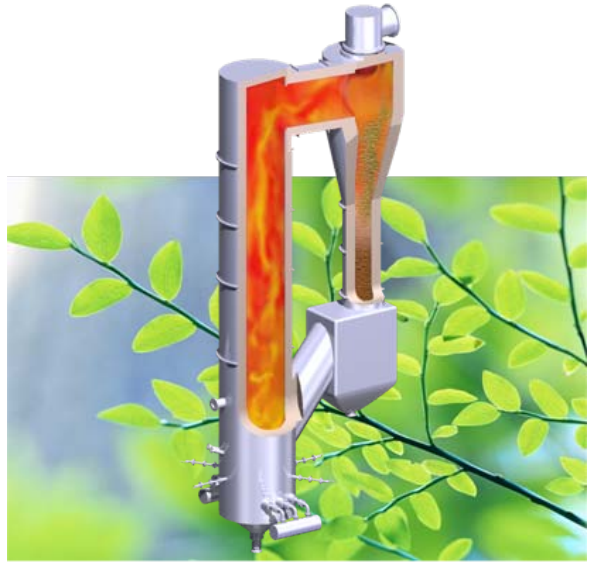
MITSUBISHI Circulating Fluidized Bed Sewage Sludge Incineration System



MITSUBISHI HEAVY INDUSTRIES
ENVIRONMENTAL & CHEMICAL ENGINEERING CO., LTD.

MITSUBISHI Circulating Fluidized Bed Sewage Sludge Incinerator

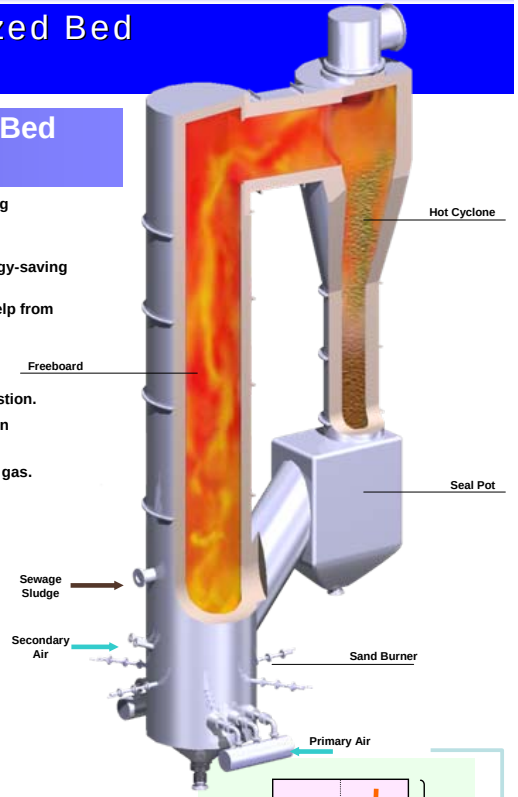
Application of the Circulating Fluidized Bed (CFB) Sewage Sludge Incinerator

The conventional system used for sewage sludge Incineration in the Bubbling Fluidized Bed (BFB) Sewage Sludge Incinerator.
MITSUBISHI developed the Circulating Fluidized Bed (CFB) Sewage Sludge Incinerator in consideration of the recent environmental targets such as energy-saving and the mitigation of global warming.
The new incinerator contributes to global environmental conservation with help from the following technical features.

1) Reduction of the N_2O gas, Major Greenhouse Effect Gas from Sewage Sludge Incinerator.
2) Reduce the electricity consumption of the plant using two-stages combustion.

The CFB Sewage Sludge Incinerator design is a reflection of MHI's vast design experience with CFB Coal Firing Boiler.

※ The greenhouse effect gas of N_2O gas is 310 times more potent that of CO_2 gas.



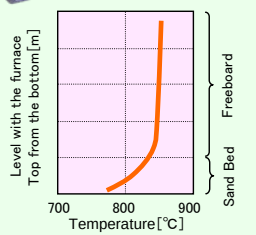
System Structure

The sand at the bottom part of the furnace is fluidized by primary air and blown up into the freeboard by the secondary air.
The gas in the freeboard flows at a speed of about 4～6m/s. The fluidized sand therefore reaches the top of the furnace together with the flue gas, where it is collected by Hot Cyclone.
Once collected, the sand is transterred to original sand bed.
Sewage Sludge is incinerated efficiently within the Circulation of the High Temperature Sand in the furnace.

Technical Features

1. High-Temperature Stable Combustion

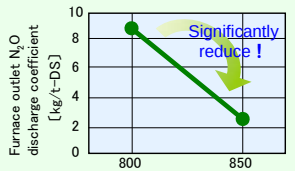
- To further reduce the green house effect gas in the flue gas of the Conventional BFB Sewage Sludge Incinerator, the combustion gas temperature in the furnace of the CFB is maintained at a high temperature. Under this condition, CFB furnace temperature exerts an effect equivalent to that of the heated circulating sand.
- The N_2O gas from CFB is redacted for the above reasons.



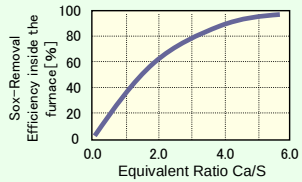
Furnace temperature distribution

2. Furnace Inside Sox Removal System

- Obtaining the high SOx removal efficiency due to the Stirring effect between the sulfurizing chemical and flue gas in the furnace.
- Not necessary for the conventional wet type gas absorber.
- Huge reduction in operation cost through the use of limestone as the desulfurizing chemical (compared with the wet type gas absorber by using sodium hydroxide.
- Reduction of N_2O gas from CFB due to the supply of the desulfurizing chemical.



