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Recycling Service Strategy by Considering Demand-Supply Interaction

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Abstract : Circular economy promotes greater resource productivity and avoids pollution through greater recycling and re-use which bring benefits for both the environment and the economy. The concept is contrast to a linear economy which is 'take, make, dispose' model of production. A well-design reverse logistics service strategy could enhance the willingness of recycling of the users and reduce the related logistics cost as well as carbon emissions. Moreover, the recycle brings the manufacturers most advantages as it targets components for closed-loop reuse, essentially converting materials and components from worn-out product into inputs for new ones at right time and right place. This study considers demand-supply interaction, time-dependent recycle demand, time-dependent surplus value of recycled product and constructs models on recycle service strategy for the recyclable waste collector. A crucial factor in optimizing a recycle service strategy is consumer demand. The study considers the relationships between consumer demand towards recycle and product characteristics, surplus value and user behavior. The study proposes a recycle service strategy which differs significantly from the conventional and typical uniform service strategy. Periods with considerable demand and large surplus product value suggest frequent and short service cycle. The study explores how to determine a recycle service strategy for recyclable waste collector in terms of service cycle frequency and duration and vehicle type for all service cycles by considering surplus value of recycled product, time-dependent demand, transportation economies and demand-supply interaction. The recyclable waste collector is responsible for the collection of waste product for the manufacturer. The study also examines the impacts of utilization rate on the cost and profit in the context of different sizes of vehicles. The model applies mathematical programming methods and attempts to maximize the total profit of the distributor during the study period. This study applies the binary logit model, analytical model and mathematical programming methods to the problem. The model specifically explores how to determine a recycle service strategy for the recycler by considering product surplus value, time-dependent recycle demand, transportation economies and demand-supply interaction. The model applies mathematical programming methods and attempts to minimize the total logistics cost of the recycler and maximize the recycle benefits of the manufacturer during the study period. The study relaxes the constant demand assumption and examines how service strategy affects consumer demand towards waste recycling. Results of the study not only help understanding how the user demand for recycle service and product surplus value affects the logistics cost and manufacturer's benefits, but also provide guidance such as award bonus and carbon emission regulations for the government.

Keywords : circular economy, consumer demand, product surplus value, recycle service strategy
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