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Characterization of Bottom Ash from Czech Waste-to-Energy plants

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Bottom ash presents the majority of all solid residues from waste-to-energy (WtE) plants and contains significant amount of valuable components that can be recycled such as ferrous scrap, non-ferrous metals, or glass. Metals and glass recovery followed by the reuse of residual fraction as a construction material can be an appropriate option for bottom ash treatment. Important benefits of bottom ash recycling for the plant operator are also the reduced costs for landfilling and revenues from obtained metals. In the Czech Republic, most of the bottom ash is landfilled, which is not in accordance with contemporary trends and its material reutilization should be preferred.

Bottom ash usually contains around 5–13% of ferrous scrap, 2–5% of non-ferrous metals, 15–30% of glass and ceramics, 1–5% of unburned organics, and 50–70% of mineral fraction.^{1, 2, 3, 4} Several incineration plants in Europe are equipped with systems for metal recovery, mostly based on magnetic separation of ferrous scrap and non-ferrous metals separation by eddy-current separator. Separation of glass is a rather unique technology and is based on optical sorting systems.

Our study summarizes the composition of bottom ash from two WtE plants in the Czech Republic. Bottom ash with particle size over 2 mm was characterized by combination of manual and mechanical analyses (e.g. magnetic separation, sieving, grinding, etc.). Bottom ash with particle size under 2 mm was analysed using scanning electron microscopy, to find its composition and to determine the form of comprised metals.

The composition of dry bottom ash from Czech WtE plants ranged as follows: 10–24% of glass, 1.8–5.2% of ceramics and porcelain, 0.3–1.0% of unburnt organic matter, 12–17% of magnetic fraction, 1.1–4.5% of Fe scrap, 1.3–2.4% of NFe metals. Residual fraction formed by ash and minerals together with fraction of particles under 2 mm varied between 54–67%. Various content of recoverable materials were found in bottom ash samples from different WtE plants. Therefore, we performed an analysis of incinerated waste with respect to the plant waste

collection area (urban vs. rural or mixed), type of incinerated waste (commercial or municipal), intensity of separate collection, etc. Based on the results, we found that type of incinerated waste had crucial impact on the bottom ash composition. Especially the amount of incinerated commercial waste which usually does not contain any recoverable materials. The determination of waste and thus bottom ash composition can be decisive in the period of considering instalments of technology for metals or glass recovery.

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