A feasibility study on the pre-treatment for the recycling bottom ash of incineration in S city

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1. Introduction

Since 1990s, the amount of Municipal Solid Wastes (MSW) in Korean increases because of rapid industrialization but most of MSW are treated by incineration and recycling recently for the shortage of Landfill. When the 1 ton of MSWI occur the fly ash (30~40 kg) and bottom ash (250~300 kg). Fly ash containing a large amount of dioxins and heavy metals is transported to the specified landfill as the designated waste, and bottom ash which has low hazardous materials relatively is moved to landfill or recycled. Worldwidely, researches related road packaging material or insulating material recycling bottom ash are progressing. Then also many studies have used bottom ash as cement additives such as components of the clinker (lime/partial substitutes of clay), sand/gravel mixture of alternative substances, or inactive filler concrete. In Korea, the studies utilizing the bottom ash have been actively performed for recycling bottom ash as bricks or aggregates. Specially, the main components of bottom ashes are similar to those of the cement so that, the recycling bottom ash becomes important. The goal of this study is to provide an economical pre-processing and to arrange a basis data for bottom ash recycling in S city in order to reduce the amount of landfilling waste.

2. Material and method

10kg of the bottom ash was collected at resource recovery facilities located in the four locations (A, B, C, D) in S city. After all samples were air-dried at shady place for 7-10 days, sieving analysis is performed. And the physico-chemical characteristics of each bottom ash were analyzed according to entries and standards presented in the [Waste Management Act Enforcement Rules of Korea]. Three of pre-treatment methods (weathering, CO$_2$ aging, washing) were selected through several literature reviews, the physico-chemical analysis of the bottom ash was conducted through the each pre-treatment, and compared to the changes before and after the pre-treatment.

3. Result and conclusion

Without pre-treatment, the bottom ashes from resource recovery facilities satisfied the standard of ignition loss except

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B facility. The pH of every sample exceeded the standard. In the case of chloride, only bottom ash of C facility satisfies standard and in the case of cyanide, all bottom ashes satisfied standard. As a result of leaching test of bottom ash in four resource recovery facilities, all samples exceeded standard of Cr₆⁺, two facilities (A, D) exceeded that of Cu, and only B facility exceeds that of Pb. After the three pre-treatments (washing, weathering, CO₂ aging, washing), ignition loss was unvaried. Only after the CO₂ aging, the pH satisfied standard. In the case of chloride and cyanide, washing method was the most effective the other pre-treatments.

Based on the results, the most suitable pre-treatment measures were confirmed as washing method for recycling bottom ash in four resource recovery facilities. As a result of the removal efficiency for contaminants by washing time, 60 minutes and solid-liquid ratio of 1:10 showed the optimal efficiency. Washing bottom ash is the fastest and most effective when compared to weathering and CO₂ aging. However, the pH and Cr₆⁺ are considered to require additional studies such as CO₂ Bubbling, heavy metal screening.