DOI: https://doi.org/10.46632/jmc/1/1/5

Journal on Materials and its Characterization
Vol: 1(1), September 2022
REST Publisher; ISSN: 2583-6412
Website: http://restpublisher.com/journals/jmc/

Performance Analysis of Materials Selection Using Weighted Product Method (WPM)

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Abstract: Materials selection. The choice of materials is a sorted one is the process by which engineers remove one or a small number of items that can be found most suitable. Successful engineering design material selection is critical to the process. As much as possible your preparation must be strong and durable that's what you want. Security to consider there are also implications. You see, with poor material, there are many more dangerous failures arising from examination a very common occurrence in industries. The weighted product method is a multi-criteria decision-making process there are many alternatives, and based on several criteria we must determine the best alternative. Alternative: Specific strength (Mpa), Specific modulus (Gpa), Corrosion resistance, Cost category. Evaluation Preference: AISI 1020, AISI 1040, ASTM A242, AISI 4130, AISI 316. From the result, it is seen that AISI 4130 is got the first rank whereas is ASTM A242 is having the lowest rank. As a result, AISI 4130 is ranked first, while ASTM A242 is ranked lowest.

1. Introduction

Material selection means any physical material a step in the design process. In the context of product design, material selection is the key objective, and product performance deceasing costs while meeting targets. Best for a given application systematic selection of material, candidate materials starting with features and costs. Material selection is mostly material code or with desired material properties using the relevant performance index benefiting fra om given temperature to reduce differential heat transfer, a thermal blanket has poor thermal conductivity to have. Characteristics of a designer's materials complete knowledge of behavior a must-have Material selection is of a given application most suitable to meet the needs it is the process of selecting the object. Their working conditions mechanical properties, chemical properties, physical properties, electrical properties, and cost exam requirements and various factors go into the decision. These are during the material selection process and should be weighed.

2. Materials selection

Today's selection of products meeting the needs of the future recycling of an item to do ability should be strongly driven. Material selection and product design material recycling in the future must be done with purpose. Customer's choice of products it should be tailored to their needs. Very valuable and expensive items. Final from extracting items a product life until disposal energy used in the cycle. However, the concept is usually of the product during the life cycle flow of toxic substances loses, which is a drawback [1]. Selection of materials in design manual format, marketing and design analysis provided a tool for product developers. Materials selection and design various methods have been presented over the past two decades. However, most methods are forms per object only as a physical object to deliver are defined. Presented in this paper systematic, an integrated product development an object that is an integral part of the model it approach to current exam model, in which physical and for different types of products psychometric properties are analyzed. Selection of new integrated product products (ibms) model is fashion, marketing trends, cultural aspects, aesthetics and recycling and target group, successful includes factors such as product are offered, as well as for different products examples of material selection are also provided [2]. Design of a supersonic aircraft and its material selection acoustic engineering principles and should be based on procedures, because the fuselage, fuselage, wing a small design flaw any important part dangerous. The designs of supersonic aircraft important material selection considerations include the following. Specific power (energy-to-weight ratio), tensile energy properties, fatigue electricity, low-pace effect electricity, bone fracture longevity, top sensitivity, toughness and anti-crack propagation, pressure corrosion cracking and peeling corrosion will arise [3]. Environmental concerns in the selection of materials, when referring to the effect a substance emissions, waste, environment, a little, a lot, very importantly, only in part by ashby's work covered; energy content. In most cases these are ashby's work on many material properties environmental are classified as contracts heat, some environment like humidity, chemicals and so on relating to the reaction of matter to conditions are attributes. Energy uses in the past and content is some measure of environmental performance one of the features, so the materials can be used in exam exercises [4]. For thermal barrier coatings with high temperature capability materials in identifying and developing substitutes selection guidelines are desirable. An additional item the selection criterion is that the compositions are high significant mass loss at temp will not disclose. Materials selection criteria are high with thermally grown aluminum oxide at temp coating thermodynamic stability, specific heat conductivity, corrosion resistance and weather ability towards volatile losses in the presence of containing water the trend includes [5]. Rough data for materials is required. The

