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# OPTIMIZING CHARCOAL PRODUCTION: A STRATEGIC FACILITY LAYOUT DESIGN WITH MCDM METHODS

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## Abstract

Charcoal is a sustainable substitute for coal, particularly in the steel industry, providing a renewable energy source that reduces carbon emissions and supports green jobs. However, the efficient production of charcoal is often hindered by suboptimal facility layouts, which can impact operational efficiency and, consequentially, sustainability. This study introduces a methodology to aid decision-makers in optimizing the layout of charcoal carbonization squares, focusing on reducing material flow, minimizing costs, and improving resource allocation. The Facility Layout Problem (FLP) methodology and MultiCriteria Decision-Making (MCDM) methods were employed to develop an optimized layout. By incorporating the Analytical Hierarchy Process (AHP) and Fuzzy Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), the study presents three scenarios (L1, L2 and L3) ranked according to decision-maker input. The results demonstrate that optimized layouts can significantly enhance production efficiency, reduce resource waste, and support more sustainable energy practices. This study provides a practical understanding for industrial practitioners, demonstrating how efficient layout design can contribute to the broader goals of renewable energy and sustainable production.

*Key words:* charcoal carbonization square, FLP, MCDM, renewable energy

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