European Commission

Science for Environment Policy

Mining metals from heat-treated landfill proven to be economically viable

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Mining metals from landfill sites can be economically viable, a recent project in the US has demonstrated. Approximately 34 352 tonnes of metals, conservatively valued at US$7.42 million (€6.67 million) were recovered from the 8 hectare ashfill site, according to researchers who analysed the project.

Across the world, mountains of municipal solid waste (MSW) are produced — and disposing of them is a major problem. Regular progress is made within the European Union, where landfilling was reduced from 46% to 31% between 2005 and 2013. Although the EU's Waste Framework Directive (2008/98/EC) promotes the hierarchal management of waste by encouraging its reduction, reuse and recycling, significant amounts of MSW is still landfilled — with an estimated 30 to 50 billion m^3 of waste buried in over 150 000 landfills in Europe.

Landfills, however, are stores of valuable materials, including metals, which can potentially be recovered and recycled into new products. This would save raw materials and contribute to a 'circular economy'. Mining landfills is nevertheless technically challenging as the composition and distribution of the contents is unknown, and processing the recovered waste to be free of contaminants is expensive.

Ashfills are a type of landfill where metals are concentrated in ash from the incineration of MSW. Now researchers have analysed a case study of a profitable ashfill mining project in the US state of Maine. The project shows that incinerating MSW is a viable way to produce electricity, and makes metals easier to extract.

Since 1988, waste ash produced from burning 500 tonnes of MSW a day to produce electricity in a mass burn waste-to-energy (WTE) plant has been buried in a nearby 8 hectare landfill site. Until 2004, the average ferrous (iron-containing) metal content of the ash waste was 10.5% by weight, but this was reduced to 6% after using a magnetic separator to extract easily separable ferrous metals. The concentration was further reduced to 0.5–1% in 2012 using more advanced equipment.

A private company started mining the ashfill in November 2011. Ash was dug up, stockpiled to dry out, broken up, and passed through a series of shaking screens to separate metal parts from landfill material. Ferrous metals such as steel cans, nails and mattress springs were removed with magnets, and taken off-site for processing. Any remaining ash waste was reburied in the ashfill site.

After further analysing the processed ash, it was realised that some valuable non-ferrous metals such as aluminium, copper, brass, silver and stainless steel could also be economically recovered, despite accounting for only 1% by weight of the total content. In 2013, the company installed eddy current separators to recover non-ferrous metals from items such as aluminium cans and kitchen appliances.

Between November 2011 and March 2015, 34 352 tonnes of ferrous and non-ferrous metals were recovered and shipped offsite to the secondary metals market. The researchers conservatively estimate the value of all the recovered metal to be US$7.42 million (€6.67 million), although exact figures are not known as this is confidential information. Furthermore, they estimate that approximately 95% of all metal pieces larger than 9.5 mm were recovered.

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In addition to recovering valuable metals, mining freed up 13 200 m^3 of space in the ashfill, extending its working life and reducing the need for new landfills. The researchers estimate this extra benefit to be worth US$267 000 (€240 086).

Overall, the average estimated cost per tonne of extracting and recovering all the metals was US$158 (€142) compared with an average US$216 (€194) estimated return per tonne of metal. The researchers say that using standard construction equipment, such as excavators, contributed to the economic success of this project. Overall, this case study demonstrates that thermal treatment may be crucial to make landfill mining for metal economically feasible.

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