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Evaluation of Smart Materials in using the VIKOR Method

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Abstract. *Smart materials are environmentally friendly Materials that respond to changes and then a Material property is subject to change. Any extras without the need for control or electronics an actuator or sensor from objects these property changes can be used to create. Smart material technology and its functions adapting to environmental changes through implementation helps us. Multifunctional material, of sorts A smart material, its geometry modification or property by electrical impulses, to produce change can be implemented. From this analysis the VIKOR technique is the most accurate determines a worst-case-good solution, however, is variation these Distance is not taken into account. VIKOR the approach is Multi-Criteria Selection (MCDM) or Multicriteria selection is an evaluation technique. Alternative: Density, Nominal stress, Actuation frequency, Stimulation. Assessment Option: Piezoelectric ceramic, piezoelectric composites, openness Shape memory polymer (SMP), Elastic-active polymer (EAP), Magnetostriction. It is solved by using the VIKOR method. It is the data set of this paper. The result it is seen that Shape memory polymer (SMP) is got the first rank where as is the Magnetostriction is Very low rank. In this paper Shape memory polymer (SMP) is got the first rank whereas is the Magnetostriction is having the lowest rank*

Keywords: *Piezoelectric ceramic, Piezoelectric composite, Shape memory polymer(SMP), Elastic-active polymer (EAP) Magnetostriction and MCDM Method.*

1. INTRODUCTION

Smart objects respond to changes in their environment they have the ability to react. This means Temperature, light, pressure, electricity, voltage, pH or external chemical compounds Conditions can change one of their properties. This change is reversible and multiple times repeatedly can be done. Specific, Measurable, Attainable, Relevant and setting time-bound (SMART) objectives Achieving long-term goals with your grant A great way to plan steps. This is yours Grants help move from ideas to action. New technologies to meet these needs and High performance materials are developed coming up, especially for long-term problems Creative for negative impact on the environment and provide innovative solutions. They are all structural stability, environmental or Benefits for the maintenance and repair process Provide; it is architectural design thinking Affect positively.

2. SMART MATERIALS

Smart Materials for Civil Structures Pies For electric actuators control show their superiority as actuators. show performance. Caused to a structural member by electrical resistance we can find the maximum strain that reflects the damage. Super elastic effect of shape memory alloy energy super elastic effect of shape memory alloy energy demonstrates the ability of dispersive devices. But these Materials are very limited in their capacity or applied to actual civil structures at that time being [1]. Research status SMMs, most notably SMAs, probably are having enjoyed more widespread use, their availability since the 1960s Character reflects. Many SMA applications operate comprises, whereby the SMA based device is As an alternative to a powered actuator is used Linear and Rotary SMA many advantages in typical Quiet operation and presence of such devices are many Most compact, lightweight and from manufacturers High energy efficiency [2]. Among the Various parts/components of aerospace industries, material One of the most important elements. Space Many types of products in industries Used, but smart products are theirs Continued importance due to unique features are receiving basically, smart products are conventional Newer than functional and structural materials Additional elements of generation [3].

