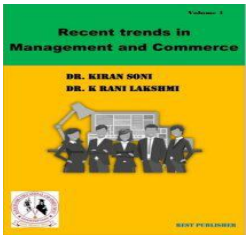
Recent trends in Management and Commerce
Vol: 2(4), 2021
REST Publisher
ISBN: 978-81-936097-6-7
Website: http://restpublisher.com/book-series/rmc/



Designing automotive products for remanufacturing from a material selection perspective using the VIKOR method

Patil Aaditi Sharad
SSt College of Arts and Commerce, Maharashtra, India.
Email: aaditipatil@sstcollege.edu.in

Abstract

Because remanufacturing preserves most of the ingredients in the original product, less raw material are used than making new products. This is particularly useful where there are critical raw materials in the product – goods where there is a supply risk. Reproduction is the complete form of an object Protects, whereas recycling is the product itself Break into component parts Melting, melting, or fresh Involves reprocessing into patterns. Reproduction is a production-assembly a process in which the materials used or Cores are extracted, cleaned, repaired or renewed Refurbished, and new or new Qualify for equipment. Recycling is the reprocessing of Waste products are their originals for the purpose or for other purposes. Reproduction At least original to the original equipment manufacturer (OEM). Original Equipment Manufacturer (OEM) performance Returns used the product to specification to the process and the resulting product at least for a newly manufactured equivalent warranty provides an equivalent guarantee. Reproduction is a more thorough and expensive process because it is more rigorous and works towards a higher quality than refurbishing. If the seller cannot meet the true definition of remanufactured, it should be considered a refurbished product. Alternative**:** Width, Size, Thickness, And Weight. Evolution parameter: Mounting Plate, Ball screw, Anti rotation guide, Belt drive mount, Belt pulley assembly, Motor Assembly. Result: from the end based on C Anti rotation guide are the result seen and got the first Rank, whereas the Belt drive mount got having the lowest rank. The Value of dataset for trapezoidal cubic reluctance in VIKOR method shows that it results in C Anti rotation guideand top ranking.

Keywords: Mounting Plate, Thickness, Belt drive mount, Motor Assembly.

Introduction

[3] In addition to reliability, the cost of reproduction is another criterion to consider for process planning. Starting a reproduction business requires a large Initial Infrastructure and equipment Investment to create reproduction. Reproducers only do this if the reproducers make a profit Can go, therefore, Another major The challenge of reengineering process planning is reengineering the process by guaranteeing reliability To improve the project at a low cost.**[9]** This section deals with reproductive activities We focus on cases and models. Many practical cases in different contexts of application are reported. As mentioned above, the network through unique optimization models many jobs are dedicated to scheduling reclamation, pricing, order quantity, limited life cycle of a lot of products on one item. **[13]** Our modeling structure is developed by we extend it in the following way. First, we propose novel optimization models that integrate the CCD-mechanism into traditional production and reproduction and pricing Samples. Secondly, IT-Market and ST- We study two models for the market Third, the effects and production of the CCD mechanism and related to carbon in reproductive products Analysis to examine the parameters expanding. In the first period, the monopoly Manufacturer produced new products on the market using virgin ingredients selling new products. In the second period, the End of life from the market for breeding a certain proportion of products can be collected, so the monopolistic producer can use the income earned Products in the second period In the first period to breed. **[19]** The above review is a design of the RL network important research shows that problem because the conditions leading to model development are unique. The study emphasizes reducing RL costs by selecting locations and capabilities. Research shows that the reproduction commodities and in secondary markets their sales are important concepts that need to be explored for different types of recalled products. Other positions to be considered in the model are warehouses, recycling for inspection and disposal, factories for recycling, recycling, spare parts and markets for recycled materials. Network Preselected New Module suppliers separately considers residue. **[23]** In this study, the Wagner-Witt algorithm is a set-up cost We generalize under the assumption that produces and reproductive systems mentioned above We test experimental modifications of the heuristics. Dynamic through reproduction Some papers written on lot sizing do not consider heuristics. Further, They provide more complex algorithms or more control systems Making assumptions. An overview of previous contributions and our A detailed account of the differences in structure are given in Part 2. **[29**] 14% re- 64 rate. Finally, the authors rank The aforementioned literature review, expert opinions and Based on 66 surveys among students Fifteen factors. These factors are external and internal are classified as factors. External factors To carry out reproductive activities of an organization Stimulate, while internal factors reproduce Self-management of process and administration manage. motivation for reproduction activities. **[33]** Production and reproduction processes have different paths in the production facility. It is assumed that both production and reproduction are done in two steps; the first functions are separate for new parts and revenues, the second function is general. The first

