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The Environmental Impacts of Municipal Waste Incineration Plants in Poland Comparison as a Part of Circular Economy System*

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Abstract

The aim of the research presented in this paper was to identify the environmental impacts accompanying thermal treatment of waste at incineration plants in Poland as a part of circular economy system. Source emissions from three large plants were compared with the aim of identifying differences between them. In order to examine thermal waste treatment operations and their impact on the environment, the Life Cycle Assessment (LCA) method was used. Production of heat and electricity in the process of municipal waste incineration may be a potential source of emissions of harmful dust and gas substances to the environment, of solid waste (slag and ash) and of sewage. The magnitude of this negative impact on the various components of the ecosystem and on humans was determined by means of LCA. The life cycle assessment for the thermal waste conversion of energy processes was carried out with the software SimaPro version 9.1.0.11 using the environmental impact assessment method ReCiPe 2016. The basic data were supplemented with records from Ecoinvent 3, ELCD, EU & DK Input Output Database, and Industry Data 2.0. The generation of 100 GJ of energy was chosen as the functional unit to compare the environmental impact of the production of usable energy in the municipal waste incinerators analysed. The LCA results are presented taking into account three damage categories in DALY units for human health, species per year for changes in ecosystem quality, USD2013 for comparing the use of raw materials and ecopoints to make comparisons between the plants.

Keywords: life cycle assessment, municipal waste, incineration plants, circular economy

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