Specific results are as follows.
(1) Embedded motion concepts, such as pitch, turn and Camper control is not in effect at this time. Servo flop Control with a hinge control that drives individual actuators Surfaces, smart materials are very functional as appropriate rotor control mechanization emerges.
(2) Rotor design is less controllable Achieving loads and movements should be designed.
(3) There should be Recent Advances in Smart Materials were used. Short-term, high-speed acceleration Smart objects are high-output-height during manoeuvres Capacity is of particular interest.
(4) Multiple Smart object types in an actuator to be attached; each one performs a different function appropriate [4]. It is widely observed that the eccentric behaviours Time, temperature and some other things of smart objects Varies according to environmental conditions. So stable of open-loop inverse compensation based on the model Performance model is prone to uncertainty. This to combat the problem, with control theory Robust by incorporating inverse compensation a control framework is proposed. [5]. A major goal of smart materials research is to develop new is to find the types of objects. Constructive For construction through architecture and sustainability what is needed According to the previous view, this research focusing on smart objects, it is new Brings possibilities and construction and a dramatic boost to architectural innovation. SMART Materials Technologies and Architecture This research will discuss the integration of And will analyze, which we imagine today Changing architectural thinking in ways that were impossible is reassuring. Smart Materials Building Design and bring about a paradigm shift in performance It can be said that it will come [6]. MRFs are smart materials composed of a carrier fluid are; typically oil micron-sized Ferro of magnetic particles and some thyrotrophic compounds of magnetic particles and some thyrotrophic compounds Dispersion. When subjected to a magnetic field, a liquid is like a viscoplastic solid apparent viscosity greatly depends on its volume increases. This behaviour occurs because the magnetized particles are directed toward each other in the field Begin to attract, hence the chains create the chains then a into the liquid Form the skeleton, which for the movement of fluid the opposite [7]. Among the existing smart materials are piezoelectric materials including, they generate voltage under stress or vice versa. Voltage will be applied while structures made from these products Change shape or dimensions. Likewise, Used for monitoring purposes the shape can be changed to produce a voltage [8]. In the remainder of this review, fiction is form-morphing systems and through multi-scale magnetic assembly Surface properties of concrete smart objects we focus on Most In some cases, they are magnetically active elements by incorporation into degradable polymer matrices are achieved in practice. In this regard, Researchers arbitrarily reliable methods Planned and designed magnetic nanoparticles Orientation and positioning of magnetic lithography created in conjunction with renovation. [9]. in the past few decades, smart products have varied For example; chromomeric materials are all liquid have had a major impact on the sector. Crystallography is also the basis of photography Chrome sunglasses as sunglasses Allow to change. Light ignition switches, Headphones and the latest fuel injection Shaped cell phone antennas and mirrors Memory is smart stuff [10]. Many smart products are based on composite materials have Polymer matrix composites include, Interest in polymers is their flexibility, manufacturability From simplicity and tailoring properties is formed. This part of the appendix is in three parts Divided into: Piezoelectric and Piezoceramics materials; SMAs; and other items. This All sections are finite element modelling are thermally and mechanically related properties with their constitutive equations respective subject [11]. It has dual functionality it allows sensor and actuator functions to be performed; hence, these are inherently smart objects. Although Many materials exhibit piezoelectricity, which is quantitative And the efficiency of electromechanical coupling in these Materials that ultimately determine their suitability Smart products [12]. The strength of printing technologies lies in its versatility has The disruptive nature of those technologies An interesting fact to prove is that today Here are some things to say about smart material printing What was said about composites decades ago Looks like it: it will inspire scientists More than replacing previous technology is reassuring. And how about a specific object Engineers to produce Need to reconsider [13].

3. VIKOR

The VIKOR machine is a unique choice-making trouble with inconsistent and conflicting criteria many standards for judgment were developed as a choice-making frame. This technique specializes in ranking and choosing from a hard and fast of alternatives Pays and with conflicting standards to help choice makers achieve a final end result determining compromise solutions to the hassle. Here, a compromise answer is a possibility that is very near the precise the solution, and compromise, refers to an agreement [14]. Through mutual offerings. Another distance primarily based method, the TOPSIS technique, is from the pleasant answer Determines solution that is too short and took a ways far away from the poor-best answer to upload values to scales, you have to first convert them to the same units. Normalization is used to put off gadgets of criterion functions, and hence all criteria Dimensionless.The default cost is determined by using "Simple Normalization", which is the criterion function Divides the price with the aid of its most cost [15]. This is an easy scale change; its miles all scale the values additionally alternate in a linear manner, and however the scales are not of identical duration. Linear normalization, in VIKOR mode Use more than one standards which include (VIKOR) selection making (MCDM) strategies are generally used to estimate and examine stability [16]. To pick out big preferred and appropriate alternatives various strength projects or renewable strength technologies aimed toward presenting choice-making guide [17]. Consistency of several previous research electricity Departments cowl many unique areas, consisting of existence

