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Scheduling Optimization of Yard Cranes with Minimal Energy Consumption at Container Terminals

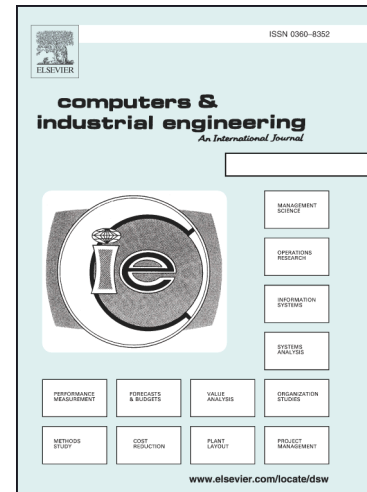
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## Scheduling Optimization of Yard Cranes with Minimal Energy Consumption at Container Terminals

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### Abstract

This paper proposes a novel integer programming model to solve optimal problem of yard crane scheduling with minimal energy consumption at container terminals from the low carbon perspective. The traditional approaches for optimal crane scheduling focus only on crane moving distance without considering the total energy consumption of yard cranes. In this paper, an optimal model is built with consideration of such key factors as the crane moving distance, turning distance and the practical operation rules, which are directly related to the total energy consumption. In accordance with the general kind of handling system at container terminals in China, an integer programming model is proposed to optimize scheduling of yard cranes at container terminals with the purpose of minimizing the total energy consumption of the rubber-tired gantry cranes. Then, on the basis of the actual operational data of the Shanghai Yangshan Deep Water Port(SYDWP), the container volume of each block is calculated and used to solve the model. Finally, computational experiments are proposed to illustrate and validate the solutions for yard crane scheduling.

**Keywords:** Yard crane scheduling; Integer programming; Optimization; Crane turning time; Energy consumption

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