INTEGRATED FORWARD AND REVERSE LOGISTICS MODEL: A CASE STUDY IN DISTILLING AND SALE COMPANY IN KOREA

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ABSTRACT. This paper aims to build integrated forward and reverse logistics model, and to optimize it with closed loop supply chain (CLSC). After that, we evaluate the effectiveness of the proposed model with the numerical examples, and simulate it with a bottles distilling/sale company in Korea. This paper designs the method of calculation for a solution using optimization algorithms with the priority-based genetic algorithm (priGA), and the hybrid genetic algorithm (hGA) by Fuzzy Logic Control (FLC). We describe the effectiveness of hGA such as shortness of computation time and better solutions with comparing experimental results with by ones of a conventional priGA and hGA. We determine the optimal delivery routes, and discuss its results on open and integrated facilities through a simulation. Based on the case study of a distilling and sale company in Busan, Korea, the new model of closed loop supply chain of bottles is built and the effectiveness of the proposed method is verified. In closed loop supply chain, bottles produced from plant are transported to retailer through DC. In retailer, product and end-of-life product are treated in the same time. We find that the total cost related with the forward, reverse, and closed loop supply chain model can be reduced by integrating forward and reverse flow with Lingo, priGA and hGA. The value of this paper is summarized as follows.

- The optimization method of the closed loop supply chain to minimize the transportation cost, inventory cost, open cost, purchasing cost and disposal cost is proposed.
- This paper presents calculation method of solution using optimization algorithms of the priority-based genetic algorithm (priGA) and the hybrid genetic algorithm (hGA) by Fuzzy Logic Control (FLC).
- In the experimental results comparing conventional priGA and hGA, we demonstrated the effectiveness of hGA such as shortness of computation time and better solutions.
- Through the simulation, the optimal delivery routes and the open and integration results of facilities are determined.
- Based on case study using real data for the reusable reverse logistics problem from a distilling and sale company, the effectiveness of the proposed method was improved. Finally, we could compare of GA to other meta-heuristics such as simulated annealing, and Tabu search methods are worth investigating in future studies.

Keywords: Closed-loop supply chain, Forward/reverse logistics, Genetic algorithm (GA), LINGO

1. Introduction. In a recent decade, social demands for eco-friendly society have increased [1]. Many countries are getting interested in reverse logistics, because they consider it as a solution to accomplish eco-friendly society. Additionally, enterprises have recognized that logistics problems should be solved not only by reducing cost, but also by considering such social demands with an eco-friendly logistics. Forward logistics is to