Relationship between furnace free board gas temperature and N_2O discharge coefficient

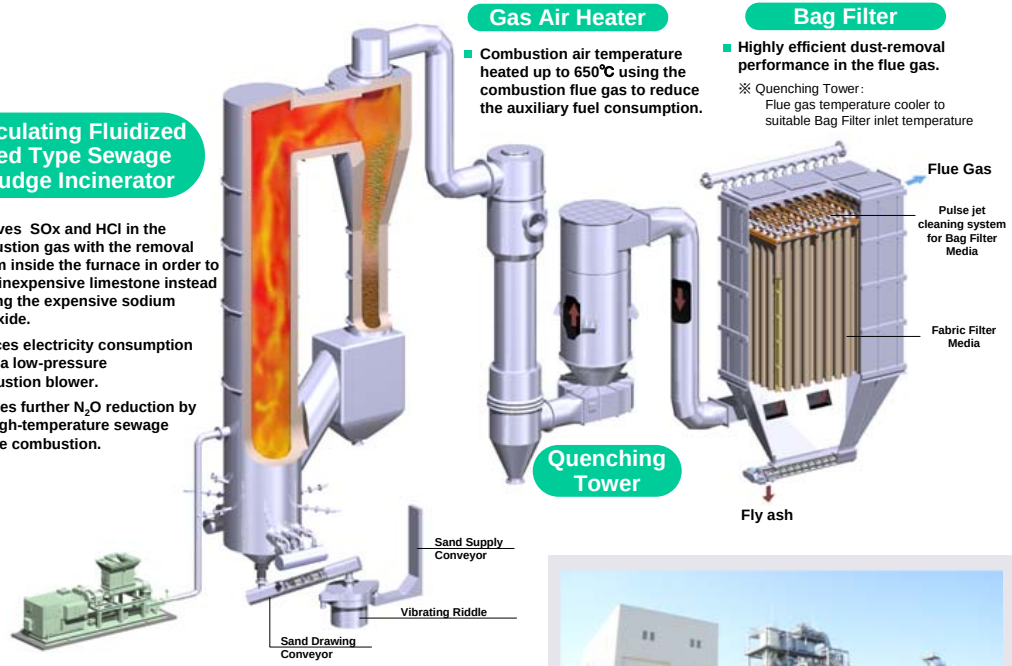


Relationship between limestone equivalent ratio and furnace inside SOx removal efficiency

3. Reduced Operation Cost

- The operation cost can be reduced by reducing the electrical consumption of the primary air blower, chemical supply cost, and auxiliary fuel consumption.

System Flow



Circulating Fluidized Bed Type Sewage Sludge Incinerator

- Removes SOx and HCl in the combustion gas with the removal system inside the furnace in order to apply inexpensive limestone instead of using the expensive sodium hydroxide.
- Reduces electricity consumption using a low-pressure combustion blower.
- Enables further N_2O reduction by the high-temperature sewage sludge combustion.

Gas Air Heater

- Combustion air temperature heated up to 650℃ using the combustion flue gas to reduce the auxiliary fuel consumption.

Bag Filter

- Highly efficient dust-removal performance in the flue gas.

※ Quenching Tower:
Flue gas temperature cooler to suitable Bag Filter inlet temperature

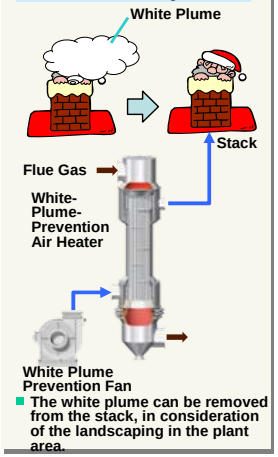
Sludge Feed Pump

- Maintains a clean condition at the sewage sludge cake transfer area using the piping. Prevents scattering of the stench and sewage sludge cake.
- Easy Daily Maintenance Works thanks to the concentration of pump maintenance points.

The largest plant in Japan: 200t/d

Optional Equipment

White-Plume-Prevention System



- The white plume can be removed from the stack, in consideration of the landscaping in the plant area.

Flue Gas Treatment System

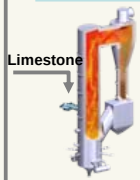
Dust-removal system

① Bag Filter

② Ceramic Filter

Acid gas removal system

① Furnace Inside SOx Removal System

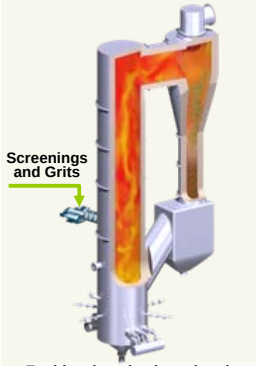


- Sox and HCl Removal inside the furnace is performed by the limestone supply.

② Wet-Type Gas Absorber

- Removal of SOx & HCl using sodium hydroxide.

Mix Combustion of Screenings and Grits



- Enables the mixed combustion of screening and grit through the easy extraction of un-combustible materials.

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Head office

15F YOKOHAMA BLUEAVENUE BLDG.,
4-2 MINATOMIRAI 4-CHOME, NISHI-KU, YOKOHAMA 220-0012, Japan
TEL:+81-45-227-1273 FAX:+81-45-227-1383

Our internet website : http://www.mhiec.co.jp/
＊ Feel free to contact us.