

## Ash Recycling: Just a Dream ?

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### Introduction

Waste to energy is only one way of handling waste, material recovery is another aspect of sustainable waste management. This is actually nothing new and has always been part of the operation of WTE (Waste to Energy) plants in Hamburg. In descriptions of the first waste incineration plant in Hamburg, which started operation in 1896, it was stated that “the fly ash” collected in the ash chambers was used as filler material for the insulation of ceiling cavities. Its use in the sandwich walls of money safes was expressly recommended by the members of the urban refuse collection authority. Another lucrative trade was the sorting of scrap iron. It was separated from the incineration slag with magnets. The slag itself was said to be as sterile as lava, as hard as glass, as useful as bricks, and it was a profitable side product of waste incineration. The crushed incinerator slag was evidently so much in demand in road construction and as an aggregate in concrete production that demand could often not be met in the building season, even though it was stored through the winter, [1,2,3].

Because the composition of waste has changed since and because methods for analysing the ingredients of fly ash have been improved, we no longer use fly ash from waste incineration in any way expressly recommended in the past. In fact fly ash from waste incinerators today is considered hazardous waste and has to be disposed of in a safe manner (e.g. underground landfill) according to German law.

The description of the values and properties of slag may have changed somewhat in recent years, but it is still considered a valuable material for constructional purposes that is too good to waste in landfills [4].

In the following only the term “bottom ash” will be used for the residues of waste incineration

which are otherwise also termed as “slag” or simply “ash”.

### Mass flows in the MVR-plant

The waste incineration plant at Rugenberger Damm in Hamburg (MVR) consists of 2 units which can be operated independently to meet the demand for uninterrupted steam delivery to a refinery [5]. Among other goals it was designed to produce reusable materials from the residues of waste incineration and the flue gas cleaning process.

Looking at the mass flows in MVR (Fig. 1), it becomes evident that the largest mass flow besides flue gas and steam (heat, power) is bottom ash, with about a quarter of the waste input by weight. Hence it is worth while taking a closer look at this material if it is desired to obtain a marketable product made from crude bottom ash.

### How to produce reusable bottom ash

Quality control starts right at the bunker. Good mixing and homogenising of the waste ensures good combustion and thus low carbon contents in the bottom ash at the end of the incineration process. According to German regulations [6,7], boiler and filter fly ash have to be kept separate from bottom ash if bottom ash is to be recycled, because they are usually contaminated with heavy metals and organic material like dioxins and furans. Grate riddlings should preferably be returned to the bunker to improve the quality of the bottom ash (Fig. 2). Even though it is hardly possible to analyse the effect of this measure, its positive influence is logical, since there is no mixing of insufficiently thermally treated material with bottom ash. Good fire control on the grate with high temperatures ensures complete combustion, maximum evaporation of volatile heavy metals and sintering of the bottom ash. Especially the