

Thesis Title	Solidification of Heavy Metal Sludge from Wastewater Treatment Plant of Zinc Mining Industry using Portland Cement and Steel Foundry Dust
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Abstract

This thesis was studied on solidification of heavy metal sludge from wastewater treatment plant of zinc mining industry using the mixture of ordinary portland cement and steel foundry dust from baghouse filter. Steel foundry dust is a solid waste generated from steel melting industry and was used as a binder. A preliminary study was carried out to investigate the effect of particle size of steel foundry dust on pozzolanic activity. It was found that the finely ground steel foundry dust met the physical requirements for pozzolanic materials for using in portland cement concrete and solidification of waste constituents. The pozzolanic activity index of this dust (having particle size $< 45 \mu\text{m}$) was higher than 56 kg/cm^2 after 7 days curing and the strength activity index was more than 75% of control after curing both at 7 and 28 days.

The optimum ratio of the finely ground steel foundry dust to cement for solidification was 1:1 and its compressive strength after 28 days curing at ambient temperature was 370.7 kg/cm^2 . The curing of solidified specimen at 55°C was greatly accelerated the development of early age strength compared to the ambient temperature curing. It is possible that the increase curing temperature accelerate both the ordinary portland cement hydration and pozzolanic reaction. As a result, the compressive strength of the specimens curing at 55°C for 7 days almost equal to that curing at ambient temperature for 28 days.

The solidified wastes with heavy metal sludge to binder ratio of 0.1, 0.3, 0.5, 0.7, 1.0 and 1.4 by weight were determined for compressive strength and leachability of metal (zinc, cadmium, ferrous, copper and lead). It was found that the maximum sludge to binder ratio was 1.0 with the compressive strength of the solidified wastes cured at 55°C and ambient temperature met the minimum requirement for secured landfill (50 kg/cm²). In addition, leachability of metals from the solidified wastes by Extraction Procedure Toxicity test was lower than the standard of EP.Tox.

Keywords : Solidification / Heavy metal sludge / Pozzolan / steel foundry dust