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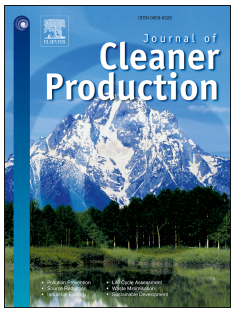

An investigation into effect of sawdust treatment on permeability and compressibility of soil-bentonite slurry cut-off wall

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An Investigation into Effect of Sawdust Treatment on Permeability and Compressibility of Soil-bentonite Slurry Cut-off Wall

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Abstract: Landfills containing municipal solid waste (MSW) are increasing with growing population and consumption rate in Australia. However, construction of conventional containment systems such as slurry walls are a cost-effective and timesaving approach to control the leachate diffusion, they are weak barriers when exposed to volatile organic compounds (VOCs) or heavy metals, which are abundant in municipal solid wastes. This study investigates effect of sawdust addition on hydraulic conductivity and compressibility of the Soil-Bentonite (SB) slurry cut-off wall. A series of hydraulic conductivity and consolidation tests performed on SB backfill amended with 2%, 5% and 10% sawdust contents. The results showed that application of sawdust reduced the final hydraulic conductivity (k_f) in the range of $2.13 \times 10^{-10} \leq k_f \leq 3.5 \times 10^{-10}$ m/s. The computed hydraulic conductivity values using consolidation theory (k_{theory}) also showed an identical decreasing trend in the range of $5.10\times 10^{-11} \leq k_{theory} \leq 3.50\times 10^{-10}$ m/s under $24 \leq \sigma'_n \leq 1{,}280$ kPa effective overburden pressure (σ'_n). The coefficient of consolidation (c_v) was computed using Casagrande and Taylor methods showed a good agreement range value. Additionally, the computed compression index (C_i) and swelling index (C_s) were calculated using void ratio and effective overburden pressure graphs (e - $\log\sigma'_n$) showed that application of sawdust had no significant impact on settlement of the SB backfill.

Author Keywords: Slurry cut-off wall; Soil-bentonite backfill; Hydraulic conductivity; Compressibility; Sawdust.

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1. Introduction

A significant growth in production of the waste has been reported in recent years in Australia due to increase in population and consumption rate. There is 12% increase in volume of waste deposited to landfill from 2001 to 2007 (Plant et al. 2014). The statistics showed that 19 million tonnes of waste was disposed to landfill in 2001. The amount has increased to more than 21.3 million tonnes in 2007. Moreover, it has been indicated that during 2006–2007, nearly half (i.e., 48%) of all waste was released in landfill (Plant et al. 2014). Similar conditions has been reported in different areas around the globe (Nabavi-Pelesaraei et al. 2017; Rong et al. 2017). It has been proved that landfills contain a wide range of volatile organic compounds (VOCs), and the leachates from municipal solid waste (MSW) can contaminate the surrounding land and groundwater (Malusis et al. 2009). The VOCs containing some toxic elements that can migrate to the environment and enter to the body system through food (Haque 2016).