exam enters, but is required at each stage the nature of data for material properties is its accuracy and varies greatly in width. Conceptual design at the stage, the widest possible range for the designer all options are open. Polymer per concept a better choice may be a metal for another, although the functionality is the same. Fulmer materials optimizer, 6 materials selector, 7 like low accurate tables or shown below those in the selection charts of the type of products kinds of data are found [6]. This tool for product selection is efficiency codes and controls in various combinations flexible enough to create, very convenient graphical interface and, most importantly, wide contains cloth databases. Meaning performance indexes and controls for exam a hassle is of method, i.e. Of fabric choice purpose, a structural element function, for manufacturing possible and many others. In different words, material choice through material databases it is a problem orientated technique. Using kbs choosing materials is also a problem seems to be the process. It is the objectives and starts by creating controls, and then they translate into heuristic rules [7]. As expected from semiconductor gas sensors a study of selecting materials for performance impacts are made. For both types of use early commercial developments were simple binary respectively the oxides include tioz and sno. However, oxides change atmospheric composition faster on methods of conversion to abduction conversions a growing body of research is investigating alternatives suitable for doping by choosing schemes and performance of such devices helps highlight opportunities for improvement [8]. Next, an extensive selection of products a database is required and updated data is required processing clarifying some nuclear engineering challenges we present illustrative case studies. Characteristics of each case study presented requirements are also higher than those provided here we feel great [9]. A step towards such an approach materials selection in micro system design. Minimalist aspect micromechanical at sizes greater than 1m initial selection of materials for structures we focus on levels. Length scale and of machine properties along with processing parameters variation is discussed. Of many properties limits for initial design values recommended and other characteristics especially residual and intrinsic stresses the necessity of measuring loss coefficients is discussed [10]. Modified to select items nonlinear normalization with digital logic method a weighting factor approach when combining proposed and the classical weighted property of the two case studies derived from the method compare the results. Various MCDM methods past in choosing materials using good level of research work by researchers' appropriate material, even if already carried out simple to guide the decision maker in making selection decision and to use a formal mathematical approach there is still a need [11]. AISI 1020 has low hardness properties and low tensile carbon steel. AISI 1040 equivalent to en8/080m40.carbon is medium unalloyed steel. AISI 1040 is a medium with good tensile strength is steel. ASTM a242 specification is weight storage and atmospheric corrosion resistance high-strength for critical structural member's standard for low alloy structural steel specification. Nominally 0.3% carbon, 1% chromium and aisi 4130 with 0.2% molybdenum widely used in low alloy steel oil patch applications are used. AISI 316 and AISI 316l stainless, austenitic chromium-nickel-molybdenum describes steels, which are non-oxidizing acids and good resistance to media containing chlorine have the specific strength of a material strength is divided by its density. Specific modulus is the modulus of elasticity for the mass density of a material is an object property of having corrosion resistance ft as the ability to protect the molecule from corrosion is defined. A cost category is reporting, fixing expenditure limits and fixing rates similar or related to the purposes of doing a classification or grouping of expenses.

