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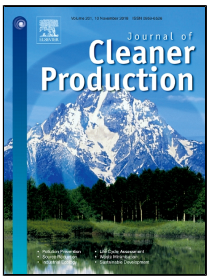

An integrated decision model of restoring technologies selection for engine remanufacturing practice

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An integrated decision model of restoring technologies selection for engine remanufacturing practice

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Abstract

There have been various restoring technologies in remanufacturing industry for the recovery of designed dimension. The life cycle environmental performance, economic benefits, and quality reputation of remanufactured products are influenced by the restoration process. An appropriate selection of restoring technology would enhance the sustainability and assure the quality requirement of remanufactured products. The primary objective of the present study is to develop an effective and comprehensive multi-criteria decision-making approach for the application to the remanufacturing process considering the environmental impact, economic cost, and technical property. We applied the fuzzy Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) approach to select a proper restoring technology for the crankshaft remanufacturing. The final results indicated that, based on the proposed criteria, the preferential ranking is brushing electroplating, plasma spray, plasma arc surfacing, and laser cladding. The present study would help facilitate and guide the selection of restoration technology in engine remanufacturing practice and benefit remanufacturers for the sustainability improvement.

Key words: Decision-making; life cycle assessment; cost analysis; TOPSIS; remanufacturing process;

Nomenclature

AHP	Analytic Hierarchy Process	LCI	Life Cycle Inventory Analysis
ANP	Analytic Network Process	LCIA	Life Cycle Impact Assessment
AP	Acidification Potential	MACBETH	Measuring Attractiveness by a Categorical Based Evaluation Technique
BE	Brushing Electroplating	MAUT	Multi-Attribute Utility Theory
CADP	Chinese Resource Depletion Potential	MCDM	Multi-Criteria Decision-Making
CLCD	Chinese Core Life Cycle Database	PAS	Plasma Arc Surfacing
DEA	Data Envelop Analysis	PS	Plasma Spray
ELECTRE	Elimination and Choice Expressing Reality	RI	Respiratory Inorganics
GP	Goal Programming	RP	Rated Power
GWP	Global Warming Potential	SEC	Specific Energy Consumption
ISO	International Standard Organization	TOPSIS	Technique for Order Preference by Similarity to Ideal Solution
LC	Laser Cladding	WEP	Water Eutrophication Potential
LCA	Life Cycle Assessment		

1. Introduction