Metal recovery from MSWIBA: Danish state-of-the-art

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ABSTRACT

Municipal Solid Waste Incineration (MSWI) has a central role in the waste management system in Denmark resulting in approximately 650000t of bottom ash (BA) each year. However, the targets imposed by the Danish Waste Strategy and the increasing discussions about resource in waste raise an issue on resource losses through waste incineration, especially metals. In this framework, this study provides actual data on the state of the art of the recovery of non-ferrous (NFe) metals in MSWIBA in Denmark and wants to introduce the need for further investigations on the potential for further recovery and on the environmental benefits or burdens that can be assessed through the Life Cycle Assessment (LCA) methodology.

MATERIAL AND METHODS

The study is based on a BA treatment system located in the Copenhagen Area and treating the BA produced at 6 incinerators in Denmark. Data were collected through personal comunications with AFATEK (manager of the system) and through direct measurments and analyses of samples.

- ✓ Measurements of the mass flow in the system
- ✓ Collection of samples of the input and output flows to the NFe recovery section
- ✓ Analyses of the samples: Swiss method for the analysis of the content of metal scraps; moisture content measurments; grain size distribution analysis
- ✓ Mass Flow Analysis (MFA) and Substance Flow Analysis (SFA) using the software STAN

THE BA TREATMENT SYSTEM

- ✓ Ferrous (Fe) metals recovery section: 50mm sieve; 2 magnets
- ✓ NFe metals recovery system treating the fraction below 50mm: 2mm, 8mm and 16mm sieves; three Eddy Current Separators (ECS) treating the three fractions above 2mm; one Inductive Sorting System (ISS) for the fraction between 16 and 50mm
- ✓ Fe metals upgrading system: cleaning trommel; two magnets in series
- ✓ NFe metals upgrading system: series of screens, ECS and ISS followed by density separator for the segregation of the heavy NFe fraction
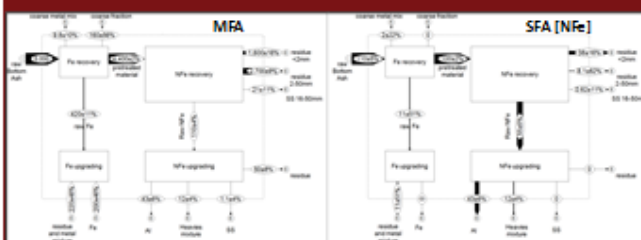
RESULTS

Figure 1: MFA and SFA of the BA treatment system. Flows in the MFA are expressed in t/batch, where the batch is the treatment unit that is equivalent to 5000t of BA. The SFA flows are reported in tNFe/t.

- ✓ Current total efficiency for NFe metals: 62%

- ✓ Efficiency on the treated BA fraction (2-50mm) including the NFe recovery system and the NFe upgrading system: approximately 89%

- ✓ Major losses in the non-treated fine fraction (<2mm): 35% of the total content of NFe metals in the raw BA

DISCUSSION and FUTURE WORKS

The future developments of the treatment system will focus on the recovery of NFe in the fine fraction where the major losses are identified. However several aspects have to be taken into acount :

- ✓ Quality of the NFe metals below 2mm → oxidation level
- ✓ Need for increasing investments in terms of energy and resource increasing the complexity of the recovery system

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Implementation of the BA treatment system in a LCA perspective including:

- ✓ Systems of increasing complexity
- ✓ Burdens and benefits related to the resulting mineral fraction
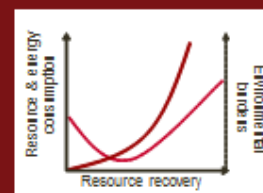

Figure 2: qualitative representation of the increase in resource and energy consumption and so of the burdens to the environment in trying to recover additional metals and resource from BA

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