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A General Variable Neighborhood Search for Design Supply Chain Network

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***Abstract*— The configuration of the supply chain network has a strong influence on the overall performance of the supply chain. A well-designed supply chain network makes a correct base for effective supply chain management. This paper presents a solution procedure based A General Variable Neighborhood Search(GVNS) for the design of a new mixed integer programming in direct and indirect shipment state. The effectiveness of the GVNS has been investigated by comparing its results with those obtained by GAMS at different sizes.**

Keywords-component; supply chain network design; General Variable Neighborhood Search; Mixed Integer Linear Programming;

I. INTRODUCTION

A supply chain is a network of suppliers, manufacturing plants, warehouses, and distribution channels organized to acquire raw materials, convert these raw materials to finished products, and distribute these products to customers. The supply chain network should be designed in the way that could meet the customer needs with an efficient cost.

Geoffrion and Powers [1] reviewed deterministic models for the SCND problems and their application. Thomas and Griffin [2] presented a literature review related to the integration of multiple stages in supply chains. They also considered the strategic and operational coordination in supply chain designs. Dogan and Goetschalckx [3] developed a comprehensive multi-commodity mixed integer linear model for the design of integrated domestic supply chains.

Most of supply chain network design problems can be reduced to capacitated facility location problem (CFLP) which is known to be NP-complete [4]. therefore, most of supply chain network design problems are NP-hard. To deal with the complexity of SCND problems many metaheuristics algorithms are developed in the recent years. For example Chan and Chung [5] developed a hybrid approach based on genetic algorithm(GA) and Analytic Hierarch Process (AHP) for production and distribution problems in multi-factory supply chain models.

Pishvaee and kianfar [6] also proposes a mixed integer linear programming model to minimize the transportation and fixed opening costs in a multistage network .They also apply a SA algorithm with special neighborhood search mechanisms to find the near optimal solution. Yeh [7] has proposed a memetic algorithm (MA) for the same problem. Other applications of meta heuristics algorithms in SCND problems can be noted Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Tabu Search (TS) and Scatter Search(SS) [8,9,10,11] .

This paper presents a new solution procedure based on GVNS for the design of a mixed integer programming model include multi-source, multi-product, multi-stage SCND in direct and indirect shipment. The effectiveness of the GVNS has been investigated by comparing its results with those obtained by GAMS.

II. MODEL FORMULATION

In this section, we propose a SCND mathematical model that is able to determine the least cost configuration of the supply chain network considering the direct and indirect shipment mechanisms at the same time.

Indices

I	set of customers (i ∈ I)
J	set of DCs (j ∈ J)
K	set of plants (k ∈ K)
L	set of products (l ∈ L)
S	set of suppliers (s ∈ S)
R	set of raw materials (r ∈ R)

Parameters

D_k	capacity of plant k