

Resource mining: obtaining high-grade metals from bottom ash

*Dedusting plant
outside for
supersortmetal.*



Since the summer of 2013, DHZ has been running an innovative municipal solid waste incineration bottom ash recycling plant in Switzerland, to which supersort^{metal} is the latest addition. The new plant processes and purifies non-ferrous metal concentrates and other metal-containing waste streams.

DHZ, a subsidiary of the Eberhard group, was created in December 2009 in order to provide an environmentally best available landfill facility in the environs of Zurich in Switzerland. In 2012 the innovative and trademarked municipal solid waste incineration (MSWI) bottom ash recycling service known as supersort^{technology} was built. Its mission is the implementation of a 'resource mining' strategy that enables an essential increase in the recovery of recyclable materials. The first of its kind, the trademarked supersort and supersort^{fine} bottom ash treatment plant has already received high recognition in Switzerland as a best available technique

(BAT). It is able to recover valuable metals out of MSWI bottom ash where conventional recycling plants do not succeed. The unique technology achieves a recycling down to a size of 0.5 mm. The success of DHZ is based on an ambitious engineering programme and a combination of inhouse research and experience in different recycling technologies.

Maximising metals separation

Bottom ash is the largest residue fraction after the incineration of household waste, containing on average 1-3% of non-ferrous and 5-15% of ferrous metals. supersort is a dry mechanical recycling plant and reaches

with up-to-date technologies a high recovery of valuable products such as ferrous and non-ferrous metals, stainless steel and Cu-Fe 'meatballs' from MSWI bottom ash. The mineral fraction with a low metal content is landfilled in compliance with Swiss regulations and it is not usable for road construction or other applications as it is in other countries. The recycling plant processes over 100 000 tonnes of bottom ash per year. A major advantage for the legal disposal of the mineral residue fraction and especially for logistics is the plant's convenient location next to the Häuli landfill in Lufingen.

Unconventional approach

Installation of supersort^{fine} was another important step in the overall concept of the supersort^{technology} and enables an increased recovery of non-ferrous metals below a grain size of 3 mm. The potential of recoverable non-ferrous metals in this fraction ranges between 2% and 4% and it is typically higher than in the coarser fractions. In addition the content of valuable heavy non-ferrous metals like copper or precious metals, i.e. silver and gold is also higher.

The supersort^{fine} processing steps have been developed inhouse. The technology enables the recovery of metals out of the fine fraction that usually is directly landfilled. Given that the sieves in standard screening machines tend to clog with damp material, supersort^{fine} uses a different technique. At the same speed, larger particles fly further

An example of a high-grade heavy non-ferrous fraction produced by supersort^{metal}.



than smaller particles while particles with a higher density fly further than lightweight particles. Using these effects, the supersort-*fine* acceleration machine achieves a coarse fraction with a higher percentage of heavy metals than in the primary bottom ash. The coarse fraction runs through an Eddy Current separator and ends up as a high-grade, highly valuable metal concentrate. Together with a Swiss equipment manufacturer, DHZ recently embarked on the commercialisation of its supersort-*fine* machine.

The next generation is launched

With the goal of enhanced metal recycling, DHZ commissioned the supersort-*metal* plant in September 2016. The new plant purifies non-ferrous metal concentrates from supersort, supersort-*fine* and other MSWI bottom ash treatment plants to create high-grade metal fractions. Using different dry mechanical separation processes and state-of-the-art



The products of supersort-*metal* are filled in big bags.



View over the new supersort-*metal* plant.

technology, it separates the concentrates into light non-ferrous metals and heavy non-ferrous metals. The unique plant closes the gap between smelters and conventional bottom ash treatment installations, yielding pure metal fractions which can be processed directly by smelters.

The processing takes place on two independent lines: Line I processes particles from 8 to 100 mm and Line II handles the fine fraction and recovers metals down to a grain size of 0.3 mm. Maximum productivity per line is 10 tonnes per hour.

High quality secondary raw material

A liberation process selectively breaks down the input material. Metals are shaped and the mineral residue fraction is crushed. The metallic particles are now liberated from remaining ash impurities and can therefore be separated. The next step is the segregation of light organic particles and ferrous metals from the remaining metal fraction with specific sorting devices. Using sieves, the purified fraction is separated into different grain categories to achieve high-quality products in the final separation process. In this last step light metals such as aluminium and aluminium alloys are separated from the heavy metals such as copper, lead, brass and zinc using a density grading process.

The supersort-*metal* process recovers metals efficiently and produces consistently high-quality secondary raw materials. The light metal fractions contain mainly aluminium and aluminium alloys while the heavy fractions are a mixture of copper, brass, zinc, stainless steel and lead but also contain precious metals such as gold and silver. The resulting non-ferrous metals are dry and boast a metal content of more than 98%.

Through this treatment, the aluminium fraction meets European end-of-waste guidelines. Thanks to the high degree of reliability and constant process monitoring, a high product standard is guaranteed at all times, thus simplifying planning and process operations for customers. Using high-tech analysis and quality control systems the process is managed and the material is continuously observed and optimised by DHZ specialists. Scrap dealers and smelters can expect a consistently high product quality.

To improve the working environment inside the plant and to minimise environmental impacts, the dry mechanical treatment process is kept virtually dust-free through a state-of-the-art dedusting installation which cleans up to 300 000 m³ of air per hour. The design and location of the plant permit extremely flexible logistics operations thanks to direct connections to road and rail networks as well

PROJECT HIGHLIGHTS

supersort-*technology*

This trademarked technology helps to implement a resource mining strategy in a sustainable and efficient way, enabling an essential increase in the recovery of recyclable materials. It closes material cycles, prevents CO₂ emissions and makes a major contribution to a sustainable environment.

supersort

A dry mechanical recycling plant which recovers valuable products such as ferrous and non-ferrous metals, stainless steel and Cu-Fe 'meatballs' from municipal solid waste incineration bottom ash.

supersort-*metal*

The new plant purifies non-ferrous metal concentrates from supersort, supersort-*fine* and other municipal solid waste incineration bottom ash treatment plants to create high-grade metal fractions. The innovative supersort-*metal* process recovers metals efficiently and produces high-quality secondary raw materials with metal purity levels of >95%.

as shipping traffic. Close co-operation with well-known freight contractors complements the service offered.

Not just for MSW

Besides MSWI bottom ash, supersort-*metal* is able to process a wide variety of metal-containing waste streams. The innovative plant layout allows the processing of automotive shredder residue (ASR) from the automotive and electronics recycling industries as well as other metal-containing wastes. Suitable input materials contain recoverable metals and minerals or organic contents which can be separated from the metals. Any remaining mineral content is consigned to disposal in compliance with Swiss regulations.

Removal of metals from MSWI bottom ash helps to save space in landfills while metal-free ASR can be disposed of at lower cost.

The supersort-*technology* helps to reduce demand for metals such as iron, copper and aluminium from primary production. Recycled high-grade metals are reused as secondary raw materials and contribute to the closing of the material cycle. Therefore, supersort-*technology* helps to conserve valuable primary resources and prevents huge CO₂ emissions as secondary production of metals requires significantly less energy than primary production.

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