REST Publisher; ISSN No: 2583-4800 (Online)

Journal on Advances in Mechanical Engineering

journal homepage: http://restpublisher.com/journals/jame/

Selected Diagnostic Methods of Electrical Machines Operating in Industrial Conditions using VIKOR Method

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ARTICLE INFO

Article history:
Received: 5 March 2026
Accepted: 25 March 2026
Available online: 31 March 2026

Keywords:
Sustainable Energy Solutions
Electric Transportation
Smart Grid Technologies
Industrial Automation and Energy Storage Systems

ABSTRACT

Unlike manufacturing technologies, Information Technology (IT) plays a unique role within organizations by shaping processes through continuous interaction with systems. During Japan's industrialization era in the 1980s, machinery served as the driving force behind the growth of the electronics sector; however, structural disparities created a gap between manufacturing technologies and IT integration. As economies began to transition into information societies, IT often failed to align effectively with organizational structures. Consequently, this constrained growth and hindered operational advancement. This misalignment slowed the pace of Research and Development (R&D) within Japan's electrical and machinery sectors, leading to a stagnation in the intensity of innovation. Supported by simulation and experimental validation, this study introduces a practical diagnostic technique for detecting inter-turn insulation faults in AC circuits. Its simplicity makes it highly suitable for application in industrial machinery. Furthermore, mechanical faults—such as bearing failures—are inherently associated with vibrations; this underscores the importance of integrating such measurements into maintenance decision-making processes. Investment patterns reveal that family-owned firms within Japan's electrical machinery sector invest more aggressively than their non-family counterparts. This reflects a higher risk-taking propensity and fewer agency conflicts. Meanwhile, India's machinery industry—despite possessing comparable equipment—faces challenges stemming from both internal operational inefficiencies and external market pressures. Government initiatives and Foreign Direct Investment (FDI)—particularly capital inflows channeled through multinational corporations—are expected to play a key role in enhancing the capabilities and competitiveness of this sector.

1. INTRODUCTION

Examining a dynamic factor demand model that revolves around specific expenditures related to various factors of production, all while acknowledging explicitly that altering the scale is not feasible. This model evaluates interim production outcomes by linking them to the incurred costs, commonly known as "adjustment costs," which are defined within this context as the output reduction in production [1]. This article discusses academia's involvement in Industrial Research and Development, particularly emphasizing the collaborative efforts of multiple authors in the fields of combined and electrical machinery. It highlights the significance of these topics within the research community and delves into specific analyses pertaining to crucial electromechanical configurations essential for the design process. Moreover, the article concentrates on addressing intricate and challenging issues within these areas of study. This article presents comprehensive experimental findings accompanied by visual aids, focusing on the design, production, and operational methodologies of

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DOI: https://doi.org/10.46632/jame/5/1/4