function can be considered as pre-processing and disassembly / testing for new parts; The second function can be considered as the main production activity; At this stage of assembly production, the same unit cost for new and used parts **[49]** Reproducing A part of OE manufacturer's life cycle cost reduces Final on climate change and its impact As consumers become more aware, in the coming years Demand for human goods will increase. Climate change When becomes more important, the Riemann-like environment Sensory output will also increase. Meanwhile, companies Economical with the right tools and planning Focus on the benefits. **[4]** When designing an object, the question of the end of its life is raised and the reproduction approach must be considered. But they are not reproduction experts in all designer groups, and specialists who help designers decide the final aspect of that particular life there are no guidelines. Therefore, we propose to develop methods and tools for predicting whether a reproduction strategy is feasible. To create this expertise, we need to know what product can be produced we first classified. We have now identified what is the most appropriate criterion for establishing the classification of products that can be successfully reproduced. **[47**] The goal of the proposed strategy for restructuring process planning is to identify the optimal reproduction process plan in dynamic contexts. In finding the optimal solution, use multi-scale optimization to achieve the goal of improving reliability and reducing reproduction costs Proposed. The proposed optimization system is divided into three consecutive phrases: **[104]**

Materials & methods

Since there is In vertical handover and real-time Research papers using network selection VIKOR Nothing, they are more numerous Read the documentation, in the context of network selection Use the VIKOR method They gave us an idea. [1] Contradictory and sometimes conflicting solve problems in separate spaces with criteria Introduced VIKOR method for solving. VIKOR stands for multi criteria optimization and compromise decision Serbian abbreviation. [2] TOPSIS and VIKOR methods also give better results Gives, to choose our knowledge Best used are RF-MEMS switches dielectric material with the MODM approach MADM methods for selection This is the first time.[3] and Jurisprudence criteria, and VIKOR method provide the above five rankings Alternatives. Regulators can help Iran and other Islamic countries benefit from short-selling alternatives to the development of capital markets.[4] VIKOR method is another used in MCDM Method, it is designed to improve complexity There are several parameters in the settings. This is the method Ranking and proximity to the best option Basically the best with different criteria Focuses on choice. [5] As usual in most MCDM techniques, VIKOR method is subjective in a fuzzy environment and expanded to accommodate imprecise data various fields.[6] Based on Hamming distance, PHESP sites A VIKOR method is proposed to sort. Various as per the type of decision making information need To be translated, the values of the variables are the same This method is in units very useful for unspecified problems will be. [7] The VIKOR method is a "closer" to the best solution a ranking index based on a specified metric Introducing. On the contrary, the basis of TOPSIS method the principle is that the chosen alternative is optimal "Short-distance" and "negative-optimal" from the solution must be "away" from the solution. [8] An optimal model for determining Attribute weights. Then, the joint interval is valued Intuitive Ambiguous decision matrix and MAGDM traditional VIKOR Problems based on formal interval value resolve calculation steps Intuitive fuzzy estimators and marginally Known weight information is provided. [9] The VIKOR method is the conflicting criteria and Conflicting criteria are final for decision makers' unique multi criteria while helping to arrive at a decision An MCDM method for solving the problem. [10] Normalization technique for decision makers, optimal and optimal TECHNIQUE AND FOR CALCULATING RESISTANCE SOLUTIONS Distance measurement and VIKOR used for Method Maximum Group Utility Strategy (v) weight for method and can be selected. [11] A detailed The VIKOR method was developed to solve the problem, but this Methodology Constraints or continuum of design does not include the Objectives of design with variables. So, a mix The 0-1 goal programming model is an alternative method in this study Material selection and design optimization.[12] VIKOR method This time the other M.C.T.M [13] They use Fuzzy AHP to weight the criteria used And textile suppliers in VIKOR mode Sorted out. AHP and TOPSIS methods for studying Connecting India's fashion apparel industry under uncertainty. [14] The linguistic VIKOR method for 2-tuple linguistic information and appearance Based on the basic principles of VIKOR model has first, to calculate linguistic information Concepts, functional formulas and distance 2-tuple we introduce the method. Linguistics we review some aggregation operator of number we do It is more scientific and reasonable to consider conflicting traits. [15] Application of traditional FMEA method to improve, VIKOR method in this study is used. Vigor is one of the other available MCDM techniques Has a unique ability estimate and rank risk parameters. Fuzzy theory or fuzzy logic is used to connect vagueness and fuzzy knowledge, [16] The VIKOR method is more stable than the TOPSIS method, which Rankings detailed information, and weight Small fluctuation in value of candidate suppliers Has little impact on rankings. And TOPSIS Compared to the algorithm, many of the power grid material equipment in situations involving attribute criteria this is particularly relevant for selecting suppliers. [17] The decision making process is based on A decision to determine the significance of the ANP method Criteria and VIKOR method maintenance strategies sorting. Of the proposed method Applicability Oil refinery as demonstrated by actual research. [18] A simple random technique is used where everyone as a research participant in the population of interest there is an equal chance of being selected. Fuzzy VIKOR Following are the different steps of the method [19] To quantify the Risks in supply chain, selected Best possible solution according to risk parameters Based on extended VIKOR method to determine Fuzzy multi-level group decision-making with We created the model. Of the proposed a practical case to test applicability Research is being conducted method [20]

