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"Gheorghe Asachi" Technical University of Iasi, Romania

AN INTERVAL-PARAMETER QUEUING MODEL FOR PLANNING MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM WITH COST-EFFECTIVE OBJECTIVE

Yongping Li[1]*, Yan Sun[2], Guohe Huang[1], Fei Zhao[2]

[1]School of Environment, Beijing Normal University, Beijing 100875, China
[2]Sino-Canada Energy and Environmental Research Academy, North China Electric Power University, Beijing 102206, China

Abstract

In this study, an interval-parameter queuing model (IPQM) for planning a municipal solid waste (MSW) management system with cost-effective objective is developed through introducing the queuing model with limited capacity into an interval-parameter linear programming (ILP) framework. IPQM can examine the effects of limited queue capacity on waste-flow allocation pattern and system cost under uncertainty. Random vehicles have to wait in queue due to limited capacities for disposing MSW, leading to excess cost of delay in receiving the service. IPQM can also be used for analyzing various waste routing scenarios that are associated with different arriving rates, service times, lost probabilities, and disposal costs. The IPQM is applied to the planning of MSW management system in the City of Changchun, whose waste-generation rate continues to increase since it has been encountered swift urbanization, industrialization and economic development during the past decades. Three cases associated with different limited capacities of the queue at the landfill are analyzed, which are related to tradeoffs between the system cost and the capacity-violation risk. Lower limited capacity can reduce the waiting time in the queue but with an increased system cost; conversely, a desire for reducing the system cost could result in an increased risk of violating the waste disposal capacity.

Key words: cost-effective, interval parameter, limited queue capacity, management, municipal solid waste

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* Author to whom all correspondence should be addressed: e-mail: yongping.li@iseis.org; Phone: +86 10 5197 1255; Fax: +86 10 5197 1284