electric machines. It sheds light on lesser-known aspects, emphasizing intricate details. The integration of electric machines introduces a fresh approach to system dynamics, with an emphasis on the crucial role they play in intricate operations [2]. The advancement of information technology, spurred by self-promotion, presents a new level of sophistication. This progress in electric machinery holds potential for offering valuable insights. Within the context of an IT-centric economy, such advancements have led to notable contributions. These insights stem from research on the structural hindrances in R&D, with a focus on fifty-four Japanese companies known for their intensive research and development efforts. A comparative empirical study is undertaken, specifically analyzing electrical machinery and pharmaceutical firms [3]. Vibrations in electrical machinery can be troublesome when they exceed acceptable levels, indicating potential failure. Ignoring these signs can lead to catastrophic consequences, posing real dangers. Addressing vibration issues is crucial as the costs of dealing with the aftermath, such as repairing or replacing components, often surpass those of implementing vibration detection systems. Monitoring vibrations helps in assessing the extent of component degradation and allows for the collection and analysis of relevant data to mitigate risks effectively [4]. In markets like displays, Japanese manufacturers face intense competition from Korean and Taiwanese family firms who are aggressively increasing their production capacity. This article aims to examine whether non-family companies invest more than their family counterparts. Family firms are distinct in their investment approach, not only in terms of the scale of their investments but also in their timing. For instance, while Samsung Electronics, a leading DRAM manufacturer, has been expanding its production capacity, Japanese firms have been cautious and refrained from such investments until demand rebounds [5]. One responsibility of the Electrical Engineering Committee, partly overseen by this group, involves reviewing various submitted subjects, procuring pertinent documents, and conducting thorough assessments leading to significant accomplishments. The committee also holds regular and regional meetings. The table below illustrates the classification of documents by the number of sheets [6]. The utilization of machinery represents a form of labor that enhances productivity and substitutes subjective human judgments in production wherever feasible, thereby introducing more precise and manageable processes. Furthermore, the widespread adoption of advanced and outdated machinery within user organizations aids in streamlining the adaptation process. For instance, within the mechanical manufacturing industry, when a cost-saving innovation emerges, it benefits both machinery manufacturers and enhances the productivity of companies utilizing such technology, thus substantially boosting overall productivity. Thirdly, the productivity growth in the manufacturing sector outpaces that of the machine-consumer sector of the economy [7]. Assessing computer health involves several methods such as examining plant infrastructure, operational workflows, and repair accessibility. Cost-effective Condition-Based Maintenance (CBM) can be achieved through monitoring tools, considering factors like measurement uncertainties and fault thresholds. Despite potential false positives, statistical methods help minimize negatives. The success of CBM in a plant depends on factors like the monitoring system's effectiveness, overall cost, operational arrangement, and benefits compared to maintenance costs over the plant's lifespan [8]. The energy density and efficiency of traction machines are on the rise, driven by a growing desire for improvement and innovation. This trend has led to the development of new designs and machinery, as well as topological enhancements. Traction drives with high specific energy for systems are becoming more prevalent, with a focus on increasing machine density. This article offers insights into current technology and industry standards, highlighting the ongoing efforts to achieve specific energy goals. It emphasizes the trends expected to persist in the future [9]. Only a handful of electric vehicle (EV) manufacturers have released technical literature on the machinery design utilized in production. While there are technical documents available, they do not provide comprehensive details on the design. Much of our understanding regarding the electric machines used in EVs comes from researchers in the field and from reverse engineering conducted by third parties. Numerous companies engage in dissecting EVs to gain insights into their system configurations. Leading this effort is Oak Ridge National Laboratory (ORNL), which has conducted thorough studies in this domain, making their findings openly accessible [10]. Moving towards sustainable development involves addressing global changes and reducing carbon emissions, particularly in energy production. Significant strides have been taken in various sectors, with a pivotal focus on electrifying transportation and employing high-efficiency electrical machines. The manufacturing of reliable and top-notch electrical machines plays a crucial role in meeting these demands, marking a significant shift in the paradigm towards cleaner growth. For instance, the production of electrical machinery is primarily geared towards serving the aerospace industry. Fulfilling the criteria of examinations necessitates further enhancement in the manufacturing process. Ensuring precise control and tolerance becomes a challenging task, especially within a tightly

regulated setting. Adhering to the demanded standards of tolerance and quality entails dealing with potential repercussions [11]. Electromagnets housed within transformers and rotating machinery generate magnetic fields that interact with other physical fields and external circuits. These interactions are crucial for accurate analysis, necessitating a comprehensive treatment of combined fields. Among various methods, the finite element method (FEM) stands out as the most favored for solving such complex coupled field problems. In the paper, much of the discussion revolves around utilizing FEM for analyzing combined fields, particularly in the context of transformers and rotating machinery. It begins by categorizing formulas and then delves into the intricacies of magneto-thermal and magneto-mechanical issues. Recent research attention on addressing problems specific to transformers and rotating machinery is highlighted and thoroughly examined [12]. Over time, dedicating oneself to a specific region exposes one to its varying environmental conditions, shaping corporate leaders' risk assessments. c Moreover, power differentials within communities can hinder immediate responses to potential hazards, affecting both corporate decision-makers and local residents [13]. In the realm of small to medium-sized electric motor manufacturing, companies are constantly introducing new products to equip their factories with the latest technology. They also ensure they have enough capital to invest in automation, like their larger counterparts, to remain competitive amidst low-cost manufacturing from emerging countries. Despite facing stiff competition, smaller electrical machinery industries manage to stay afloat by focusing on specialized product offerings [14]. The majority of energy production involves converting renewable sources (such as wind, ocean, and geothermal), along with coal, natural gas, and nuclear power, into electromechanical energy. This energy is then adjusted according to voltage demands and distributed. After transmission, the same principle is applied for further significant usage. Approximately 300 million industrial electric motors are currently installed, with an annual volume increase of 15%. Differentiating between internal rotor, external rotor, rotary, axial flux, and translational motion variations adds complexity to the motor selection process. When it comes to motors for Direct Online (DOL) applications versus electronic applications with speed control via converters, distinguishing them becomes crucial due to potential adverse effects [15].