Analysis and Discussion

TABLE 1. Re-manufacturing in Determination of best and worst value

Determination of best and worst value				
	Width	Size	Thickness	Weight
Mounting Plate	0.704	0.955	0.752	0.604
Ball screw	0.621	0.431	0.607	0.391
Anti □ rotation guide	0.909	0.319	0.703	0.379
Belt drive mount	0.445	0.743	0.712	0.164
Belt pulley assembly	0.547	0.426	0.826	0.526
Motor Assembly	0.266	0.832	0.821	0.436
Best	0.266	0.955	0.826	0.164
worst	0.909	0.319	0.607	0.604

TABLE 1. Re-manufacturing shows the Width it is seen that Motor Assembly the highest value for Anti □ rotation guide is showing the lowest value. Size it is seen that Mounting Plate is showing the highest value for Anti □ rotation guide is showing the lowest value. Thickness it is seen that Belt pulley assembly is showing the highest value for Ball screw is showing the lowest value. Weight it is seen that Belt drive mount is showing the highest value for Mounting Plate is showing the lowest value. **Alternative:** Width, Size, Thickness, Weight. **Evolution parameter**: Mounting Plate, Ball screw, Anti □ rotationguide, Belt drive mount, Belt pulley assembly, Motor Assembly.

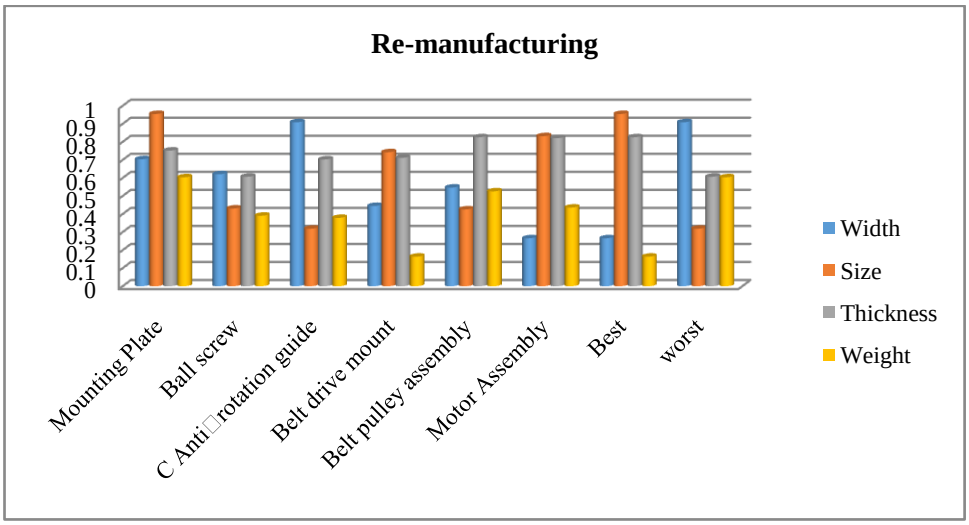


FIGURE 1. Re-manufacturing

Figure 1 show that **Alternative:** Width, Size, Thickness, and Weight. **Evolution parameter**: Mounting Plate, Ball screw, Anti □ rotation guide, Belt drive mount, Belt pulley assembly, Motor Assembly.

