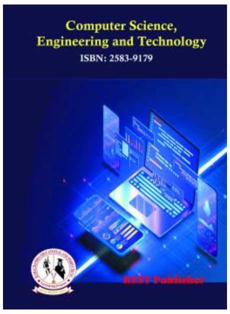
Computer Science, Engineering and Technology
Vol: 1(1), March 2023
REST Publisher; ISSN: 2583-9179 (Online)
Website: https://restpublisher.com/journals/cset/
DOI: https://doi.org/10.46632/cset/1/1/4



Future Technology Development Using the VIKOR Method

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Abstract: *Future Technology Development. Future technologies could consist of tangible objects like robots, drones, and wearable technology. These can occasionally be utilized as human-powered tools to gather data, access information, or carry out helpful tasks nearby. Current and upcoming technologies are the main topics of Introduction to Technology. It covers the study of technology with a focus on management, operations, industries, specialized knowledge, security, interpersonal relationships, and developing technologies. India is now engaged in the development of cutting-edge technologies including 5G, AI, blockchain, augmented reality, virtual reality, robots, natural language processing, etc. Robotics, artificial intelligence, machine learning, and other technological advancements have greatly sped up transition. By 2025, 50 billion connected devices will make up the Industrial Internet of Things (IIoT), and 70 percent of manufacturers will be employing digital twins. Everybody who has access to virtual reality or augmented reality gadgets by the year 2040 will also have access to a digital virtual assistant. Virtual assistants can now be created on language model platforms that are significantly more powerful than previous language models, such as GPT-3. The VIKOR (VIšekriterijumsko Kompromisno Rangiranje) Optimal replacement Select method is used in Water, Carbon dioxide, Nitrogen gas, Oxygen, Silicon oxide, Calcium carbonate, Iron oxide, and Enthalpy (kJ/mol), Entropy (kJ/mol), Exergy (kJ/mol). Water, Carbon dioxide, Nitrogen gas, Oxygen, Silicon oxide, Calcium carbonate, and Iron oxide. Enthalpy (kJ/mol), Entropy (kJ/mol), Exergy (kJ/mol). Water got the first rank whereas Calcium carbonate is having the lowest rank.*
Keywords: *TPS in reusable launch vehicles, The Changing Role for Technology, VIKOR Method.*

1. INTRODUCTION

Thermal protection equipment must be used for re-entry and entrance into the atmosphere (TPS). With the increased interest in interplanetary travel, the requirement to guarantee the safety of payloads (people and cargo) has refocused attention on TPS design and development internationally. By ensuring that the spacecraft's surface temperature does not go over a set limit due to high radiation, which could harm the internal measurement instruments, TPS is also used to protect solar probes. The TPS serves as a heat barrier in addition to being an aerodynamic body and structural element, ensuring the safety of the cargo. Extreme heat's detrimental consequences have complicated efforts to achieve controlled hypersonic flight since the earliest days of spaceflight, which prompted the creation of the first TPS. The interplay of convective and radiative heat transfer mechanisms at the vehicle surface, which results in chemical reactions and gas dynamic phenomena, makes TPS design and material selection difficult. These phenomena are still the subject of a lot of research today. It is necessary to fully comprehend these heat transfer mechanisms by modelling, computational methods, and experiments in order to choose the right materials for a vehicle's TPS. Therefore, an efficient TPS design can offer a trustworthy defense against aerodynamic loads without significantly increasing weight or jeopardizing vehicle integrity. The manufacturing sector has used additive manufacturing (AM) more frequently during the past 30 years, especially when creating part models and prototypes. In a recent report, the history of AM is outlined. Instruments used in stereolithography and 3D printing are examples of original AM processes. Polymers were initially used in these AM techniques as tools for communication or probing, and more recently as finished goods. Reduced product development steps are made possible by quick, direct prototyping from CAD models. In order to meet the demands of the aerospace, automotive, and fast tooling industries, the focus of AM research has recently shifted to creating intricately shaped metal components, notably titanium and nickel alloys, that cannot be manufactured economically using conventional processes. The creation and application of new and enhanced energy technologies will be necessary for the transition to a sustainable energy system. These new technologies must be less expensive if they are to be adopted because they frequently have higher investment costs than conventional energy methods. Making decisions for upcoming investments and the design of new energy systems requires consideration of technology and cost development. This in turn necessitates techniques for studying the dynamics of technical advancement and cost reduction. With the help of experience curves, it is possible to predict future cost growth by evaluating past cost growth. To characterize cost as a function of the total number of units in a register, an empirical curve is constructed using historical data on cost development. Then, future cost rise is predicted using an extrapolation of this curve.