2. MATERIALS AND METHOD

Sustainable Energy Solutions: Instead of relying on fossil fuels, renewable energy sources such as wind, hydroelectric, solar, and geothermal power are much more reliable. However, the production of biofuels can sometimes involve practices like deforestation, which can have significant environmental consequences, thereby making renewable energy projects demanding in terms of their environmental impact.

Electric Transportation: The urban area boasting the highest number of electric buses after China is Bogotá in Massachusetts, specifically within the Greater Boston region, managed by the Non-Gulf Transportation Authority. The Plan USA trolleybus operates on battery electric power, while the standard for the Protegra BE35 bus is also electric. Charging stations are located near San Joaquin, and the RTD relies on battery power. Additionally, Hong Kong utilizes Edison buses for electric transportation.

Smart Grid Technologies: Smart grids are essentially electrical networks enhanced with digital technologies, sensors, and software. These advancements enable real-time monitoring and adjustment of power supply to efficiently meet demand, ultimately lowering costs while ensuring grid stability and reliability.

Industrial Automation: Industrial automation refers to the utilization of computer software, robotics, and control systems to operate processes and machinery in various industries without the constant presence of human operators. It involves a range of technologies that enable automatic operation, thereby reducing the reliance on manual intervention.

Energy Storage Systems: An energy storage system, commonly referred to as ESS, is a device or a collection of devices designed to store energy for future use. It has the capability to store electrical energy and release it when needed.

Technological Advancements: Advancements in science and technology continually enhance accuracy, precision, efficiency, and potency, driving progress and competence. The history of technological development reflects a spectrum of impactful changes, with some innovations surpassing others in their effectiveness and significance.

Market Trends and Demand: Analyzing market direction enables businesses to discern emerging prospects and potential threats, thereby aiding in strategic decision-making. By scrutinizing market trends, companies can allocate resources efficiently, enhance product quality, devise effective marketing approaches, and ultimately elevate their operational efficiency.

Economic Contribution: Measuring the economic impact of manufactured products and services is crucial, often done through indicators like Gross Domestic Product (GDP). Various measures are employed to gauge this impact, including the number of jobs created and overall employment levels, which provide insights into the quality of jobs. Additionally, assessing the distribution and amount of income, which encompasses wages, salaries, and profits, helps to understand the economic landscape further.

Global Competitiveness: Here are various factors, such as infrastructure (covering energy, transportation, telecom, basic resources, and technical support), macroeconomics (comprising exchange rates, taxation, GDP growth, lending rates, interest rates, and wage policies).

