6-3 Mitigation of Greenhouse Gas Emission from Sludge Incinerators - Innovative Approach by Multilayer Incineration – (Abstract)

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1 Introduction
An annual amount of greenhouse gases exhausted by sewerage facilities in the 23 special wards area of Tokyo Metropolis is about 710,000t, and the emission through the sludge incineration process accounts for 29.7% of it.

As measures to reduce greenhouse gas emission from sludge incinerators, High-Temperature incineration at 850°C, by which about 70%-N₂O can be reduced compared with the incineration at 800°C, has been introduced. However, High-Temperature incineration causes the increase in the fuel use as shown in Figure 1.

Therefore, we researched multilayer incineration to solve this problem.

2 Principle of Multilayer Incineration
Figure 2 shows the fluidized bed incinerator in use. Air blows into the incinerator from sandbox where sludge is incinerated.

Figure 3 shows the outline of the multilayer incinerator, which air blows into from several points.
The generation of N\textsubscript{2}O is suppressed by reducing the amount of air into sandbox. In addition, N\textsubscript{2}O generated through sandbox is decomposed by high temperature at freeboard. Thus, N\textsubscript{2}O emission can be reduced synergistically.

![Figure 2. Fluidized Bed Incinerator](image1)

![Figure 3. Outline of the Multilayer Incinerator](image2)

3 Effect of Multilayer Incineration

Table 1 shows the result of multilayer incineration in Nanbu Sludge Plant. The amount of fuel of the multilayer incineration was regulated to the same value as that of High-Temperature incineration. The value of incineration at 800°C and 850°C was obtained by our past investigation. And, we tried to decrease both the amount of fuel and N\textsubscript{2}O emission compared with High-Temperature incineration. As a result, we decreased about 12%-fuel and 27%-N\textsubscript{2}O compared with the High-Temperature incineration at the same time.

<table>
<thead>
<tr>
<th></th>
<th>Amount of incineration (t/day)</th>
<th>Hydrous ratio of sludge (%)</th>
<th>Air Ratio(*1)</th>
<th>N\textsubscript{2}O Emission kg-N\textsubscript{2}O/t – Dewatered Sludge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incineration at 800°C</td>
<td>300</td>
<td>77.5</td>
<td>1.36</td>
<td>Primary Air</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>Secondary Air</td>
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<td>Tertiary Air</td>
<td>Tertiary Air</td>
</tr>
<tr>
<td>Incineration at 850°C</td>
<td>300</td>
<td>77.5</td>
<td>1.36</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.07</td>
<td>1.36</td>
</tr>
<tr>
<td>Multilayer Incineration</td>
<td>1.26</td>
<td>0.03</td>
<td>0.07</td>
<td>1.36</td>
</tr>
</tbody>
</table>

*1 practical amount of air blown into the incinerator/ theoretically required amount of air

4 Conclusion

The multilayer incineration can decrease both the amount of fuel and N\textsubscript{2}O emission compared with the High-Temperature incineration. In this research, about 83%-N\textsubscript{2}O reduction compared with the incineration at 800°C and about 12%-fuel reduction compared with that at 850°C were obtained by the multilayer incineration.