# The mass flow calculations as an indicator of the recovery potential of valuable elements from the sewage sludge incineration residues

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The amount of sewage sludge (SS) produced in wastewater treatment brings the challenges to its proper management. Since landfilling is no longer recomended due to the fact that it contains harmful elements and toxic organic substances and it is considered as hazardous material, SS incineration is regarded as safer and cost-effective option for its management. The main purpose of incineration is to reduce volume and possible negative influence of SS on the environment through disinfection and detoxification at temperatures of about 850-900°C. As a result of incineration fly ash (FA), air polution control residues (APC) and flue gas with suspended dust (FG) are produced.

Out of 76,374 t of sludge (100%) incinerated in 2015 in one of the sewage sluge incineration plant located in the ca. 1 mln inhabitants city in Poland, 4,452 t of FA (6%), 836 t of APC (~1%) and 0.14 t of FG (0.0002%) were produced.

Based on mass flows calculations (mass per year) and results of chemical analysis, the recovery potential of Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se and Zn was determined.

Even though the measured concentrations of Cd, Cr, Cu, Ni and Zn indicated their accumulations in the FA and of Hg, Pb, Sb and Se in the APC (especially noted after removal of soluble mineral phases, which precipitated as a result of addition of $NaHCO_3$ in the APC purification process), the mass flow calculations indicated that 99% of Cd, Cr, Cu, Ni, Pb, Sb and Zn accumulated in the FA, what gave totally 25 t/y. Se was fractionated evenly between FA and APC (ca. 25 kg/y in each) whereas 99% of Hg (~1 kg/y) concentrated in the APC.

The measured content of elements is not a realiable indicator of their recovery potential. It is possible to assess it by determining the share of elements in the bulk volume of incinerated SS. Nevertheless none of this elements formed own mineral phases but it was rather dispersed within other minerals and amorphous substances, therfore their recovery require the development of specific recovery methods.

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