A bi-objective environmental-economic optimisation of hot-rolled steel coils supply chain: A case study in Thailand

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A B S T R A C T

Steel production is an energy intensive industry, emitting a considerable amount of CO₂ which contributes to global warming. Many sources of energy may be used in steel production, incurring different costs. This research studies the effects of different decisions in the supply chain network for the production of hot-rolled steel coils (HRSC) in Thailand. The objectives are to minimise the total cost of HRSC production as well as to minimise the total CO₂ emissions in order to reduce environmental impact. Towards meeting these two objectives, a mathematical model is proposed to simultaneously determine the choices of energy, raw materials, and transportation modes with regard to production, network, and business constraints. Via examination of the price differences for available raw materials and energy sources several scenarios are investigated to evaluate their impact on both environmental and economic requirements of the supply chain. The analysis shows that the optimal solutions are greatly affected by changes in the prices of slabs and scrap, and the cost of electricity, whereas fuel oil and natural gas prices only affect the choice of fuel for the pre-heating process of the slabs. Strategies to operate under different scenarios are also discussed.

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