Evaluation of cyclic stability, strength assets, environmental management and environment assessment. Deploy the chosen particular model of VIKOR and select the choicest object, after figuring out and growing cloth selection residences, materials in engineering application you can use the shortlist [18]. The VIKOR machine has produced a wide variety of improvements and enjoys giant popularity on complicated structures. Focuses on evaluating and deciding on from options with exceptional unit criteria. In the VIKOR technique, installed through mutual privileges Compromise rankings are made by comparing proximity and compromise for the fine alternatives by way of settlement.Song to avoid numerical problems in fixing problems inside the conventional VIKOR machine created a changed VIKOR machine [19]. In this phase, the changed VIKOR become modified using a new default method. The proposed approach can improve the priority of materials engineering layout procedure. The first instance illustrates the proposed version and Trying to reveal the significance of target values Material choice, try to display examples 2-4 the validity of the encouraged model and the final For example, it shows how the brand new device overcomes a crucial vulnerability of VIKOR [20]. Huang et al. The VIKOR machine was created as an MCDM system, which is a unique one Multicredia solves the problem, by means of incompatible and conflicting standards. This is from hard and fast alternatives focuses on assessment and selection and Reconcile a problem with conflicting criteria Determines solutions, so test makers are a can help achieve very last choice.A compromise answer is a viable answer this is very near the exceptional VIKOR based totally on vintage ideas of compromise programming [21]. An extension of VIKOR is provided to decide the ambiguous compromise solution for multigriteria. Obscure VIKOR device created by using Obscure MCDM machine, this solves the unique ambiguous multicredia trouble with random and conflicting standards. Of this method in the heritage, integration, normalization, priority rating of the DM and ambiguous numbers Functions are discussed, which makes the indistinct VIKOR approach a rational have a look at Justifies and shows the repute of its historical past within the literature [22].

4. RESULT AND DISCUSSION

TABLE 1. Smart Materialsin Determination of best and worst value

	Density	Nominal stress	Actuation frequency	Stimulation
Piezoelectric ceramic	0.254	0.475	0.452	0.896
Piezoelectric composites	0.478	0.734	0.547	0.687
Shape memory polymer(SMP)	0.578	0.345	0.475	0.478
Elastic-active polymer (EAP)	0.356	0.354	0.745	0.321
Magnetostriction	0.457	0.753	0.654	0.457
Best	0.254	0.753	0.745	0.321
worst	0.578	0.345	0.452	0.896

Table 1 shows the Determination of best and worst value Smart Materialsshows the Density it is seen that Shape memory polymer(SMP) the highest value for Piezoelectric ceramic is showing the lowest value.Nominal stress it is seen that Elastic-active polymer (EAP) is showing the highest value for Shape memory polymer(SMP)is showing the lowest value.Actuation frequency it is seen that Elastic-active polymer (EAP) of ideas is showing the highest value for piezoelectric ceramic is showing the lowest value. Stimulation it is seen that the piezoelectric ceramic is showing the highest value for Elastic-active polymer (EAP) is showing the lowest value.Alternative: Density, Nominal stress, Actuation frequency, Stimulation. Assessment Option: Piezoelectric ceramic, piezoelectric composites, openness Shape memory polymer(SMP), Elastic-active polymer (EAP), Magnetostriction. It is solved by using the VIKOR method. It is the data set of this paper.

Figure 1 shows the Determining the best and worst valueof Alternative: Density, Nominal stress, Actuation frequency, Stimulation. Assessment Option: Piezoelectric ceramic, piezoelectric composites, openness Shape memory polymer(SMP), Elastic-active polymer (EAP), Magnetostriction.