3. Weighted Product Model (WPM)

Weighted product model (wpm) is well known multi-criteria test performance (MCDM)/multi- standards test analysis (MCDA) technique. Both methods similar, but that is the main difference the primary mathematical operation involves a multiplication in preference to an addition. This method is a simple combination same as weight (saw). technique greater details about this method are given in MCDM E-book. Assume that a given MCDA problem is described in phrases of m options and n choice standards [12]. The weighted production method (wpm) added in 1922 via Bridgman has confirmed to be a totally reliable approach select multiple criteria do and for three for more criteria researched as much as a hundred standards, many researchers have pronounced a hit use of wpm. Solve multi-criteria choices together with selecting a boarding house, deciding on a appropriate diet selecting an appropriate studying platform for detecting to cope with housing desire for individuals facing decision-making problems. The approach changed into calculated and carried out in an internet-based totally device. The principal goals of this look at are to develop a domestic selection model using wpm to calculate and sort advisory values, implementing a selection assist device in an internet-primarily based environment [13]. The weighted product approach is this version involves multiplication in preference to addition. Each opportunity is in comparison to the others through multiplying numerous ratios, a chief downside of the weighted product systemic, for undesirable effects overstating the importance of the key evaluates because it is any the last rating is also commendable supports/fixes in opportunity with respect to a criterion [14]. The weighted product (WP) method calls the normalization method because of this approach each and evaluative effects of character multiplying. Multiplication consequences aren't meaningful unless they're compared (divided) by means of constant values. For benefit attributes weight serves as a high-quality estimate multiplicative function, even as the value weight acts as a poor ranking [15]. A convert each bid into an estimate to provide new scoring feature weighted product method. Many two types of types -characteristic bidding fashions are delivered based totally on that's the primary bidding design are classified into fashions. Finally, of our models by recognizing the assumptions [16]. A weighted product version (wpm) is used to remedy the routing decision hassle. This proposed scheme considers a relational assessment system. The relaxation the paper follows organized in section of the application of multi-criteria decision model proposed and calculation of weights as discussed in section. Implementation of the tiny OS initiative in section v defined and in section an assessment of the challenge is provided. Section related works are discussed. [17]. Weighted product (WP) and ideal through solution (TOPSIS) etc order preference technique in decision making used extensively to help there are two techniques. As studies in assessment the 2 techniques is not comprehensive, this observe goals to compare the 2 strategies by searching their complexity and in accuracy their complexity size became achieved the usage of the complexity of the cycle and their accuracy calculated

based on error fee received. Product model, or as its miles known as wpm. The first step in wpm is primarily working standards and weight age based on requirements determines criteria. Wpm stands for decision making described in sentences a couple of selection criteria. This result may be expressed in a matrix, in which every [18]. The product-weighted technique is a way for fixing the FMADM problem. This method evaluates more than one alternative for of attributes or standards synthesis, each characteristic each is separate according to the weightless product approach, each characteristic score has to be raised to boost with its corresponding characteristic weights [19]. The use of multiplicative techniques to mix the rating attributes. Wpm research using excessive spatial resolution remote sensing facts land sat types of sensors are very are important. Nevertheless, the common unavailability of high-decision photographs is a proscribing element. The international locations wherein rigorous information required by means of metric or SEBAL can encourage wpm research the usage of remote sensing [20]. Wpm inside lipid droplet surface after emulsion formation the composition is now determined, and of emulsions at one hundred and twenty c thermal stability vision and evaluated microscopically. Wpm temperature is consistent in the course of the non-stop section of emulsification, however because of fast gelation of emulsions. In warm emulsions, fats droplets appeared to be attached via wpm. Caseins in contrast to wpm in lipid droplet ground because the heat balance of the emulsion is low and restore in excess whey protein concentrates allowed. This study, heat-stable whey protein mixing the rich broths together shows that it is very possible [21]. Heat-strong wpm and sufficient amounts of caseins, previously aggregated whey proteins, to completely cowl the floor of the fat's droplet. These effects will make a contribution to the improvement of heats table whey protein rich emulsions. The proposed strategies provide better accuracy and faster computational performance while compared to different choice developing techniques. Useful for bauxite mining proposed to determine mining approach techniques are provided. The results of these techniques with methods used in previous studies are compared. Regular cut and fill the approach is maximally appropriate the results show that the mining method [22].

4. Analysis and Discussion

Table 1 shows the Specific strength (Mpa) it is seen that AISI 4130 is showing the highest value for ASTM A242 is showing the lowest value. Specific modulus (Gpa) it is seen that AISI 4130 is showing the highest value for ASTM A242 is showing the lowest value. Corrosion resistance it is seen that AISI 316 is showing the highest value for AISI 4130 is showing the lowest value. Cost category it is seen that ASTM A242 is showing the highest value for AISI 316 is showing the lowest value.

TABLE 1. Materials selection

	Specific strength (Mpa)	Specific modulus (Gpa)	Corrosion resistance	Cost category
AISI 1020	70.08	78.53	19.15	32.05
AISI 1040	80.12	82.97	33.69	27.30
ASTM A242	68.08	72.58	29.18	33.10
AISI 4130	92.17	98.28	14.60	27.59
AISI 316	89.33	86.41	37.96	18.89

Table 1 shows the Materials selection Alternative: Specific strength (Mpa), Specific modulus (Gpa), Corrosion resistance, and Cost category. Evaluation Preference: AISI 1020, AISI 1040, ASTM A242, AISI 4130, AISI 316.

