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Abstract

This paper proposes a two-stage stochastic mixed-integer programming model for a closed-loop supply chain network design problem in the context of modular structured products in which the reverse network involves several types of recovery options. It accounts for uncertainty in the quality status of the return stream, modeled as binary scenarios for each component in the reverse bill of material corresponding to such products. To deal with the intractable number of scenarios in the proposed model, a scenario reduction scheme is adapted to the problem of interest to preserve the most pertinent scenarios based on a modified Euclidean distance measure. The reduced stochastic large-scale optimization problem is then solved via a L-shaped algorithm enhanced with surrogate constraints and Pareto-optimal cuts. Numerical re-

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