TABLE 2. Re-manufacturing in Calculation Sj and Rj

Culculation Sj and Rj				Sj	Rj
0.170295	0	0.084475	0.25	0.50477	0.25
0.138025	0.205975	0.25	0.128977	0.722977	0.25
0.25	0.25	0.140411	0.122159	0.76257	0.25
0.069596	0.083333	0.130137	0	0.283066	0.130137
0.109253	0.20794	0	0.205682	0.522876	0.20794
0	0.048349	0.005708	0.154545	0.208602	0.154545

Table 2 shows the calculation of the Sj and Rj, it is calculated.

TABLE 3. Re-manufacturing in Calculation Sj and Rj and Qj

	Sj	Rj	Qj
	1.00477	0.50477	0.677257
	1.101954	0.722977	0.941552
	1.134729	0.76257	1
	0.413203	0.283066	0.067209
	0.936498	0.522876	0.646287
	0.517693	0.208602	0.072409
S+ R+	0.413203	0.208602	
S- R-	1.134729	0.76257	

Table 3 shows the Sj, Rj, Qj by using the previous tabulation it is the sum of the value. Sj and Rj using the S+ R+ Minimum formula, S- R- Maximum formula.

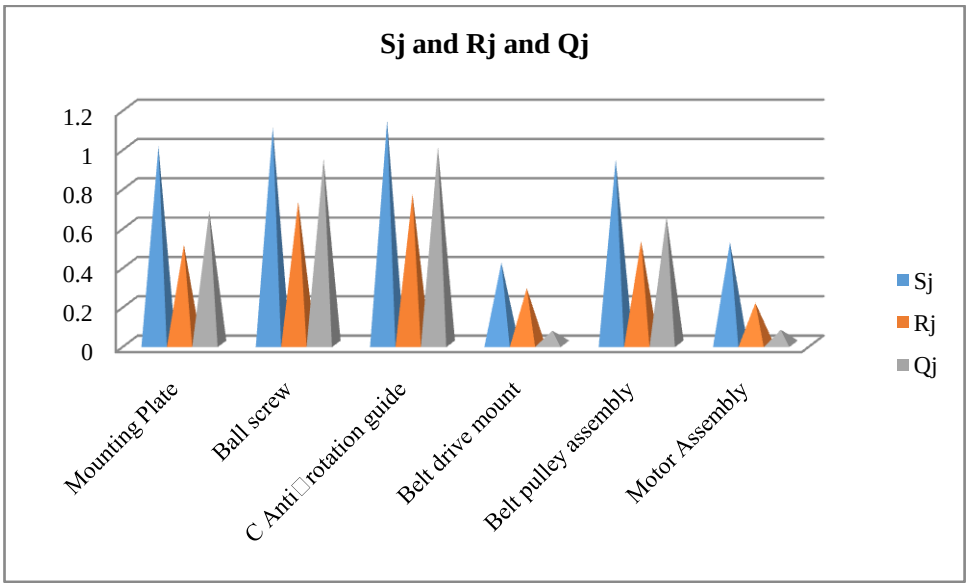


FIGURE 2. Sj and Rj and Qj

Figure 2 shows the graphical view of Calculation Sj and Rj value Sj the B1 RJ C Anti rotation guideis high, Sj Belt drive mount is low.

TABLE 4. Re-manufacturing in Rank

	Rank
Mounting Plate	3
Ball screw	2
C Anti rotation guide	1
Belt drive mount	6
Belt pulley assembly	4
Motor Assembly	5

Table 4 shows the final result of this paper the Mounting Plate 3rd rank, Ball screw is in 2nd rank, C Anti rotation guidein 1st rank, Belt drive mount is in 6th Rank, Belt pulley assembly is in 4th, Motor Assembly 5th The final result is done by using the VIKRO method.