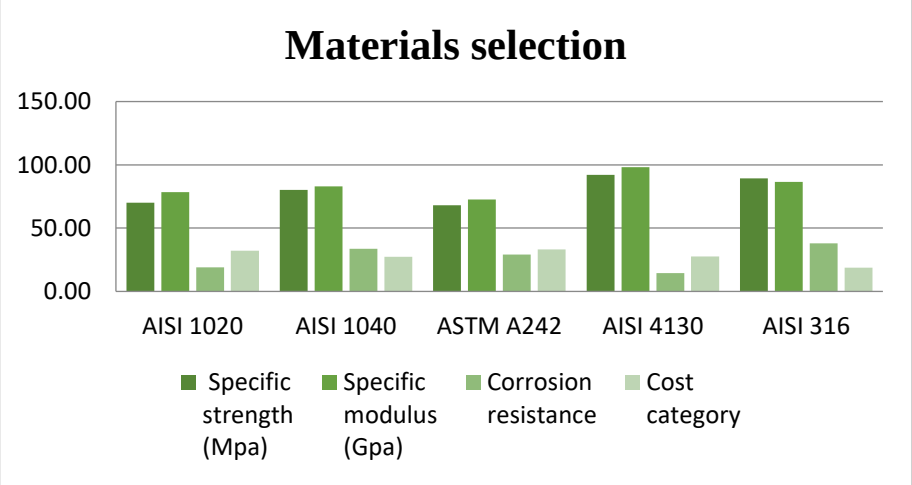

FIGURE 1. Materials selection

Figure 1 shows the graphical representation Alternative: Specific strength (Mpa), Specific modulus (Gpa), Corrosion resistance, Cost category. Evaluation Preference: AISI 1020, AISI 1040, ASTM A242, AISI 4130, AISI 316.

TABLE 2. Performance value

Performance value			
0.760334	0.799044	0.762402	0.589392
0.869263	0.844221	0.433363	0.691941
0.738635	0.738502	0.500343	0.570695
1	1	1	0.684668
0.969187	0.879223	0.384615	1

Table 2 shows the performance value for Materials selection. Alternative: Specific strength (Mpa), Specific modulus (Gpa), Corrosion resistance, Cost category. Evaluation Preference: AISI 1020, AISI 1040, ASTM A242, AISI 4130, AISI 316 it is also Maximum or Minimum value.

TABLE 3. Weight

Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25

Table 3 shows the Weight ages used for the analysis. We took same weights for all the parameters for the analysis**.**

TABLE 4. Weighted normalized decision matrix

Weighted normalized decision matrix			
0.933794	0.945459	0.934428	0.876195
0.965579	0.958548	0.811359	0.912047
0.927059	0.927018	0.84104	0.869163
1	1	1	0.909641
0.992206	0.968333	0.787511	1

Table 4 shows the Weighted Normalized Decision Matrix. Alternative: Specific strength (Mpa), Specific modulus (Gpa), Corrosion resistance, Cost category. Evaluation Preference: AISI 1020, AISI 1040, ASTM A242, AISI 4130, AISI 316. it is also Weighted Normalized Decision Matrix value.

TABLE 5. Preference Score

	Preference Score
AISI 1020	0.72284
AISI 1040	0.68491
ASTM A242	0.62822
AISI 4130	0.90964
AISI 316	0.75663

Table 5. Shows the Preference Score value AISI 1020=0.72284, AISI 1040=0.68491, ASTM A242=0.62822, AISI 4130=0.90964, AISI 316=0.75663.

