Practical Implementation of Cement-solidification-style Landfill Technology for Resilient Solid Waste Management

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[Abstract]

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The objective of this research is to demonstrate the effectiveness of "Cement-solidification-style Landfill Technology" on a real scale in an actual landfill site, and to pave the way for practical implementation. The ultimate goals are as follows: (1) to construct a flexible pretreatment and determining composition system that can respond to the daily changing properties of incineration residues, (2) to demonstrate the high workability that can efficiently dispose of the large amount of incineration residues brought in every day, strong landfill ground characteristics that allow structures to be installed without ground improvement and the volume reduction effect for prolonging the life of a landfill site, (3) to demonstrate the long-term durability of landfill ground and the environmental safety that the concentrations of hazardous substances such as heavy metals in leachate are below the effluent quality standard, (4) to confirm the high economic efficiency that enables construction and operation with life cycle costs equal to or lower than those of conventional final disposal.

The results obtained in this research are shown in a) to f) below. a) The pretreatment (magnetic separation and sieve separation) and composition determination (vibration compaction test) system that can deal with daily changes in the properties of incineration residues was constructed. b) It was verified that the process can be performed with the targeted processing capacity (5 t/day). c) The landfill ground achieved its development goals (unconfined compressive strength $\geq$ 5 N/mm^2, hazardous substance elution concentration $\leq$ effluent water quality standard, volume reduction effect $\geq$ 20%). d) It was verified that almost no leachate was generated and that the surface water quality achieved the development target (satisfied with the effluent quality standards). e) The long-term durability of the landfill ground was verified by the boring cores investigation and the dismantling survey after one year (strength increased with age, there was no deterioration of surface layer, and firm ground bearing capacity). f) It was confirmed that the solidification type disposal has higher economic efficiency than the conventional type. In addition, the draft of the design and construction guideline for the solidification disposal system was presented.