VIKOR Method: In numerous sectors, companies are broadening their new product development efforts beyond their organizational confines by outsourcing. This expansion is driven by innovations. Involving suppliers in product development is becoming crucial and, for many firms, unavoidable. To effectively execute this strategy, organizations must carefully consider contingencies at the organizational and project levels, ensuring proper management of supplier engagement. Choosing suppliers is often a tricky task, especially for decision-makers. This difficulty arises primarily due to the complexity of the function involved. The circumstances surrounding supplier selection are often ambiguous and uncertain, further complicating matters. Context plays a significant role in determining outcomes in such situations. Therefore, caution is warranted when making decisions in this realm. Practical application demands a systematic approach. As criteria and alternatives multiply, relying solely on the human brain to analyze and establish relationships between them becomes exceedingly challenging. In fact, it can border on impossibility. This is where decision-making techniques become indispensable, particularly when dealing with numerous criteria [16]. According to the European Commission's report in 2014, European Union (EU) countries and emerging economies are considered significant destinations for Foreign Direct Investment (FDI) on a global scale. Despite this importance, the selection of the most attractive investment targets within the EU presents a complex decision-making challenge due to various criteria involved. This research aims to address this challenge by focusing on FDI inflows into the EU and identifying the most appealing investment destinations based on specific criteria. To achieve this, a newly developed algorithm called VIKOR (Vise Kriterijumska Optimizacija I Kompromisno Resenje) is utilized. The study covers the period from 2010 to 2013, with the year 2010 serving as the starting point, marked as the beginning of economic recovery [17]. The proposed problem revolves around assessing the availability of software character, specifically within the context of SAPEVO-M article. It suggests employing hybrid modeling techniques, incorporating VIKOR method for evaluating alternatives based on scale and weighting. The main constraint is the tight budget of the country, which necessitates stringent project control measures. Moreover, the existing infrastructure, particularly the naval base structure, needs to be taken into account. The assessment primarily focuses on rating cities, particularly prioritizing them for the construction and maintenance complex, which demands a substantial amount of funds from the general budget [18]. In this research, seven geographic datasets related to NPCD were utilized. Each layer was carefully extracted and assigned a suitable score based on its relevance. A C-A fractal model was employed to distribute weights among different population categories. Subsequently, a final result matrix was generated based on these criteria and sub-criteria weights. Multi-Parameter Maps (MPMs) were then formulated using this matrix. Two methods, VIKOR and IO, were applied to introduce variations. Finally, the effectiveness of each map was assessed by comparing it with drilling results [19]. The paper discusses the integration of the VIKOR methodology with Prospect Theory in the context of a multi-energy micro grid. It outlines the development of an evaluation method for such micro grids. Initially, a comprehensive index system for evaluating micro grids is constructed, considering the subjective inclinations of decision makers. The theory of Prospect Theory is then introduced to assess the benefits of micro grid opportunities. Subsequently, an opportunity value function is established, and weights are assigned to evaluation indicators to ensure fairness and effectiveness in reaching a compromise plan. The VIKOR method is employed for the

comprehensive evaluation of micro grid projects. Finally, the paper demonstrates the rationality and effectiveness of this approach through illustrative examples [20]. We propose investigating the foundation of synthesis through the lens of linguistic value, encompassing both soft and rough attributes. In this context, we introduce a novel approach, blending soft-coarse synthesis with the VIKOR method. Our aim is to devise a methodology capable of addressing multi-attribute ranking decision challenges, leveraging linguistic information fusion. In essence, linguistic value is flexible and subjective, determined by multiple attributes such as roughness. Our method involves ranking decision problems using a synthesis approach combined with the VIKOR method [21]. This research focuses on creating a decision support system to aid call center employees. It investigates the factors involved using the Multi-Criteria Decision Making (MCDM) technique known as the VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) method. VIKOR is chosen because it's tailored for situations with multiple criteria. By employing this method, the study quantifies the values necessary for selecting prospective call center staff, aiming to streamline the decision-making process and minimize potential regrets [22]. In the early stages of decision-making, when the values associated with objects are relatively straightforward, a technique called Many Attributed Group Decision Making (MAGDM) is commonly used for evaluation. However, as problems become more intricate, ambiguity and imprecise information often arise, which can be challenging to express clearly. To address this, Jadewal introduced Fuzzy Set (FS) theory. Nevertheless, many Decision Makers (DMs) struggle to fully grasp FSs due to their complexity. To overcome this limitation, Dora proposed the concept of Hesitant Fuzzy Set (HFS), which allows DMs to express their evaluations using unique fuzzy numbers and spans the spectrum of uncertainty from complete certainty to complete hesitation. In certain scenarios, DMs may prefer to use qualitative descriptors rather than quantitative values to convey their assessment information [23]. The criteria for evaluating websites can often be intricate, conflicting, and open to different interpretations. Hence, our approach involves devising a collective decision-making framework. This framework aims to reconcile the various, often conflicting, criteria involved in internet evaluation, which tend to be ambiguous and inconsistent. To effectively manage information in such scenarios, we rely on the Neutrosopic approach, particularly utilizing the VIKOR method. This method proves valuable in addressing the challenges posed by conflicting and diverse criteria, especially when dealing with decision problems involving multiple, sometimes unattainable, criteria [24]. Fuzzy VIKOR, a method for multi-criteria optimization and compromise solution, operates within a realm of subjectivity and indirectness. Its strength lies in its capacity to translate linguistic expressions into objective and transparent data, despite inherent ambiguities. This integration is facilitated by optional employment of AHP (Analytic Hierarchy Process) alongside the Fuzzy VIKOR method within PLM strategies, thus providing a structured approach to decision-making. Within this framework, local weights, also known as fuzzy pairs, are ascertained through comparison matrices, enabling the delineation of criteria weights [25]. To streamline the selection of effective professional development (PD) partners, it's essential to establish a structured evaluation process to assist managers. This involves developing a framework and defining key components, with the primary focus on facilitating decision-making. This includes crafting various aspects of the model and, essentially, identifying the criteria for evaluation. Furthermore, the application of these methodologies within specific contexts adds originality to the paper's contributions. Specifically, the integration of AHP-VIKOR methodology for partner selection is a novel approach not found in existing literature [26]. The VIKOR system, a sophisticated framework, was devised to enhance criteria. This approach prioritizes selecting alternatives amidst conflicting criteria. It focuses on ranking alternatives based on a specific measure of proximity, effectively addressing human subjectivity, ambiguity, and experiential aspects in decision-making. This paper introduces an evaluation model that accommodates ambiguity through numerical data, interval numbers, and linguistic terms [27]. MCDM, or Multiple Criteria Decision Making, entails identifying the optimal choice from a multitude of possibilities, each characterized by various and often conflicting criteria. This process navigates through uncertainty and ambiguity inherent in real-life scenarios, where decision makers face constraints such as time limitations, data scarcity, and insufficient knowledge. These challenges particularly hinder fair evaluations for individuals with diverse abilities. To address this, leveraging Fuzzy Set (FS) theory becomes imperative. FS theory offers a means to mitigate uncertainty, vagueness, and the ill-defined nature of decision-making contexts, thereby aiding decision makers in arriving at more informed and equitable choices [28]. Enhancing productivity in contemporary research involves exploring value-based financing for businesses, incorporating a hybrid model to assess performance. The suggested approach integrates benchmarking techniques with accounting operations. It introduces an analytical framework encompassing four criteria and proposes economic value metrics comprising seven criteria for evaluating companies