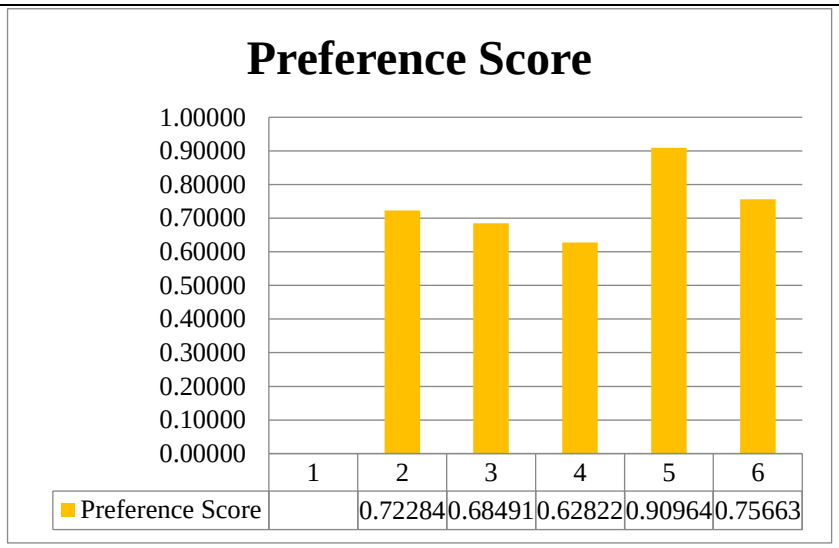

Figure 2 shows the preference Score for AISI 4130=0.909641 is showing the highest value for preference score and ASTM A242=0.62822 is showing the lowest value.

TABLE 6. Rank

	Rank
AISI 1020	3
AISI 1040	4
ASTM A242	5
AISI 4130	1
AISI 316	2

Table 5. shows the final result of this paper the AISI 1020 is in Third rank, the AISI 1040 is in Fourth rank, the ASTM A242 is in Fifth rank, the AISI 4130 is in First rank and the AISI 316 is in Second rank.

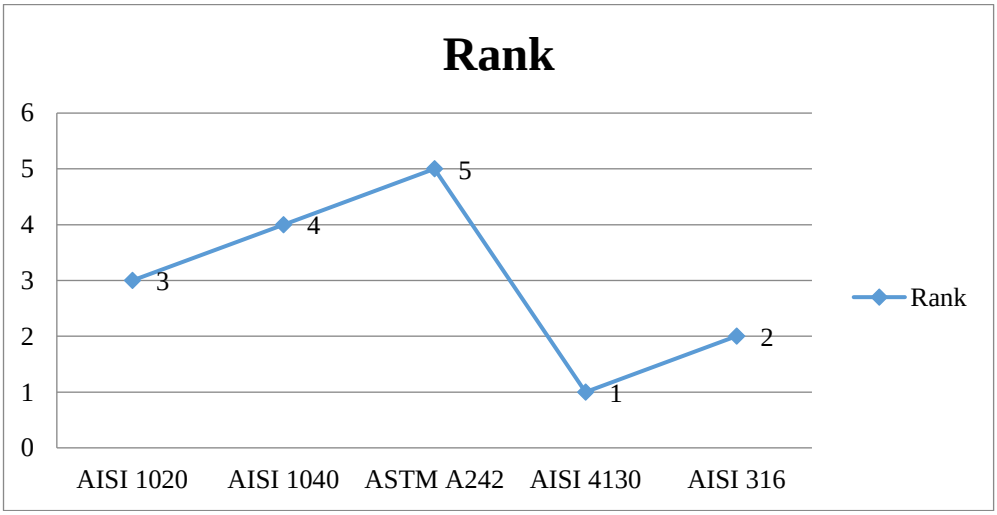

FIGURE 3. Rank

Figure 3 shows the graphical view of the final result of this paper the AISI 1020 is in 3rd rank, the AISI 1040 is in 4th rank, the ASTM A242 is in 5th rank, the AISI 4130 is in 1st rank and the AISI 316 is in 2nd rank. The final result is done by using the WSM method.

5. Conclusion

The choice of materials is a sorted one is the process by which engineers remove one or small number items can be found most suitable. Successful engineering design material selection is critical to the process. As much as possible in your preparation must be strong and durable that's what you want. Security to consider there are also implications. You see, poor material there are many more dangerous failures arising from examination a very common occurrence in industries. The

weighted product method is multi-criteria decision-making process is there are many alternatives, and based on several criteria we must determine the best alternative. The final result of this paper is AISI 1020 in third grade, AISI 1040 in fourth grade, ASTM A242 in fifth grade, AISI 4130 in first grade and AISI 316 in second grade.

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