

An Integration of Life Cycle Assessment and Techno-Economic Optimization in the Supply Chains

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Abstract : The objective of this paper is to compose a sustainable supply chain that integrates product, process and networks design. An integrated life cycle assessment and techno-economic optimization is proposed that might deliver more economically feasible operations, minimizes environmental impacts and maximizes social contributions. Closed loop economy of the supply chain is achieved by reusing waste to be raw material of final products. Societal benefit is given by the supply chain by absorbing waste as source of raw material and opening new work opportunities. A case study of ethanol supply chain from rice straws is considered. The modeling results show that optimization within the scope of LCA is capable of minimizing both CO₂ emissions and energy and utility consumptions and thus enhancing raw materials utilization. Furthermore, the supply chain is capable of contributing to local economy through jobs creation. While the model is quite comprehensive, the future research recommendation on energy integration and global sustainability is proposed.

Keywords : life cycle assessment, techno-economic optimization, sustainable supply chains, closed loop economy

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