[29]. The decision ultimately rests with the DMs, who are responsible for managing any complications stemming from instability. In group decision-making, the DMs play a pivotal role beyond mere judgment. Each term of the sequence corresponds to the conclusion drawn. This underscores the challenge posed by uncertainty in synthesis, which complicates decision-making processes. As the sequence lengthens, the data becomes increasingly uncertain, making accurate modeling more difficult. Consequently, there is a demand for a novel fuzzy set concept capable of effectively modeling and extracting pertinent information from arrays of varying lengths [30].

3. ANALYSIS AND DISCUSSION

TABLE 1. Technological Advancements and Market Analysis

Technological Advancements	Market Trends and Demand	Economic Contribution	Global Competitiveness	
Sustainable Energy Solutions	11.22	16.25	89.23	41.12
Electric Transportation	22.33	26.35	79.52	51.13
Smart Grid Technologies	44.22	46.65	49.62	61.14
Industrial Automation	55.66	96.35	79.85	71.15
Energy Storage Systems	77.99	85.65	85.63	81.65
Best	11.22	96.35	89.23	41.12
Worst	77.99	16.25	49.62	81.65

Table 1 shows the VIKOR method was applied to evaluate the Electrical Machinery Industry across four criteria: Technological Advancements, Market Trends and Demand, Economic Contribution, and Global Competitiveness. The best values were found in Industrial Automation for Market Trends and Demand (96.35) and Sustainable Energy Solutions for Technological Advancements (11.22) and Economic Contribution (89.23), while the worst values were found in Energy Storage Systems for Global Competitiveness (81.65) and Sustainable Energy Solutions for Market Trends and Demand (16.25).

