Cluster-based Transportation Optimization – A Case Study from Pharmaceutical Supply Chains (PSC)

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Transportation planning attempts to allocate fixed logistics capacity in the best possible way, for particular business requirements. This study focuses on the pharmaceutical supply chains, as optimization of medicine distribution routes has become an urgent issue that needs to be solved. The cost components of many distribution and transportation systems represent the routing and scheduling of vehicles, but there are only a few optimization approaches that have been introduced to effectively solve Vehicle Routing Problem (VRP). Therefore, this study presents a simulation based solution approach for transportation optimization, in order to minimize the cost, based on the pre-identified *pharmaceutical product clusters*. The simulation models are developed using the SupplyChainGuru® modelling and simulation platform, where vehicle routing models are developed to simulate the inherent features of the product families using test cases from the literature and the benchmark instances listed on the repository of CVRPLib. The study proposes and models five product characteristic-based clusters namely, time sensitive pharmaceuticals, hazardous pharmaceuticals, hybrid pharmaceuticals, condition constrained pharmaceuticals (conditions such as pressure/temperature, etc.), and general pharmaceuticals. The baseline VRP model is compared with the cluster specific VRP models developed for each product cluster. The results of the study depict that the total transportation cost minimizes as the products are routed with respect to the inherent product clusters, than the cost of routing without considering cluster-specific characteristics. The maximum percentage cost reduction is for the general/condition constrained cluster (64.04%), whereas the minimum is for the time sensitive product cluster (0.59%). This product clustering approach of transportation optimization could be utilized dynamically to provide efficient delivery of products to the consumers, and could be adopted in related industrial supply chains.

Keywords: Pharmaceutical Industry, Transportation Optimization, Vehicle Routing Problem

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