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Development of an Optimization Mathematical Model by Applying an Integrated Environmental Indicator for Selecting Alternatives in Cleaner Production Programs

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Abstract

The purpose of this work is to propose an optimized mathematical model to facilitate the selection alternatives in cleaner production (CP) programs. On the basis of goal programming, this study develops an integer-programming model for CP option selection in case of multi-innovation objects and multi-alternative scenarios. With the constraints given, the model defines which objects, and which alternatives can be used for innovation to obtain the optimal objective. The model is tested and proved in a cassava starch factory in Tayninh, Vietnam. Based on production accounting, innovation objects and their CP-alternatives in this factory are identified. Baseline integrated environment impact of the factory is 11,882 person equivalent (PE), in which bulk waste is 52.7 %, global warming is 11.9 %, photochemical ozone creation is 10.8 %, energy is 10 %, and the rest is 14.5 %. With 135,000 USD for environmental impact reduction, the maximum reduction potentials obtained from solving the model are 8,335.2 PE and 878.68 PE in case of minimization of integrated environment indicator and global warming, respectively. The results show that this model works excellently as a support alternative

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