

8th World Congress and Expo on Recycling

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The influence of material flow on ecological cost in the waste paper recycling and manufacturing process

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In the background of fact that the problems of the resources and environment are serious day by day, waste paper, as an important secondary resource, has gradually become the most important raw material for paper making. Now the studies on environmental impact of waste paper recycling, which always use life cycle assessment, were mainly about comparison of different recycling strategy. Their results are non-monetary volume, which have difficulties on guiding enterprises to achieve win-win between economic and environmental. Therefore, in this paper, ecological cost is put forward and defined; its calculation model based on material flow was set up. Based on the material flow analysis, a standard ecological cost flow diagram (SECFD) was set up in waste paper recycling system, and the influence of deviating from SECFD on the ecological cost is analyzed. The rule of the influence of material and energy flow in the waste paper recycling system to the ecological cost is revealed. Taking the minimum ecological cost of waste paper recycling system as the objective function, the optimal design is based on the constraint condition of economic benefits, manufacturing process conditions, national policy and industrial standards. The results show that the ecological cost is reduced to 1385.69 yuan per ton after optimization, which is down by 456.8 yuan/ton compared with that before optimization, and the decrease is 24.79%. At the same time, the economic benefit is increased to 1326.95 yuan/ton, 13.51% higher than that before the optimization. And it is suggested that the enterprises of waste paper recycling should be intensive development in the future; properly control the price of waste paper, avoid the high price of waste paper. The state should give a moderate economic compensation to waste paper recycling enterprise; it will contribute to the win-win between its economy and ecological environment.

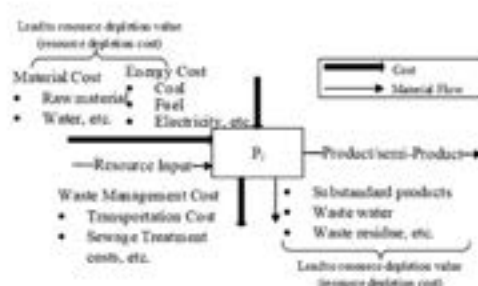


Figure 1: The cost structure in unit process P_i .

Recent Publications

1. Dai Tiejun (2015) A study on material metabolism in Hebei iron and steel industry analysis. Resources, Conservation and Recycling 95(7):183-192.
2. Dai Tiejun (2011) The influence of iron flow on iron resource efficiency in the steel manufacturing process. Resources, Conservation and Recycling 55(8):760-771.
3. Edens B and Graveland C (2014) Experimental valuation of Dutch water resources according to SNA and SEEA. Water Resources and Economics 7:66-81.
4. Nakajima M, Kimura A and Wagner B (2015) Introduction of material flow cost accounting (MFCA) to the supply chain: a questionnaire study on the challenges of constructing a low-carbon supply chain to promote resource efficiency. Journal of Cleaner Production 108(1):1302-1309.
5. Sulong F, Sulaiman M and Norhayati M A (2015) Material flow cost accounting (MFCA) enablers and barriers: the case of a Malaysian small and medium-sized enterprise (SME). Journal of Cleaner Production 108(1):1365-1374.

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Biography

Tiejun Dai as a Professor has been dedicated to theoretical and applied researches in resource, environment and circular economy over more than a decade. He built a simplified substance flow diagram of the manufacturing process, formulated two evaluation indices of eco-connectance of an eco-industrial park and the rate of waste recovery for resource, found the stability condition of eco-industrial park, built regional (industry and waste) metabolism model, concordance analysis model of material flow and value flow, and cost-benefit model and ecological cost model for waste management, circular economy development strategy and policy, etc. He has finished a monograph, edited two textbooks, one English book and two other academic writings as an Editorial Board Member or a participant, and published 50 pieces of scientific paper, and 40 of them were collected by SCI, and EI.

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