

A hybrid fuzzy multi-criteria decision making model for selecting a sustainable supplier of forklift filters: a case study from the mining industry

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Abstract

Supplier selection has long been a strategic cornerstone for the advancement of companies from the mining sector due to its impact on many sectors as inventory management, production planning, maintenance scheduling, financial resources and environment. In this regard, expert decision-makers should deem a number of performance conflicting criteria and supplier alternatives. Moreover, choosing a suitable Multi-Criteria Decision Making (MCDM) approach has become a key strategic consideration for supplier selection. Hence, this paper presents a combination of powerful MCDM methods to select the most suitable supplier of forklift filters. The Fuzzy Analytic Hierarchy Process (FAHP) is first used to calculate the initial weights of criteria and sub-criteria under uncertainty, followed by the implementation of Fuzzy Decision Making Trial and Evaluation Laboratory (FDEMATEL) to assess the interrelations and feedback between them. The fuzzy theory is used in both AHP and DEMATEL methods to represent the human vagueness when making judgments. Then, FAHP and FDEMATEL are combined to obtain the final contributions of both criteria and sub-criteria on the basis of interrelations and uncertainty. Finally, the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) is used to rank the supplier alternatives. To validate the effectiveness of the proposed framework, a case study is presented. The results evidence that *quality* criterion is the most crucial aspect when selecting suppliers of forklift filters.

Keywords

Multicriteria decision-making (MCDM), Fuzzy AHP (FAHP), Fuzzy DEMATEL (FDEMATEL), TOPSIS, Mining industry, Supplier selection, Sustainability