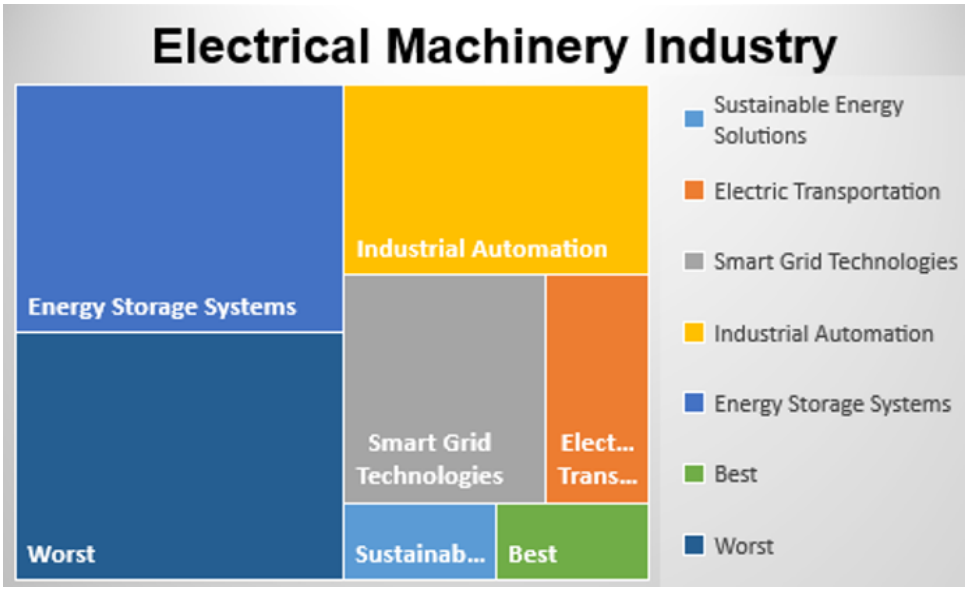

FIGURE 1. Determination of best and worst value of Electrical Machinery Industry

The VIKOR method was utilized to assess the Electrical Machinery Industry across Technological Advancements, Market Trends and Demand, Economic Contribution, and Global Competitiveness. Notably, Industrial Automation achieved the highest score for Market Trends and Demand (96.35), while Sustainable Energy Solutions scored lowest for Market Trends and Demand (16.25).

Table 2 displays the calculation of Sj and Rj values using the VIKOR method for various aspects of performance within the

TABLE 2. Performance Evaluation with S_j and R_j Values

Alternative	Electrical Performance	Thermal Performance	Mechanical Strength	Environmental Resistance	S_j	R_j
Sustainable Energy Solutions	0.000000	0.250000	0.000000	0.000000	0.250000	0.250000
Electric Transportation	0.041598	0.218477	0.061285	0.061744	0.383104	0.218477
Smart Grid Technologies	0.123558	0.155119	0.250000	0.123489	0.652166	0.250000
Industrial Automation	0.166392	0.000000	0.059202	0.185233	0.410827	0.185233
Energy Storage Systems	0.250000	0.033396	0.022722	0.250000	0.556117	0.250000

electrical machinery industry. These values help assess the overall utility and relative closeness to the ideal solution for each alternative, aiding decision-makers in evaluating and ranking the options effectively.