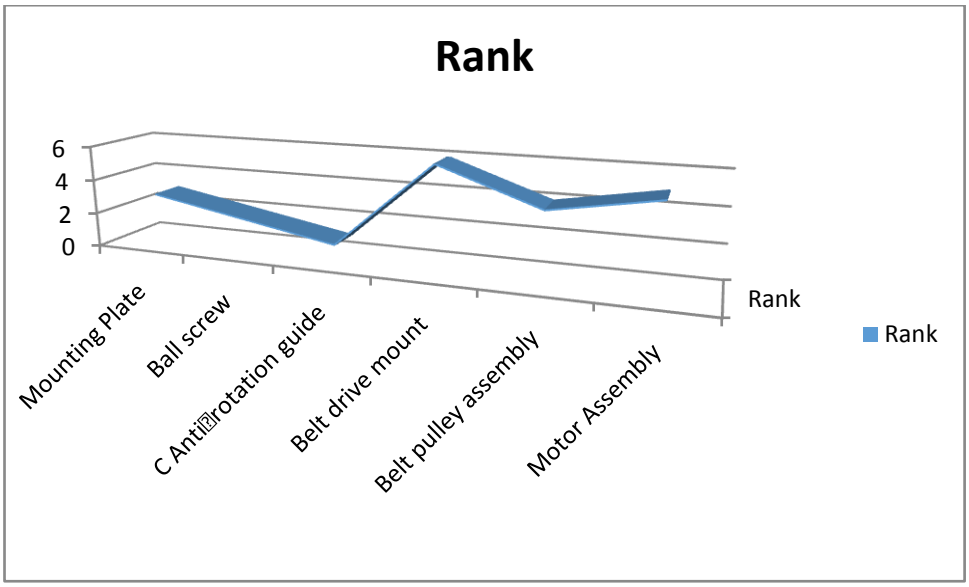


FIGURE 3. Re-manufacturing

Figure 3 shows the from the end based on C Anti rotation guideare the result seen and got the first Rank, whereas the Belt drive mount got having the lowest rank.

Conclusion

Reproducing A part of OE manufacturer's life cycle cost reduces Final on climate change and its impact As consumers become more aware, in the coming years Demand for human goods will increase. Climate change When becomes more

important, the Riemann-like environment Sensory output will also increase. Meanwhile, companies Economical with the right tools and planning Focus on the benefits. This section deals with reproductive activities We focus on cases and models. Many practical cases in different contexts of application are reported. As mentioned above, the network through unique optimization models many jobs are dedicated to scheduling reclamation, pricing, order quantity, limited life cycle of a lot of products on one item. The VIKOR method is a "closer" to the best solution a ranking index based on a specified metric Introducing. On the contrary, the basis of TOPSIS method the principle is that the chosen alternative is optimal "Short-distance" and "negative-optimal" from the solution must be "away" from the solution. [8] An optimal model for determining Attribute weights. Then, the joint interval is valued Intuitive Ambiguous decision matrix and MAGDM traditional VIKOR Problems based on formal interval value resolve calculation steps Intuitive fuzzy estimators and marginally Known weight information is provided. [9] The VIKOR method is the conflicting criteria and Conflicting criteria are final for decision makers' unique multi criteria while helping to arrive at a decision An MCDM method for solving the problem.