2. TPS IN REUSABLE LAUNCH VEHICLES

Reusable launch vehicles (RLVs), which may be used for a variety of space missions with little in the way of maintenance and repair needs, have been developed over the years by numerous nations and commercial businesses. The Space Shuttle Orbiter (SSO) Columbia was successfully launched by the US National Aeronautics and Space Administration (NASA) in 1981 after extensive planning and work. DPS is included, and the car is made of aluminum. Experimental and theoretical evidence has demonstrated that the nose cone and the leading edge of the wings encounter the most intense heat and hence need the most protection. The chosen materials must be high-temperature competent and high-temperature shock resistant to function as reconfigurable TPS. high emissivity, low catalysis, and stable characteristics in a variety of aircraft reduced thermal expansion (v) vii) the least amount of other qualities, as well as vi) low thermal conductivity. Weight. Reinforced carbon-carbon (RCC), low-temperature reusable surface insulation tiles (LRSI), high-temperature reusable surface insulation tiles (HRSI), and reusable surface insulation blankets were chosen as the five fundamental materials (FRSI). Given that RCC can resist temperatures of up to 2400 0C, the usage of RCC panels for the vehicle's nose cone and wing leading edges was investigated. While the HRSI tiles were produced with a black borosilicate glass covering with an emissivity of 0.8 and retained some surface regions at 1260 0C, the LRSI tiles had a white coating with reflecting characteristics that ensured that certain portions of the vehicle surface were maintained at 694 0C. Later, NASA developed other materials that outperformed those utilized in the original SSO design. First, as an alternative to LRSI, advanced flexible reusable surface insulation (AFRSI) blankets. Alumina Enhanced Thermal Barrier (AETB-8) was a second substance that was made by adding trace amounts of alumina (Al2O3).

3. THE CHANGING ROLE OF TECHNOLOGY

According to the National Space Policy, the NASA technology program now shares responsibility for determining the agency's future rather than being restricted to a purely supporting position or the occasionally constrained viewpoint of mission strategists. delivering "technology that paves the way for future decisions." In this policy statement, NASA's technology program asks for developing a strong national talent and capability base to support the commercial and other space industries. Studying the development of technology in-depth and in-depth is a crucial component of change. The steady evolution and productivity of this programming transformation were imperfect, and they struggled to achieve their current levels. A significant shift in the agency's role has resulted from the dramatic changes in the nature and organization of NASA's space research and technology program; this shift away from operating systems that primarily respond to "pull" from major flight programs instead provides "ample" performance to carry out planned and candidate missions. In addition to being acknowledged as a crucial component of US civil space policy, this transformation, which was prophesied in the documents of the previous IAF Congress, was also planned for and budgeted for in the form of significant new institutional initiatives like the Civil Space Technology Initiative (CSTI) and Pathfinder.

4. VIKOR METHOD

The VIKOR approach is added as an adaptive approach implemented inside the MCDM problem and is evolved Inapplicable (exclusive units) and a unique choice of contradictions many to solve the problem of doing as an attribute selection technique standard. Help selection makers arrive at a final answer. A Multi-criterion for compromise ranking Metric lb-for metric is used. aggregation feature within the compromise programming method. The VIKOR method turned into advanced for multivariate Preliminary (Given) Preference of compromise solution obtained with weights Determines the load stability periods for equilibrium. In the presence of this approach, contradiction Evaluation is from a fixed set of alternatives and focuses on selection standards. The VIKOR technique changed Multiple criteria in complex structures Built to improve and great reputation, Contrasted and exceptional unit Ranking with grades and alternatives It specializes in selection. VIKOR in approach, it’s close to a first-rate alternative Compromise by assessing charter Rankings is being completed, too a compromise is an agreement. way of mutual options. VIKOR is used to assess medical institution service exceptional due to the fact this technique represents a compromise selection in an indistinct, ambiguous, and uncertain environment. For this purpose, the principle cause and contribution of this look is to advocate a collection fuzzy-based compromise VIKOR method with parameters by way of fantastic triangular numbers (TFNs) on the way to be considered later, and the set principle and VIKOR approach Might be added within the next segment. The VIKOR Index is well-matched. Taguchi's SN rate is simultaneously an excellent characteristic, considering recommendation and variation and VIKOR Index simultaneous use and regret Measures to improve multi-response methods. The VIKOR technique is brought as an identical technique applied within the MCDM hassle and developed as a multi-standards selection-making technique. The VIKOR method makes decisions to provide methods by researchers to finish hard issues with extra correct solutions. This involves using the simplest VIKOR, the nation of the artwork of VIKOR specialty in this paper, and as we shall see Uniquely mathematics. You are Different from VIKOR. It can be found in the documentation The proposal can be evaluated. The VIKOR technique is based on integrative fuzzy qualification Qe, which for a first-class solution represents the alternate distance. Functions and routines in developing a set of VIKOR rule Rank numbers are used A numerical example illustrates using the VIKOR technique in water resources planning, which targets numerical justification. VIKOR with incomplete statistics for analysis of land use techniques to reduce economic and social expenses with the capability of natural dangers. The bad defines the solution with the furthest distance from the appropriate answer and the answer with the short of a suitable solution Far, but it no longer takes into account these distances' Relative importance. The VIKOR technique includes defining positive and negative perfect points within the answer area. It makes a specialty Possible in the presence of contradiction Limited options ranking from the set and choosing and incompatible (attributes with specific units) standards. While the VIKOR method solves demonstration examples. It also attempted to pick out the fine-appearing VIKOR approach to the usage of Spearman's rank correlation coefficient values.

