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ECO-EFFICIENT DECISION SUPPORT MODEL OF SOLID WASTE RECYCLING

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Abstract

This paper describes an eco-efficiency decision support model for of end-of-life solid waste recycling. A holistic approach in balancing environmental pollution concern and waste recycling is required. A system dynamic model is based on mathematical model of the supply chain, and decision-making analysis is supported with the online spreadsheets. A criterion function-based modelling is used as a core model for simulation that uses net present value-based metrics of the supply chain activities. The economic and recovery effects of processing are determined. The system model combines technology process model, operational model, and macro and micro economic model, to locate all production-related technical requirements, effects, risks, and associated costs. The supply chain assessment based on criterion function assures a better technological foresight of environmental impact and preserved quality. The eco-efficiency indicators were developed. These indicators are used to evaluate the performance of the whole recycling system. The combination of technology and economic parameters dynamic modelling offers several advantages over existing modelling methodologies: they consider multiple products/process matrixes driven by the available inputs, and can respond to rapidly changing conditions in technology and economics. Theoretical framework on these aspects is provided in this paper, followed by a description of the dynamic modelling framework. An example case involving online simulation tool is presented to demonstrate the type of analyses possible using of the model developed in this study.

Key words: decision-making online tool, eco-efficiency, net present value based metrics, process-based cost modelling, solid waste recycling

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