

Redesign for sustainability and assemblability using particle swarm optimization method

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Abstrak

Nowadays, the pursuance of sustainability obligates manufacturers to redesign products in order to reduce negative environmental impacts. However, only a few studies have simultaneously considered environmental sustainability and assemblability. To bridge this research gap, this study aimed to develop a redesign method based on modular product architecture. This method manages to support a sustainable product considering its materials, assembly sequence and line balance at initial design phase. This method begins with a current product analysis based on economic and environmental performances (i.e., total cost and CO₂ emissions). Additionally, new materials and assembly methods are incorporated into redesigning a more sustainable product without compromising production performance. To ensure assemblability, the line balance of 60% is served as one of the constraints. This study applies the particle swarm optimization algorithm to calculate an optimal module organization along with assembly methods and assembly sequences. An air purifier case study is presented to demonstrate the benefits of the proposed method. As a result, the redesigned product can be more easily maintained during product usage and be recycled at the end of product life.