An L – Shaped decomposition method for the inventory routing problem under uncertainty

Evangelia Chrysochoou*†[1] and Athanasios Ziliaskopoulos[2]

[1]Centre for Research and Technology Hellas/Hellenic Institute of Transport (CERTH/HIT) – 6th km Charilaou-Thermi Rd., P.O.Box: 361, P.S.:57001, Thermi, Thessaloniki, Greece, Greece
[2]Department of Mechanical Engineering / University of Thessaly (MIE/UTH) – Leoforos Athinon, Pedion Areos, 38334 Volos, Greece, Greece

Abstract

Nowadays, Vendor Managed Inventory (VMI) seems to be one of the most tractable business models in global logistics and supply chain operations. The backbone of VMI systems is the solution of the Inventory Routing Problem (IRP) which constitutes a significant extension of the classical Vehicle Routing Problem (VRP). The goal is to jointly optimize the decision process of both inventory management and distribution of goods. The decision maker in such a model has to make three decisions; the amount to be transported; the frequency of shipments and the distribution plan. IRP in real life is stochastic since demand uncertainty is a fact. Aiming to solve the IRP under uncertainty and securing flexibility, a recourse action of transhipment was proposed in the framework of two stage stochastic programming model. Transhipment is treated as a recourse action when extra demand is revealed and stock out situation occur. An innovative model was developed of two stage recourse action for the stochastic IRP. An L – Shaped decomposition method was adopted to solve the problem exactly. The proposed model was tested using a modification of known benchmark instances (Archetti et al). The problem was coded and solved in the ILOG CPLEX Optimization Studio. Validating the computational experiments results of proposed model derived significant conclusions on the tradeoff revealed among proactive distribution plans in coherent to costs of transhipment.

*Speaker
†Corresponding author: echryso@certh.gr