

Integrated Evaluation of Green Design and Green Manufacturing Processes Using a Mathematical Model

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Abstract : In this research, a mathematical model for integrated evaluation of green design and green manufacturing processes is presented. To design a product, there can be alternative options to design the detailed components to fulfill the same product requirement. In the design alternative cases, the components of the product can be designed with different materials and detailed specifications. If several design alternative cases are proposed, the different materials and specifications can affect the manufacturing processes. In this paper, a new concept for integrating green design and green manufacturing processes is presented. A green design can be determined based the manufacturing processes of the designed product by evaluating the green criteria including energy usage and environmental impact, in addition to the traditional criteria of manufacturing cost. With this concept, a mathematical model is developed to find the green design and the associated green manufacturing processes. In the mathematical model, the cost items include material cost, manufacturing cost, and green related cost. The green related cost items include energy cost and environmental cost. The objective is to find the decisions of green design and green manufacturing processes to achieve the minimized total cost. In practical applications, the decision-making can be made to select a good green design case and its green manufacturing processes. In this presentation, an example product is illustrated. It shows that the model is practical and useful for integrated evaluation of green design and green manufacturing processes.

Keywords : supply chain management, green supply chain, green design, green manufacturing, mathematical model

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