Anekpracha Kaewmanee 2006: Effects of Material Depths and Hydraulic Application Patterns on Treatment Efficiency of Leachate by Rock-Soil Layering System. Master of Engineering (Environmental Engineering), Major Field: Environmental Engineering, Department of Environmental Engineering. Thesis Advisor: Assistant Professor Wilai Chiemchaisri, D.Tech.Sc. 151 pages.
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This study aims to investigate the rock-soil layering system (RSLS) performance in treatment landfill leachate.Three soil columns were set-up by layering lime-stones, sand, clay and silty-clay from top down to the bottom.The leachate had BOD and COD concentrations of 1,500-2,016 and 5,011-7,238 mg/L, respectively. The organic and ammonia nitrogen concentrations in the leachate were 41-127 and 244-392 mg/L, respectively. The treatment efficiencies of the RSLS were compared when the depth of each material and hydraulic application pattern (HAP) were varied at 10, 20, 30 cm and 5 cm/d, 10 cm/2d, 15 cm/3d, respectively. In addition, the adsorption and biodegradation studies for organic and nitrogen compound of each material were carried out via batch experiments.

The results showed that the adsorption was not the major mechanism in removals of pollutants in leachate. The continuous study revealed that treatment efficiencies of the RSLS were increased as increase in material depths. The HAP of 15 cm/3d could increase treatment stabilities of all conditions. The highest BOD, COD removals were 74±3 %, and 24±7 %, respectively. For nitrogen, removals of 57±4 %, 68±9 % were found for organic nitrogen and ammonia nitrogen. The wet-dry conditions in HAP of 15 cm/3d could promote high DO in deeper soils especially in sandy soil. The highest removals of those pollutant were found at lime-stone and sand layers. In mass balance studies, few biomass in term of organic and nitrogen compounds (<3.1%) had accumulated in all materials. However, K_s (half-velocity constant) of all materials for organic and nitrogen compounds were insignificant different. The ratios of nitrifying bacteria to all microorganisms examined by fluorescence in-situ hybridization method had increased significantly in lime-stones and sandy soils which correlated with the nitrogen removal efficiencies of the RSLS.

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