Reference

1. Maroua, Drissi, Oumsis Mohammed, and Aboutajdine Driss. "VIKOR for multi-criteria network selection in heterogeneous wireless networks." In 2016 International Conference on Wireless Networks and Mobile Communications (WINCOM), pp. 82-86. IEEE, 2016.
2. Golfam, Parvin, Parisa-Sadat Ashofteh, and Hugo A. Loáiciga. "Evaluation of the VIKOR and FOWA multi-criteria decision making methods for climate-change adaptation of agricultural water supply." Water Resources Management 33, no. 8 (2019): 2867-2884.
3. Patra, Pritam, and Mahesh Angira. "Investigation on dielectric material selection for RF-MEMS shunt capacitive switches using Ashby, TOPSIS and VIKOR." Transactions on Electrical and Electronic Materials 21, no. 2 (2020): 157-164.
4. Ahmadvand, Maysam, and Hossein Tamalloki. "Using VIKOR method to prioritise sharia-compliant equivalents for short selling (based on evidence of Iran's stock market)." Afro-Asian Journal of Finance and Accounting 7, no. 3 (2017): 281-303.
5. Shahnazari, Arman, Hamed Pourdej, and Monali Dhondiram Kharage. "Ranking of organic fertilizer production from solid municipal waste systems using analytic hierarchy process (AHP) and VIKOR models." Biocatalysis and Agricultural Biotechnology 32 (2021): 101946.
6. Afful-Dadzie, Eric, Stephen Nabareseh, and Zuzana Komínková Oplatková. "Fuzzy VIKOR approach: Evaluating quality of internet health information." In 2014 Federated Conference on Computer Science and Information Systems, pp. 183-190. IEEE, 2014.
7. Wu, Yunna, Lingyun Liu, Jianwei Gao, Han Chu, and Chuanbo Xu. "An extended VIKOR-based approach for pumped hydro energy storage plant site selection with heterogeneous information." Information 8, no. 3 (2017): 106.
8. Wu, Min, and Zhujun Liu. "The supplier selection application based on two methods: VIKOR algorithm with entropy method and Fuzzy TOPSIS with vague sets method." International Journal of Management Science and Engineering Management 6, no. 2 (2011): 109-115.
9. Xu, Chen Guang, Dong Xiao Liu, and Min Li. "Extension of VIKOR method for multi-attribute group decision making with incomplete weights." In Applied Mechanics and Materials, vol. 513, pp. 721-724. Trans Tech Publications Ltd, 2014.
10. Ramezaniyan, M., M. Kazemi, H. Jafari, and S. Elahi. "Application of integrated fuzzy VIKOR & AHP methodology to contractor ranking." Management Science Letters 2, no. 5 (2012): 1511-1526.
11. Papathanasiou, Jason, Nikolaos Ploskas, Thomas Bournaris, and Basil Manos. "A decision support system for multiple criteria alternative ranking using TOPSIS and VIKOR: a case study on social sustainability in agriculture." In International conference on decision support system technology, pp. 3-15. Springer, Cham, 2016.
12. Jahan, Ali. "Material selection in biomedical applications: comparing the comprehensive VIKOR and goal programming models." International Journal of Materials and Structural Integrity 6, no. 2-4 (2012): 230-240.
13. Ishak, Aulia, and Bagas Nainggolan. "Integration of Fuzzy AHP-VIKOR Methods in Multi Criteria Decision Making: Literature Review." In IOP Conference Series: Materials Science and Engineering, vol. 1003, no. 1, p. 012160. IOP Publishing, 2020.
14. Karami, Shirin, R. Ghasemy Yaghin, and Fatemeh Mousazadegan. "Supplier selection and evaluation in the garment supply chain: An integrated DEA–PCA–VIKOR approach." The Journal of the Textile Institute 112, no. 4 (2021): 578-595.
15. Han, Weicheng, Yu Yao, and Yubo Gao. "VIKOR method for effect evaluation of ancient village landscape planning based on the heritage historical context under 2-tuple linguistic enviroment." Journal of Intelligent & Fuzzy Systems 37, no. 2 (2019): 1945-1952.
16. Rathore, Rishabh, J. J. Thakkar, and J. K. Jha. "Evaluation of risks in foodgrains supply chain using failure mode effect analysis and fuzzy VIKOR." International Journal of Quality & Reliability Management (2020).
17. Yang, Yatang, Gang Sun, Yansong Liu, and Fumin Chen. "Application of hybrid MCGDM model combined with VIKOR method in power grid equipment optimization." In IOP Conference Series: Materials Science and Engineering, vol. 892, no. 1, p. 012059. IOP Publishing, 2020.
18. Arjomandi, Mohammad A., Fateme Dinmohammadi, Behzad Mosallanezhad, and Mahmood Shafiee. "A fuzzy DEMATEL-ANP-VIKOR analytical model for maintenance strategy selection of safety critical assets." Advances in Mechanical Engineering 13, no. 4 (2021): 1687814021994965.