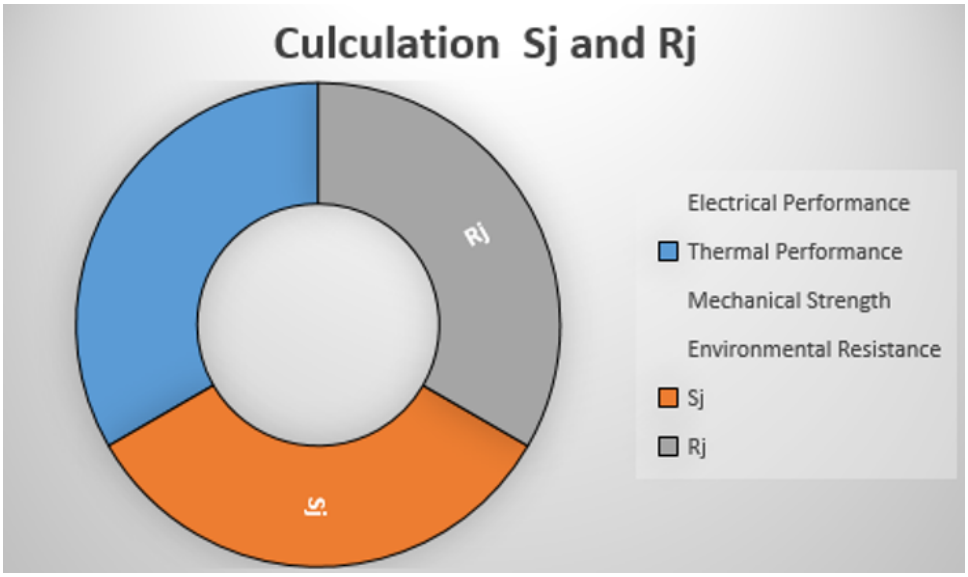

Figure **??** illustrates the computation of Sj and Rj values using the VIKOR method across various performance metrics in the electrical machinery industry. These values serve to gauge the overall utility and proximity to the ideal solution for each alternative, facilitating informed decision-making and comparative analysis among the options available.

TABLE 3. Ranking Based on S_j, R_j, and Q_j Values

Alternative	S_j	R_j	Q_j	Rank
Sustainable Energy Solutions	0.500000	0.250000	0.000000	5
Electric Transportation	0.663326	0.383104	0.312329	4
Smart Grid Technologies	1.025655	0.652166	0.972611	1
Industrial Automation	0.781294	0.410827	0.452860	3
Energy Storage Systems	1.056117	0.556117	0.880586	2

Interoperability is vital for understanding the relationships between solutions in Table 3, derived through the VIKOR method. Analyzing how Sustainable Energy Solutions, Electric Transportation, Smart Grid Technologies, Industrial Automation, and Energy Storage Systems interact enables better decision-making, ensuring alignment with overarching objectives and stakeholder requirements for effective integration. Interoperability is vital for understanding the relationships between solutions in Table 3, derived through the VIKOR method. Analyzing how Sustainable Energy Solutions, Electric Transportation, Smart Grid Technologies, Industrial Automation, and Energy Storage Systems interact enables better decision-making, ensuring alignment with overarching objectives and stakeholder requirements for effective integration.

Interoperability is crucial for understanding Figure 2 , which illustrates the Sj, Rj, and Qj calculations using the VIKOR method. By analyzing the relationships between Sustainable Energy Solutions, Electric Transportation, Smart Grid Technologies, Industrial Automation, and Energy Storage Systems, stakeholders can optimize decision-making for effective integration and alignment with overarching goals.

