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Title

Optimal Physical Life Distribution of a Reusable Unit Based on a Mathematical Model of Environmental Impact

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Abstract

Reuse of products or product parts is effective to reduce environmental impact. In the design phase of sustainable products involving reusable units, it is important to set an appropriate physical life span for a reusable unit. A reusable unit should be durable for a period equal to at least two functional lives through product circulation with consideration of functional degradation of products and reusable units, and their demand. If a reusable unit has a short functional life or little demand, its having an excessive physical life span will increase environmental impact. In this study, a mathematical model of environmental impact of a reusable unit is developed in a discrete form. Then, optimal physical life distributions are derived based on numerical examples.