8ICEG Keynote Lecture

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Keynote Lecture Title

Waste mechanics and sustainable landfilling technology: comparison between HFWC and LFWC MSWs

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Biography

Prof. Yunmin Chen is the dean of Faculty of Engineering, director of Research Center for Hypergravity of Zhejiang University, and the director of the Ministry of Education Key Laboratory of Soft Soils and Geoenvironmental Engineering. He received his bachelor's, MSc and Ph.D. degrees from Zhejiang University in 1983, 1986 and 1989, respectively. He was elected as the Academician of Chinese Academy of Sciences in 2015. He is a ISSMGE-TC 215 member, the chairman of Chinese Association of Environmental Geotechnics, the vice board chairman of Chinese Technical Association on Geosynthetics and the vice chairman of soil mechanics council in Chinese Hydraulic Engineering Society. He serves as the co-Editor-in-Chief of journal Transportation Geotechnics and the editorial board member of journal Waste Management. and journal Soil Dynamics and Earthquake Engineering.

Prof. Chen's research interests include environmental geotechnics, soil dynamics and foundation engineering. He has published over 480 papers and been invited as a keynote lecturer for 12 international conferences or symposiums. He is the chief scientist of the 973 Program (the National Basic Research Program of China) project of 'Fundamental Study of Mechanism and Sustainable Control of Environmental Disasters Induced by MSW Landfilling'. He is also the chief editor of Technical Code for Geotechnical Engineering of Municipal Solid Waste Sanitary Landfill (CJJ 176-2012). He proposed techniques for the control of waste slope failure, landfill gas emission and leachate leakage contamination in municipal solid waste landfills, and provided consultation to more than 28 landfills.

Abstract

Waste mechanics focuses on the degradation characteristics and mechanical behaviors of municipal solid waste (MSW). Knowledge of waste mechanics helps solve the severe geoenvironmental challenges for MSW landfills. This paper first summarized and compared the physical components and chemical composition of MSWs from 20 countries, including developed and developing countries, and proposed a MSW classification sys-tem based on the food waste content and the ratio of cellulose to lignin. Secondly, the degradation characteristics between high food waste content (HFWC) and low food waste content (LFWC) MSWs, originated from their differences in chemical composition due to the distinctions in physical components of MSWs, were compared quantitatively by mass loss, leachate generation, landfill gas (LFG) generation, and contaminants in leachate. Thirdly, mechanical behaviors closely related to the degradation characteristics of both HFWC and LFWC MSWs, including permeability, compressibility, shear strength, and lateral pressure, were elaborated on. Fourthly, degrees of hydrolysis, methane generation, and consolidation, calculated by the stabilization-consolidation model, were introduced to characterize the stabilization process of HFWC MSW landfills, which provided a basis for sustainable landfilling for HFWC MSW landfills. The obtained features of HFWC MSW landfills, including the distributions of leachate mounds and LFG, settlement, and slope stability, showed the causes of main geo-challenges at HFWC MSW landfills, including high risks of leachate leakage and slope instability, and low LFG collection efficiency, were consistent with the monitoring results of several cases. Finally, technologies, practices, and designs towards sustainable landfilling for HFWC MSW landfills in China were presented, which could also serve as useful references and guidelines for other countries in similar situations.