19. Ayouni, Sarra, Leila Jamel Menzli, Fahima Hajjej, Mohamed Maddeh, and Shaha Al-Otaibi. "Fuzzy Vikor application for learning management systems evaluation in higher education." International Journal of Information and Communication Technology Education (IJICTE) 17, no. 2 (2021): 17-35.
20. Nazam, Muhammad, Jamil Ahmad, Muhammad Kashif Javed, Muhammad Hashim, Adnan Sarwar, and Shahid Rasheed. "A fuzzy multi-criteria group decision making model for measuring risks in a supply chain using extended VIKOR method." In Proceedings of the Ninth International Conference on Management Science and Engineering Management, pp. 1465-1476. Springer, Berlin, Heidelberg, 2015.
21. Jiang, Zhigang, Tingting Zhou, Hua Zhang, Yan Wang, Huajun Cao, and Guangdong Tian. "Reliability and cost optimization for remanufacturing process planning." Journal of cleaner production 135 (2016): 1602-1610.
22. Kenné, Jean-Pierre, Pierre Dejax, and Ali Gharbi. "Production planning of a hybrid manufacturing–remanufacturing system under uncertainty within a closed-loop supply chain." International Journal of Production Economics 135, no. 1 (2012): 81-93.
23. Chang, Xiangyun, Haiyang Xia, Huiyun Zhu, Tijun Fan, and Hongqing Zhao. "Production decisions in a hybrid manufacturing–remanufacturing system with carbon cap and trade mechanism." International Journal of Production Economics 162 (2015): 160-173.
24. Mutha, Akshay, and Shaligram Pokharel. "Strategic network design for reverse logistics and remanufacturing using new and old product modules." Computers & Industrial Engineering 56, no. 1 (2009): 334-346.
25. Teunter, Ruud H., Z. PelinBayindir, and Wilco Van Den Heuvel. "Dynamic lot sizing with product returns and remanufacturing." International Journal of Production Research 44, no. 20 (2006): 4377-4400.
26. Singhal, Deepak, SushantaTripathy, and Sarat Kumar Jena. "Sustainability through remanufacturing of e-waste: Examination of critical factors in the Indian context." Sustainable Production and Consumption 20 (2019): 128-139.
27. Bayındır, Z. Pelin, NesimErkip, and RefikGüllü. "A model to evaluate inventory costs in a remanufacturing environment." International Journal of Production Economics 81 (2003): 597-607.
28. Subramoniam, Ramesh, Donald Huisingh, and RatnaBabuChinnam. "Remanufacturing for the automotive aftermarket-strategic factors: literature review and future research needs." Journal of Cleaner Production 17, no. 13 (2009): 1163-1174.
29. Ovchinnikov, Anton, Vered Blass, and Gal Raz. "Economic and environmental assessment of remanufacturing strategies for product+ service firms." Production and Operations Management 23, no. 5 (2014): 744-761.
30. Yang, S. S., N. Nasr, S. K. Ong, and A. Y. C. Nee. "Designing automotive products for remanufacturing from material selection perspective." Journal of Cleaner Production 153 (2017): 570-579.
31. Macedo, Pedro Belluco, Douglas Alem, Maristela Santos, Muris Lage Junior, and Alfredo Moreno. "Hybrid manufacturing and remanufacturing lot-sizing problem with stochastic demand, return, and setup costs." The International Journal of Advanced Manufacturing Technology 82, no. 5-8 (2016): 1241-1257.
32. Golany, Boaz, Jian Yang, and Gang Yu. "Economic lot-sizing with remanufacturing options." IIE transactions 33, no. 11 (2001): 995-1004.
33. Van Wassenhove, Luk N., and Christos Zikopoulos. "On the effect of quality overestimation in remanufacturing." International Journal of Production Research 48, no. 18 (2010): 5263-5280.
34. Minner, Stefan, and Rainer Kleber. "Optimal control of production and remanufacturing in a simple recovery model with linear cost functions." OR-Spektrum 23, no. 1 (2001): 3-24.
35. Bulmuş, Serra Caner, Stuart X. Zhu, and Ruud Teunter. "Capacity and production decisions under a remanufacturing strategy." International Journal of Production Economics 145, no. 1 (2013): 359-370.

