Title: A METHOD FOR TREATING BOTTOM ASH

Abstract: The invention relates to a method for treating bottom ash from a waste incineration plant. The invention relates in particular to a method for treating bottom ash from a domestic waste incineration plant. In accordance with the invention bottom ash having a size ranging up to 2 mm is treated by removing a previously determined component. The treatment comprises at least one of the following steps: the removal of organic components, the removal of heavy metals, the removal of ions and the removal of a fraction having a size of up to 50 μm. It is preferred for the nonferrous heavy metals to be removed and the ferrous metals to remain in the fraction. Most preferably at least one of the treatment steps comprises a wet treatment.
A method for treating bottom ash

The present invention relates to a method for treating bottom ash from a waste incineration plant, in accordance with the preamble of claim 1.

The treatment of bottom ash from a waste incineration plant is known in the art. The object of this treatment is to separate the various components of which the bottom ash is comprised. A technique for treating bottom ash is, for example, described in the BAT publications (Best Available Technology, a publication of the European Union specified as Pj/EIPPCB/WI, of March 2004). It is reported that both ferrous and nonferrous metals can be separated from the bottom ash.

It is claimed in said BAT publication that the fine fraction having a size of 0-2 mm cannot be treated but has to be removed. The reason for this being that most of the leachable components are contained in this fine fraction. As a result, the remaining product fraction, having a size larger than 2 mm, leaches out less readily with respect to the total bottom ash stream. The further treatment of this remaining product fraction results in making the treated material suitable for use in a wide area.

The object of the present invention is to provide an improved method for the treatment of bottom ash.

A particular object of the invention is an improved method for the treatment of bottom ash wherein a larger part of the bottom ash produced in a waste incineration plant is treated.

An object of the invention is especially to provide an improved method of the kind mentioned above, wherein the fraction of up to 2 mm can also be treated suitably.
A further object of the invention is to provide the possibility of reusing a larger part of the bottom ash.

A final object of the invention is to reduce the total amount of bottom ash that has to be removed.

In order to obtain at least one of the above-mentioned objectives, the invention provides a method as mentioned above, which is characterised by the measures of claim 1.

The treatment may comprise at least one of the following steps:
- removal of nonferrous heavy metals,
- removal of organic components, and
- removal of particles having a size of 0 to 50 \( \mu \text{m} \), preferably of 0 to 45 \( \mu \text{m} \).

By carrying out at least one of the above-mentioned treatment steps an improved product is provided that is suitable for reuse.

It is surprising that the treatment of the fraction having a size of up to 2 mm provides such a good, reusable product. The above-mentioned BAT-publications give a representation of the most highly developed methods existing in a particular area of technology. To this end the art is studied extensively in order to provide an overview of the methods that, from a technical as well as economical viewpoint, are developed the furthest.

The fraction having a size of up to 2 mm constitutes approximately 47% by weight of the total amount of bottom ash produced in a waste incineration plant. For this reason a method is preferred that is characterised in that it comprises the step of separating from the bottom ash stream a fraction having a size in the range up to 2 mm, and subsequently treating the separated bottom ash fraction in accordance with claim 1.

According to the prior art, almost half the amount of bottom ash is removed as waste, whereas this can be suitably treated by means of the present method.
According to a further preferred embodiment, the invention is characterised in that at least one of the treatment steps comprises a wet treatment. The advantage with this is that at least some of the leachable components are removed from the fraction to be treated. The wet treatment step may, for example, and preferably, be carried out with the aid of water.

It is further preferred that, after removal of the heavy metals from the fraction, at least a part of the amount of removed ferrous metals be returned to the fraction. Surprisingly, this greatly reduces the leaching out of, in particular, antimony from the fraction. If the fine iron (the ferrous fraction) is removed from the bottom ash to be treated, the leaching of antimony increases by a factor of 3.

According to a further preferred embodiment therefore, the method according to the invention comprises the step of removing only the nonferrous heavy metals and not the ferrous metals.

It has been shown that in particular a combination of the above-mentioned steps that cause the removal of organic materials, nonferrous heavy metals and ions, in combination with the removal of the fraction having a size of 0 to 50 µm and preferably of 0 to 45 µm, results in a product that is usable as a category 1 building material.

The invention therefore comprises preferably a combination of the following steps:
- the removal of nonferrous heavy metals,
- the removal of organic components,
- the removal of ions and
- the removal of the fraction having a size from 0-50 µm, preferably from 0 to 45 µm.

The result is a product that complies with the standard for category 1 building materials of the Dutch Building Material Decree (Staatsblad 1995, 567).