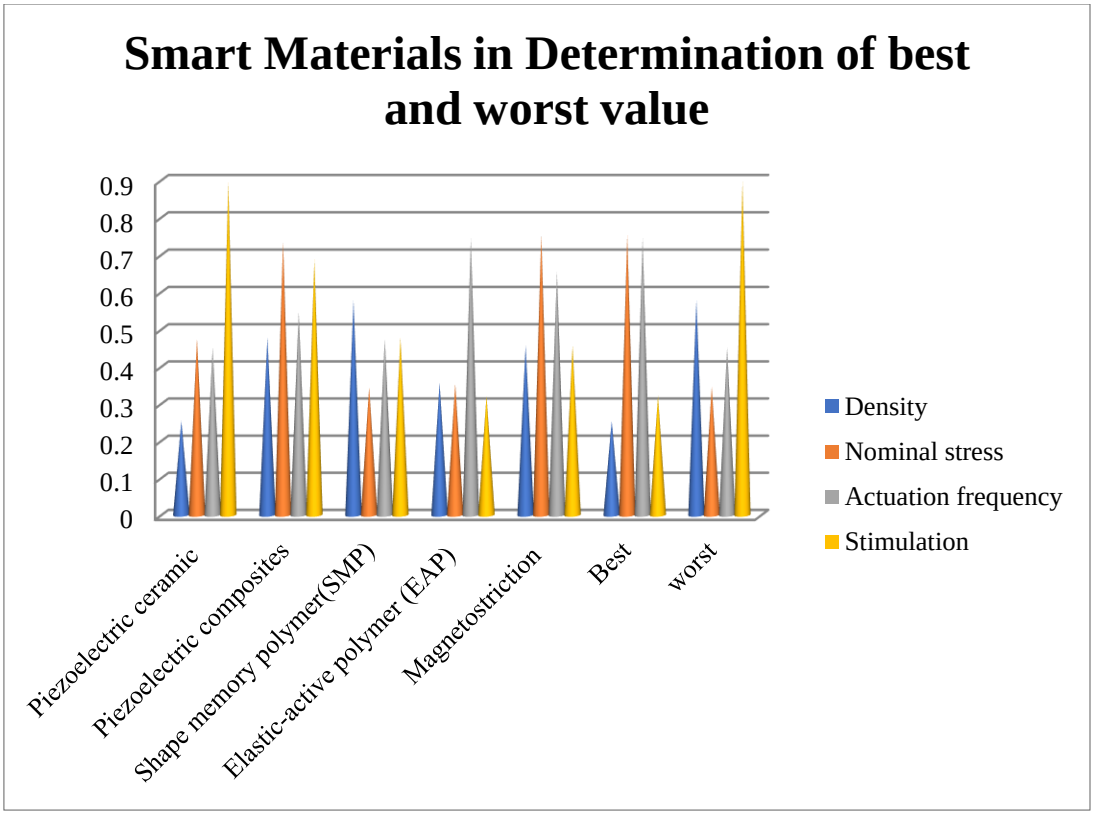

FIGURE 1. Smart Materials in determining the best and worst value

TABLE 2. Smart Materials in Calculation Sj and Rj

	CalculationSj and Rj					
					Sj	Rj
Piezoelectric ceramic	0	0.170343137	0.25	0.25	0.670343	0.25
Piezoelectric composites	0.172839506	0.011642157	0.168942	0.15913	0.512554	0.17284
Shape memory polymer(SMP)	0.25	0.25	0.230375	0.068261	0.798636	0.25
Elastic-active polymer (EAP)	0.078703704	0.244485294	0	0	0.323189	0.244485
Magnetostriction	0.156635802	0	0.077645	0.05913	0.293411	0.156636

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

TABLE 3. Smart Materials in Calculation Sj and Rj and Qj

	CalculationQj		
	Sj	Rj	Qj
	1.170343	0.670343	0.873034
	0.844524	0.512554	0.470479
	1.116897	0.798636	0.959582
	0.567674	0.323189	0.073707
	0.509178	0.293411	0
S+ R+	0.509178	0.293411	
S- R-	1.170343	0.798636	