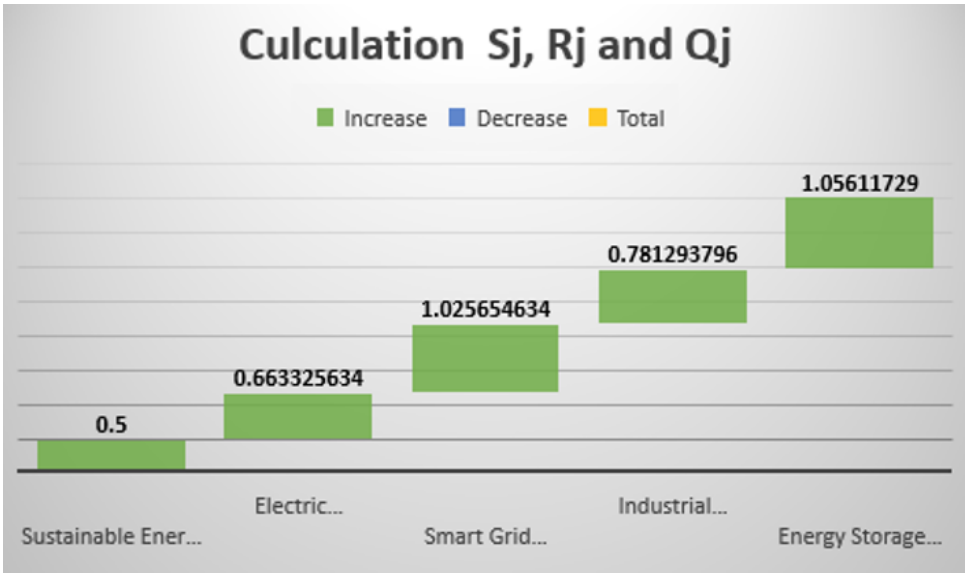

FIGURE 2. Calculation Sj, Rj and Qj

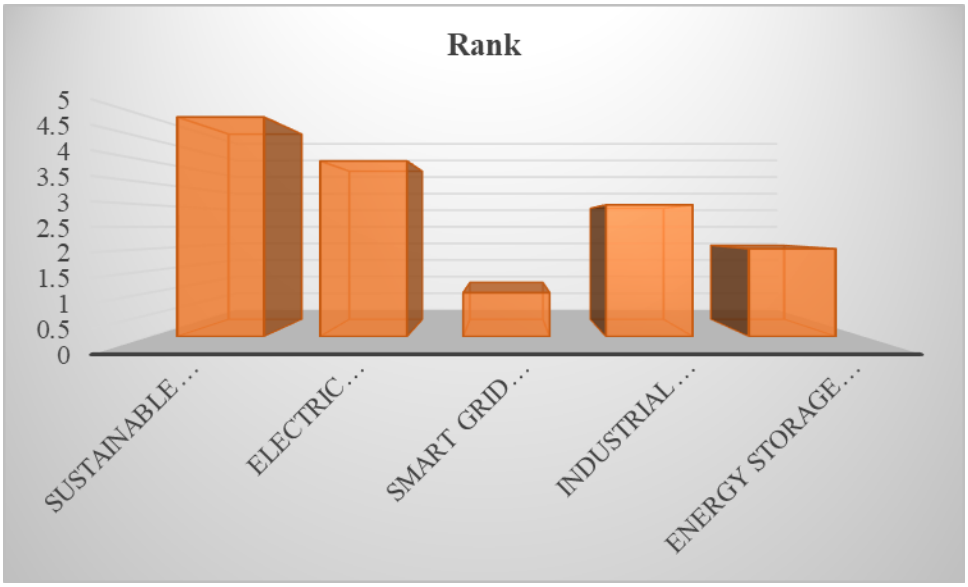

FIGURE 3. Shown the Rank

Interoperability is essential for interpreting Figure 3 , which displays the ranking results obtained through the VIKOR method. Understanding the ranked positions of Sustainable Energy Solutions, Electric Transportation, Smart Grid Technologies, Industrial Automation, and Energy Storage Systems allows stakeholders to prioritize integration efforts effectively in alignment with organizational objectives. Smart Grid Technologies is got the first rank whereas is the Sustainable Energy Solutions is having the Lowest rank.

4. CONCLUSION

This model evaluates interim production outcomes by linking them to the incurred costs, commonly known as "adjustment costs," which are defined within this context as the output reduction in production. This article presents comprehensive experimental findings accompanied by visual aids, focusing on the design, production, and operational methodologies of electric machines. It sheds light on lesser-known aspects, emphasizing intricate details. Addressing vibration issues is crucial as the costs of dealing with the aftermath, such as repairing or replacing components, often surpass those of

implementing vibration detection systems. Monitoring vibrations helps in assessing the extent of component degradation and allows for the collection and analysis of relevant data to mitigate risks effectively. Cost-effective Condition-Based Maintenance (CBM) can be achieved through monitoring tools, considering factors like measurement uncertainties and fault thresholds. Despite potential false positives, statistical methods help minimize negatives. The success of CBM in a plant depends on factors like the monitoring system's effectiveness, overall cost, operational arrangement, and benefits compared to maintenance costs over the plant's lifespan. Only a handful of electric vehicle (EV) manufacturers have released technical literature on the machinery design utilized in production. While there are technical documents available, they do not provide comprehensive details on the design. Only a handful of electric vehicle (EV) manufacturers have released technical literature on the machinery design utilized in production. While there are technical documents available, they do not provide comprehensive details on the design. Choosing suppliers is often a tricky task, especially for decision-makers. This difficulty arises primarily due to the complexity of the function involved. The circumstances surrounding supplier selection are often ambiguous and uncertain, further complicating matters. To effectively manage information in such scenarios, we rely on the Neutrosopic approach, particularly utilizing the VIKOR method. This method proves valuable in addressing the challenges posed by conflicting and diverse criteria, especially when dealing with decision problems involving multiple, sometimes unattainable, criteria. The paper discusses the integration of the VIKOR methodology with Prospect Theory in the context of a multi-energy micro grid. It outlines the development of an evaluation method for such micro grids. Initially, a comprehensive index system for evaluating micro grids is constructed, considering the subjective inclinations of decision makers.

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