of Air Preheater (replacement of heat exchange tube) and improvement of Forced Draft Fan and Induced Draft Fan (air flow adjustment, using corrosion protection material). The upgrading of HOBs in Mongolia has resulted in the reduction of coal consumption amount with the co-benefit of reduction in the emission of NO_x, SO_x, CO₂ and dust.

Mercury Technology Bulletin Series:

Advantages/Strengths

Co-benefit of reduction of pollutants

A major advantage is that the prevention of emission of a variety of air pollutants can be achieved along with decrease in the emission of CO₂, while simultaneously benefiting from the increase in the amount of power generated due to efficiency improvement. In this example, the following reductions were achieved :

Coal consumption: Reduction of 10-30 % CO (Carbon monoxide) Exhaust: Reduction of 30-60 %

NO_x , SO_x Exhaust: Reduction of 8-20 % Dust Exhaust: Reduction of 50-80 %

Reduction of coal consumption and dust exhaust also leads to the reduction of emission of heavy metals (Hg, Se, etc.).

Co-benefit of improvement to operation and maintenance

Improvement of boiler also results in the improvement of the safety of the workers through improvement in the work procedures, improvement of indoor air quality in the boiler room (through reduction of soot, fire overflow) and improvement in safety.

Before modifications



After modifications



Applicability

Over 1,000 HOBs are in operation in Mongolia. The improvement of coal combustion efficiency using Japanese boiler technology contributes to co-benefit of pollution control, reduction of mercury emission and decrease of coal consumption. This technology can also be applied to other partner countries.

Depending on the requirement and availability of funding sources, the improvements can be carried out incrementally in multiple stages. Further, Japanese technology can be utilized for manufacturing of required components locally, hence making it possible to keep the cost down.

Further Reading

MOEJ, JCM Project in Mongolia (Japanese only)

(<https://www.env.go.jp/press/102859.html>)

IGES, Workshop on JCM

(https://www.iges.or.jp/en/climate-energy/mm/20151110_1.html)

Carbon market express, Project Details

(https://www.carbon-markets.go.jp/eng/en_column/en_energy_efficiency/1780/)

Published in:

Edited and published by:



June, 2018

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>