TABLE 1. Data set

	Enthalpy (kJ/mol)	Entropy (kJ/mol)	Exergy (kJ/mol)
Water	285.69	169.34	235.2
Carbon dioxide	393.53	256.82	410.46
Nitrogen gas	209.34	332.31	145.69
Oxygen	168.23	213.26	333.96
Silicon oxide	910.94	195.29	852.71
Calcium carbonate	813.4	338.53	712.47
Iron oxide	412.1	147.31	368.18
Best	**910.94**	**338.53**	**852.71**
worst	**168.23**	**147.31**	**145.69**

Table 1 shows the data set for VIKOR method. Enthalpy (kJ/mol), Entropy (kJ/mol), Exergy (kJ/mol). Alternatives Water, Carbon dioxide, Nitrogen gas, Oxygen, Silicon oxide, Calcium carbonate, Iron oxide is the Best and Worst Value.

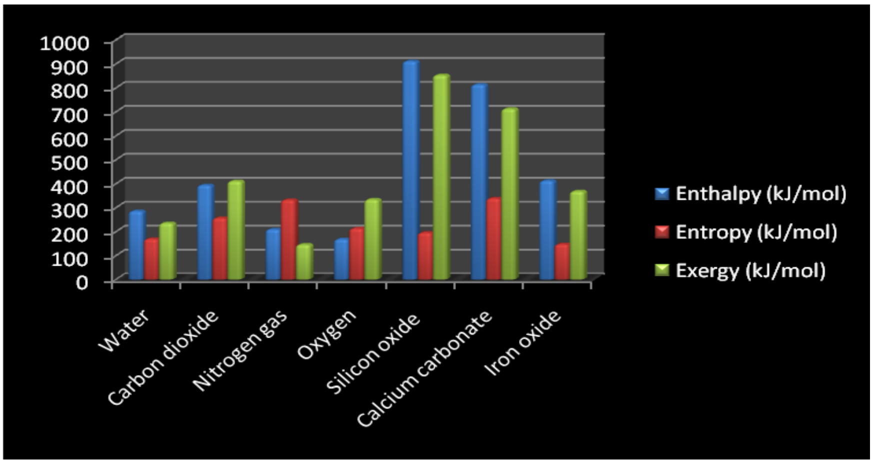

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TABLE 2. Calculation Sj and Rj

			Sj	Rj
0.210462361	0.221198096	0.218349552	0.65001	0.221198
0.174162863	0.106827215	0.156378179	0.437368	0.174163
0.236162163	0.008131995	0.25	0.494294	0.25
0.25	0.163777325	0.183428333	0.597206	0.25
0	0.187271206	0	0.187271	0.187271
0.032832465	0	0.049588413	0.082421	0.049588
0.167912106	0.25	0.171328251	0.58924	0.25

Table 2 shows the calculation Sj and Rj is the sum of Normalization of the tabulation 1 which is calculated from the Determination of best and worst value.

TABLE 3. Final Result of Calculation Qj

	Sj	Rj	Qj	Rank
Water	0.871208	0.65001	1	1
Carbon dioxide	0.611531	0.437368	0.637032	5
Nitrogen gas	0.744294	0.494294	0.776981	4
Oxygen	0.847206	0.597206	0.937248	2
Silicon oxide	0.374542	0.187271	0.256416	6
Calcium carbonate	0.132009	0.082421	0	7
Iron oxide	0.83924	0.58924	0.924844	3

Table 3 shows the Final Result of Calculation Qj calculated from the sum of the calculation from the Sj and Rj from the Qj value the rank is taken.