The ions that can be removed comprise in particular chlorides. However, it is preferred that other anions
such as sulphates etc. as well as cations be removed to the greatest possible extent from the bottom ash to be treated.

It is especially preferred for the ferrous metals to be removed when the treated bottom ash fraction is used in a bound form, for example, in combination with cement etc. This is in particular preferable if the treated fraction is used in concrete and calcium silicate brick. The overall quality of the product was shown to improve so that it complied with the standard for a category 1 building material. The imission of substances from this material into the ground is lower than, or equal to, the imission requirements laid down in the Building Material Decree. The reason for this is not known.

The treatment of the bottom ash with a fraction having a size of up to 2 mm occurs preferably in a jig, in particular in a sand jig. Such a device is described in the Dutch patent application NL 1 029 022.

The invention will now be further elucidated by way of an example.

**EXAMPLE**

The chemical composition of a bottom ash fraction having a size of up to 2 mm was as follows:

**Table 1:**

<table>
<thead>
<tr>
<th>element</th>
<th>[mg/kg dm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl</td>
<td>394 000</td>
</tr>
<tr>
<td>SO₄</td>
<td>367 000</td>
</tr>
<tr>
<td>Sb</td>
<td>37</td>
</tr>
<tr>
<td>Cu</td>
<td>1 700</td>
</tr>
<tr>
<td>Mo</td>
<td>240</td>
</tr>
</tbody>
</table>

This bottom ash was fed to a jig after the fraction having a size of up to 50 μm was removed therefrom.
During the treatment the organic components, heavy metals and ions were removed. This resulted in a product with the following imission values:

**Table 2:**  
Imission values (according to NEN (Dutch standard) 7343 column test, [mg/m²], 0.2 m height of application) of bottom ash feed, treated product and maximum value for category 1 material according to Building Material Decree

<table>
<thead>
<tr>
<th></th>
<th>Bottom ash feed [mg/m²]</th>
<th>Product obtained [mg/m²]</th>
<th>Category 1 (maximum value allowed) [mg/m²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl</td>
<td>394 000</td>
<td>14 400</td>
<td>87 000</td>
</tr>
<tr>
<td>SO₄</td>
<td>367 000</td>
<td>110 000</td>
<td>300 000</td>
</tr>
<tr>
<td>Sb</td>
<td>37</td>
<td>98</td>
<td>117</td>
</tr>
<tr>
<td>Cu</td>
<td>1700</td>
<td>352</td>
<td>540</td>
</tr>
<tr>
<td>Mo</td>
<td>240</td>
<td>77</td>
<td>450</td>
</tr>
</tbody>
</table>

Note: "category 1" is the maximum emission values of category 1 material according to the Building Material Decree.

Thus a product was obtained that complied with the requirements of a category 1 building material. This means that this material may be used without problem as building material, for example, as substitute for sand in cement and/or concrete.

The invention therefore provides a method that is able to turn a hitherto untreatable and unusable fraction of bottom ash produced in a waste incineration plant into a valuable product. In the above example merely 10% of the treated bottom ash was removed as waste. According to the invention therefore, the total amount of bottom ash fraction to be removed as waste is reduced from 47% to only 10%.

The invention is not limited to the steps mentioned above and described in the example. The invention is limited only by the appended claims. A person skilled in the art is quite capable of adapting and altering the above given example so as to create equivalent embodi-
ments. However, these are all encompassed in the present invention and therefore fall within the protective scope of the appended claims.
CLAIMS

1. A method for treating bottom ash from a waste incineration plant, characterised in that the same comprises the step of treating a bottom ash fraction having a size ranging up to 2 mm, by removing heavy metals whose specific weight is greater than or equal to that of Zn.

2. A method according to claim 1, characterised in that the same comprises the removal of nonferrous heavy metals whose specific weight is greater than or equal to that of Zn.

3. A method according to at least one of the claims 1 and 2, characterised in that the same comprises the removal of organic components.

4. A method according to at least one of the claims 1 to 3, characterised in that the same comprises the step of separating from the bottom ash a fraction having a size in the range up to 2 mm, and subsequently treating the separated bottom ash fraction in accordance with claim 1.

5. A method according to at least one of the claims 1 to 4, characterised in that the same comprises the step of the removal from the bottom ash fraction of a subfraction having a size of up to 50 μm, preferably up to 45 μm.

6. A method according to at least one of the claims 1 to 5, characterised in that at least one of the treatment steps comprises a wet treatment, preferably the step of removing organic material.

7. A method according to claim 1, characterised in that after removal of the heavy metals from the fraction, at least a part of the amount of removed ferrous metals is returned to the fraction.