Mercury Technology Bulletin Series: 007

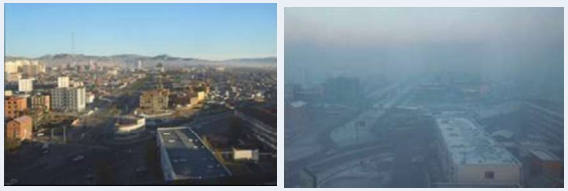
Reduction of Atmospheric Mercury Emission through Improvement of Efficiency of Coal Combustion

Background

In some cold countries, combustion of coal for heating purpose is a common practice. This results not only in the emission of CO_2 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 air pollutants through improvement of efficiency of coal combustion.

Air pollution in Ulaanbaatar



Summer

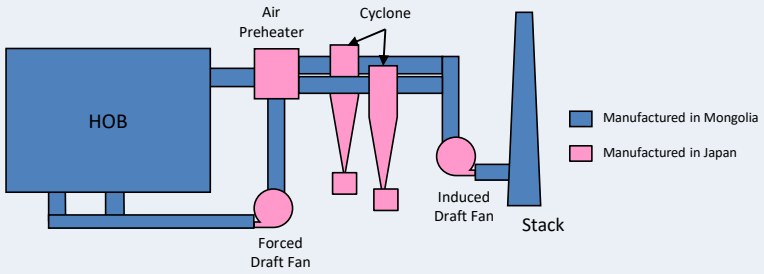
Winter

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 and use a large amount of coal, which can lead to serious problems of atmospheric pollution including cases where visibility can be restricted even during day time.

Inefficiency of coal combustion is not only contributing to mass consumption of coal, by but also 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 performance), upgrading of Air Preheater (adoption 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 effect of reduction in the emission of NOx, SOx, CO_2 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 CO_2, 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 %
NOx , SOx 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, instead of solely depending on Japanese products, 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: March, 2021
Edited and published by: 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

環境省 Ministry of the Environment