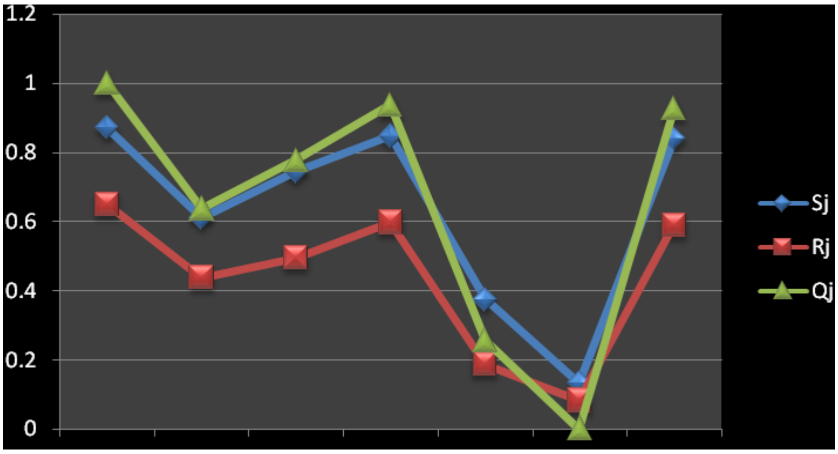

FIGURE 2. Final Result of Calculation Qj

Figure 2 Shows the Calculation Sj, Rj and Qj data set using VIKOR method. Qj for Water is showing the highest value and Calcium carbonate is showing the lowest value.

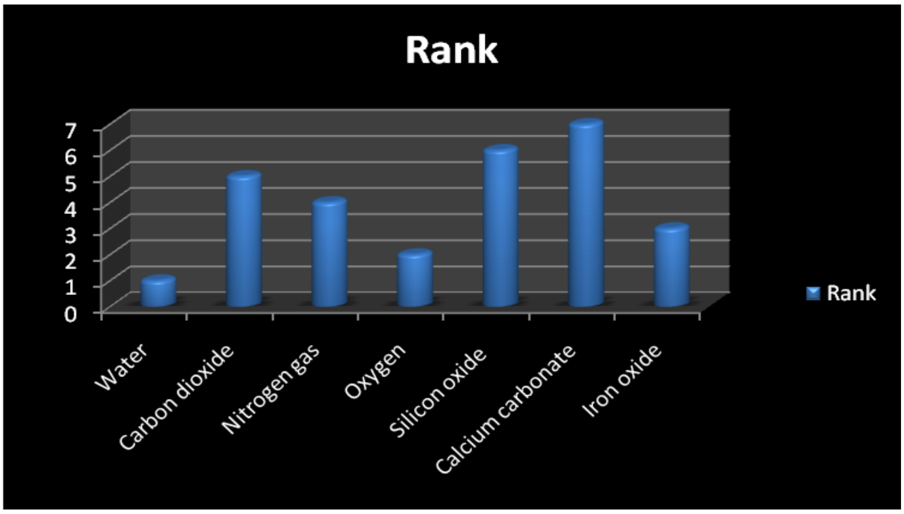

FIGURE 3. Shown the Rank

Figure 3 Shows the Rank of data set for using the analysis of VIKOR Method. Water is got the first rank whereas is the Calcium carbonate is having the Lowest rank.

5. CONCLUSION AND RECOMMENDATIONS

The importance of TPS for hypersonic spacecraft is highlighted in the current paper. The historical evolution of various TPS technologies, including passive, semi-passive, and active TPS, as well as their use in RLVs and other hypersonic vehicles, is thoroughly examined in the literature. For these technologies, the most recent research and development initiatives are described. In three primary areas—mass efficient uptake/entry TPS, modeling and simulation tools and techniques, and sensors and measurement systems—current and upcoming difficulties for TPS design and development are discussed. Empirical curves for particular energy technologies are recommended based on the analysis of cost-minimization paths described in this research. For use in energy-systems analysis and energy modeling, these empirical curves should be viewed as best approximations as they are by no means accurate. The results of empirical curve studies and bottom-up analysis generally concur, proving that the incremental cost savings explained by empirical curves are the same as those described in the bottom-up analysis. The experience curves are smaller for fuel cell and bioenergy technologies, and it is proposed that these technologies have a temporal learning rate. This is typically in line with the cost reduction trajectories of related technological clusters and the bottom-up analysis reported in this work. Space stations and platforms are currently opening up prospects for long-term access to the space environment, which portends a new era of quick advancement in space technology testing operations. The ability to employ space assets as a practical research and demonstration laboratory facility will hasten the development of technology. With new technologies, such as the ability to fly large missions, there is no need to take the first risks in the space environment. The presence of technical payloads will increase in visibility and importance as part of the whole payload operation, beginning with the shuttle program and significantly extending across stations and platforms.

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