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A multi-objective optimal decision model for a green closed-loop supply chain under uncertainty: A real industrial case study

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ABSTRACT

Green closed-loop supply chain management is an important topic for business operations today because of increasing resource scarcity and environmental issues. Companies not only have to meet environmental regulations, but also must ensure high quality supply chain operation as a means to secure competitive advantages and increase profits. This study proposes a multi-objective mixed integer programming model for an integrated green closed-loop supply chain network designed to maximize profit, amicable production level (environmentally friendly materials and clean technology usage), and quality level. A scenario-based robust optimization method is used to deal with uncertain parameters such as the demand of new products, the return rates of returned products and the sale prices of remanufactured products. The proposed model is applied to a real industry case example of a manufacturing company to illustrate the applicability of the proposed model. The result shows a robust optimal resource allocation solution that considers multiple scenarios. This study can be a reference for closed-loop supply chain related academic research and also can be used to guide the development of a green closed-loop supply chain model for better decision making.

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