Joint Industrial Waste Recycling and Disposal Mechanism in Multiple Plants Settings

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ABSTRACT

Most manufacturing plants lack proper equipments for handling industrial waste and turn to recycling centers for disposal of industrial wastes. This research studies how to coordinate efficiently recycle and disposal of waste from multiple plants in a green supply chain.

This research considers a system containing multiple manufacturing plants and a recycling center. Two systems are considered, each involving different decision makers. In the first system, the recycling center is the only decision maker and two recycling strategies, independent recycling strategy and joint recycling strategy are developed. In the second system, the decision makers include all the plants and the recycling center, and three recycling strategies, disperse recycling strategy, integrated recycling strategy and joint recycling strategy, are developed. Formulas for optimal recycling periods that minimize total costs are derived. In addition, an iterative heuristic to search for optimal solutions are designed for the joint recycling strategy. Results from numerical experiment show the joint recycling strategy obtains much lower total relative costs for all the systems. If manufacturing plants do not participate in decision making, their costs are substantially increased. Finally, sensitivity analysis on the number of plants, setup cost for waste disposal, and the scale between plants is conducted. The findings from this research can serve as valuable reference in management and operation for enterprises.

Keyword: Multiple plants waste、Joint recycling、Search heuristic