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

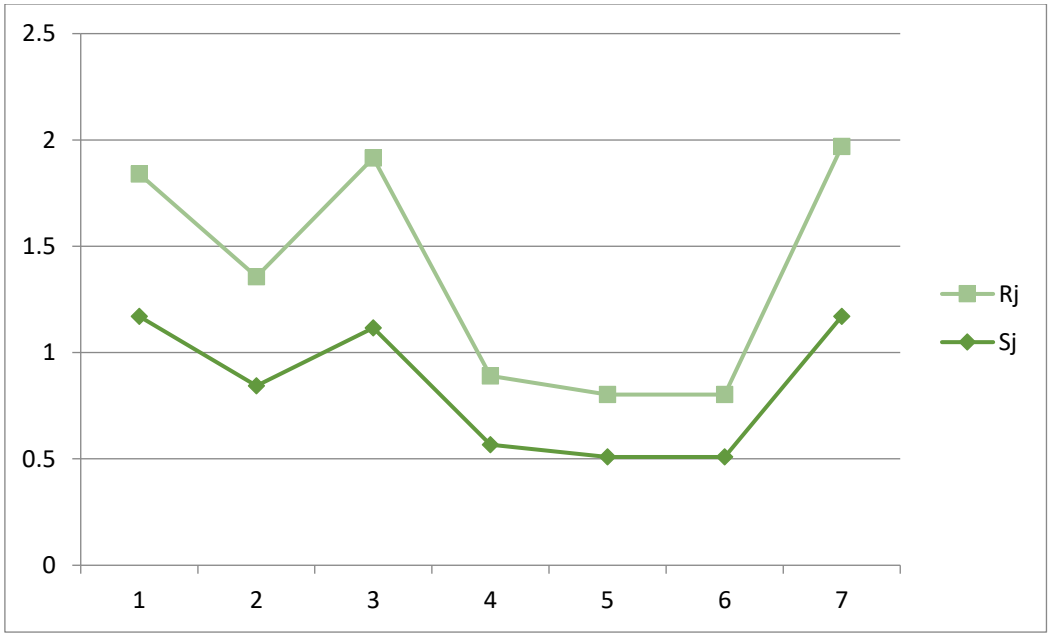

FIGURE 2. Sj and Rj and Qj

Figure 2 shows the graphical view of Calculation Sj and Rj valueSjthe Emphasis on friendship is high RjEmphasis on friendship is high, SjRespect for other employees is low, Respect for other employees is low.

TABLE 4. Smart Materials inRank

	Rank
Piezoelectric ceramic	2
Piezoelectric composites	3
Shape memory polymer(SMP)	1
Elastic-active polymer (EAP)	4
Magnetostriction	5

Table 4 shows the final result of this paper the Elastic-active polymer (EAP) is in 4th rank, Piezoelectric ceramic is in 2nd rank, Piezoelectric composites is in 3rd rank, Magnetostriction of ideas5th rank, Shape memory polymer(SMP) is in 1st rank, The final result is done by using the VIKRO method.

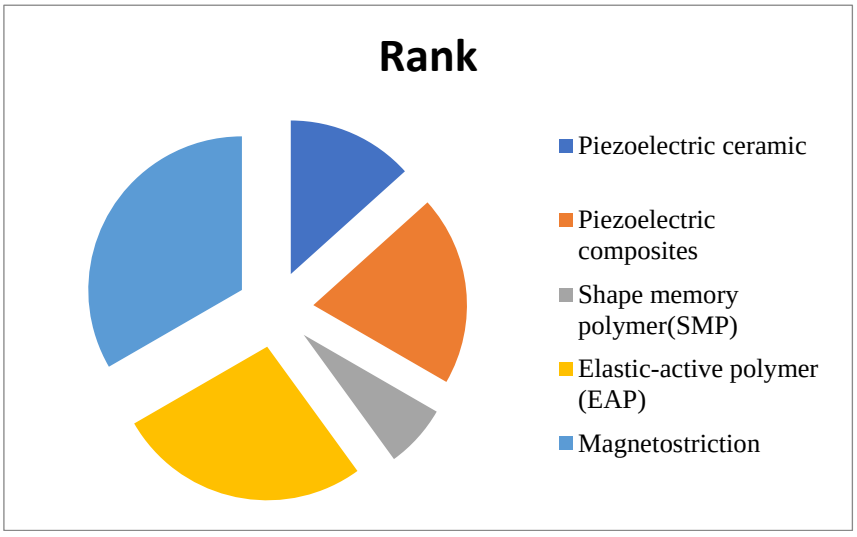

FIGURE 4. Shown the Rank

Figure 4shows the final result of this paper the Elastic-active polymer (EAP) is in 4th rank, Piezoelectric ceramic is in 2nd rank, Piezoelectric composites is in 3rd rank, Magnetostriction of ideas5th rank, Shape memory polymer(SMP) is in 1st rank, The final result is done by using the VIKRO method.

5. CONCLUSION

This section is about Smart Application objects provides insight; Many were realized and many more There areResearch status. SMMs, most notably SMAs, probably arehaving enjoyed more widespread use, their availability since the 1960s Reflects character.In the past few decades, smart products have been at It has a huge impact on various fields. For example, chromomeric materials are the basis of all liquid crystal displays and Photo chromic Eyeglasses Sunglasses Allow to change presence. VIKOR mode Use more than one standards which include (VIKOR) selection making (MCDM) strategies are generally used to estimate and examine stability. To pick out big preferred and appropriate alternatives various strength projects or renewable strength technologies aimed toward presenting choice-making guide.Song to avoid numerical problems in fixing problems inside the conventional VIKOR machine created a changed VIKOR machine. In this phase, the changed VIKOR become modified using a new default method. The proposed approach can improve the priority of materials engineering layout procedure. The first instance illustrates the proposed version and trying to reveal the significance of target values Material

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