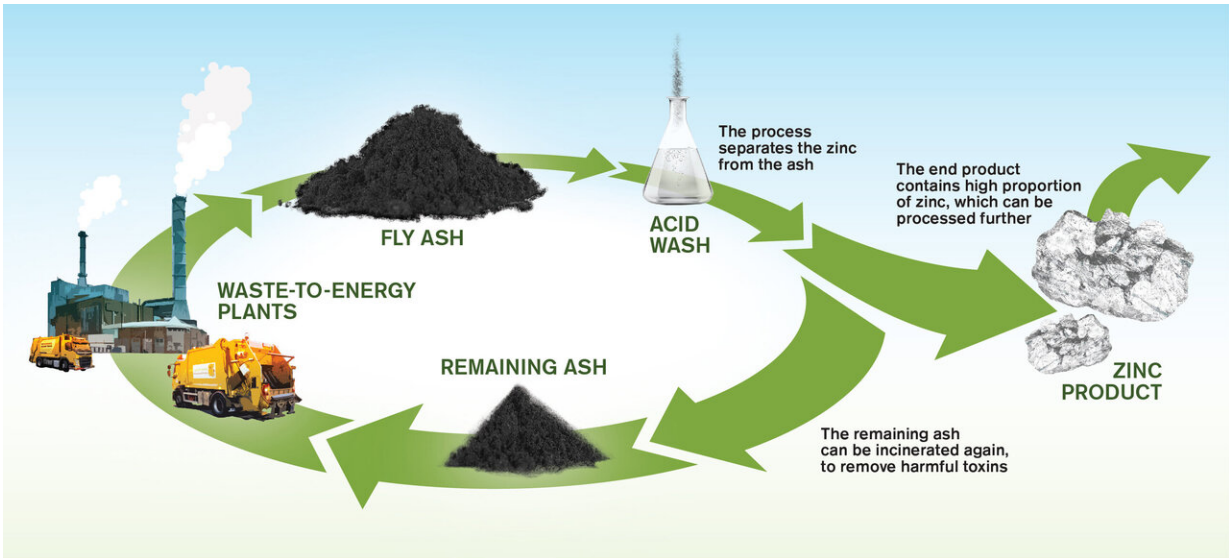


Extracting precious zinc from waste ash

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An illustration of the process for recovering zinc. Credit: Yen Strandqvist/Chalmers University of Technology

Incineration of solid waste produces millions of tons of waste fly ash in Europe annually; most ends up in landfill. But this ash often contains significant amounts of precious metals such as zinc. Researchers at Chalmers University of Technology, Sweden, have developed a method to extract these precious metals, potentially leading to reductions in environmental pollution, landfill and transport.

During waste incineration, the released flue gases are purified and the small particles present are separated, leading to the formation of fly ash.

This fly ash contains toxic substances, such as dioxins, and so is normally classified as [hazardous waste](#) and landfilled. But it also contains valuable metals, such as [zinc](#), which are thereby lost.

But a new method from Chalmers University of Technology, tested at pilot scale and detailed over several years of research, involves treating this waste with an acid wash, also separated from the flue gases, to separate the zinc from the fly ash. The zinc can then be extracted, washed and processed into raw material.

"In our [pilot study](#), we found that 70% of the zinc present in fly ash can be recycled. The zinc is not extracted as a pure metal, which would be a much more intensive process, but instead as a zinc-rich product, which can be sold to the metal industry and processed further in currently existing industry production lines," says Karin Karlfeldt Fedje, Associate Professor at Chalmers University of Technology, and researcher at the recycling and waste management company Renova AB.

Ash turned into useful material

In further refinement to the method, the researchers have been able to significantly reduce the level of toxicity.

"After extraction, we incinerate the residual ash again to break down the dioxins. Ninety percent of this is then turned into bottom ash, which can be used as a construction material, for example," explains Karin Karlfeldt Fedje.

Internationally, the prevalence of waste incineration is varied, but the need to handle large amounts of ash after the process is widespread. In Sweden, incineration of household waste in waste-to-energy plants is common, and results in around 250,000 tons of fly ash every year that could potentially be treated in this way. The rest of Europe accounts for

around ten times that amount.

Although it is hard to estimate how many tons of zinc are currently lost through landfill in Sweden and beyond, the method developed by the Chalmers researchers can be of great interest to all waste management actors. It offers great potential for recovering these metals in a relatively simple way and could have a significant impact on the profitability of [waste incineration](#), as well as its role in the [circular economy](#).

"The technology for extracting zinc from fly ash could have several positive effects, such as reducing the need for mining virgin zinc raw material, lower levels of toxicity in the ash, and greatly reduced landfill contributions. It can be a vital contribution to society's efforts towards a more circular economy," says Sven Andersson, Adjunct Professor at Chalmers and R&D Manager at flue gas cleaning supplier Babcock & Wilcox Vølund AB.

Applied at full scale in Sweden

Dividing her time between Chalmers and Renova, Karin Karlfeldt Fedje has spent many years developing the methodology, in collaboration with several external actors. Together with

Sven Andersson, they have been able to design a full-scale process. Their research has led to Renova AB and B&W Vølund to build an ash washing facility with zinc recycling in Gothenburg Sweden, an investment that could save hundreds of thousands of euro every year for the municipally owned [waste](#) management company.

More information: Karin Karlfeldt Fedje et al, Zinc recovery from Waste-to-Energy fly ash – A pilot test study, *Waste Management* (2020). [DOI: 10.1016/j.wasman.2020.07.017](https://doi.org/10.1016/j.wasman.2020.07.017)

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