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Assessment of Materials Selection Problem in Cryogenic Tank Using COPRAS Method

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Abstract: Materials are well-known for their function in product creation and development. There are numerous materials with various qualities on the market right now. Before deciding on the best material for a type of product, the architect must give it some thought. Research Significance: Before making a final decision, the design engineer must also consider a wide range of material eligibility requirements; otherwise, the product could fail before it should while in use. The choice to choose a material for a particular product is an example of a "multi-criteria decision-making" dilemma because it involves several competing criteria and a limited number of candidate options. Research Methodology: In this study, the "COPRAS (COmplex PRoportional ASsessment) technique" is used to address some typical issues with material choice. " Al2024-T6, Al5052-O, SS301-FH, SS310-3AH, Inconel718 and 70Cu-30Zn" are further materials chosen for the cryogenic storage tank. "Toughness Index, Elastic Modulus, Yield Strength, Specific Heat, Thermal Conductivity, and Density" are the material properties used as evaluation criteria. Result: The rank of alternatives using the COPRAS method for Al2024-T6 is fifth, Al5052-O is sixth, SS301-FH is first, SS310-3AH is second, Inconel718 is third and 70Cu-30Zn is fourth. Conclusion: The outcome demonstrates that "301 Full Hard Tempered Stainless Steel" and "Stainless Steel 310" are the best materials for cryogenic tanks.
Keywords: Material selection. Cryogenic, Elastic Modulus, Yield Strength, Specific Heat, Thermal Conductivity, MCDM.

1. Introduction

The developers should have a straightforward comprehension of the functional prerequisites for each different component and in-depth knowledge of the analyzed criteria for a particular engineering design when choosing the most appropriate material from an ever-increasing arrangement of available solutions, and each has its attributes, applications, potential benefits, and limitations [1]. A poor choice of material can frequently result in significant expenditures and ultimately hasten component or product failure. One of the most difficult challenges in the creation and manufacture of products for various engineering applications is choosing the appropriate materials for various components. Therefore, to achieve the required outcome with minimal cost involvement and specialized applicability, the designers must identify and choose appropriate materials with certain capabilities [2]. A classic "multi-criteria decision-making (MCDM)" dilemma is choosing the best material in the presence of many, typically contradictory criteria. Thus, to choose the optimum option for a given application, a methodical and effective strategy for the selection of materials is required [3]. The finest selections regarding the choice of the most sustainable material for various engineering purposes have been effectively derived by historical scholars using a variety of mathematical methodologies. "Chatterjee et al." described the effectiveness of the "complex proportional assessment (COPRAS) and evaluation of mixed data (EVAMIX)" approaches [4,5]. The study of previous studies demonstrates that while much work has already been done on the choice of materials using various MCDM techniques, very little has been done to compare the rating efficiency of these techniques while addressing material selection issues [6]. The "science of cryogenics" examines how comparatively low temperatures behave (nearly 123 K). The goal is to create systems and components that make use of these temperatures. " Liquid nitrogen gas" is kept and moved in the cryogenic container. These refrigerated tanks require specialized approaches for their design [7]. The material of the tank should be adequately hard and rigid. Also, weldability and machinability must be high. Lower density and thermal properties are the other desired properties. The tank material should not be suffered from a ductile/brittle transition at the operating temperature "- 196 °C" [8,9]. In this paper " Al2024-T6, Al5052-O, SS301-FH, SS310-3AH, Inconel718 and 70Cu-30Zn" are further materials chosen for the cryogenic storage tank. "Toughness Index, Elastic Modulus, Yield Strength, Specific Heat, Thermal Conductivity, and Density" are the material properties used as evaluation criteria.

2. Materials and Methods

Among the most difficult challenges in the development of merchandise for various engineering, purposes are choosing the appropriate materials for various components. Therefore, to achieve the required outcome with minimal cost involvement and specialized applicability, the designers must identify and choose appropriate materials with certain capabilities [10]. A

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Development of an Online Machining Machine Monitoring System SPSS Statistics

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Abstract: Machine monitoring system. A strong strategy called Dependability Focused Upkeep (RCM) lays out a protected least degree of support, zeroing in basic upkeep assets on especially basic gear like cycle hardware. RCM is a designing structure. It lays out an all-encompassing support theory and framework. It breaks down tasks and possible disappointments for actual resources (for instance, siphons, blowers or gas turbines). A machine monitoring solution helps factories get real-time information about current operations and future trends. That way, you can act accordingly when needed. It is also used as a tool to reduce the chances of maintenance problems and unexpected machine breakdowns. Despite the fact that has strong underlying announcing highlights that are not difficult to use for most web-based overviews, NPS reviews, and representative fulfillment studies, most specialists find SPSS the best arrangement with regards to inside and out measurable investigation. The SPSS programming bundle was created for sociology information the board and measurable investigation. It was first distributed in 1968 by SPSS Inc. Begun by and later obtained by IBM in 2009. Tool Wear Monitoring, Direct, Indirect, Offline, Online. The Cronbach's Alpha Reliability result. The overall Cronbach's Alpha value for the model is. 497 which indicates 49% reliability. From the literature review, the above 32% Cronbach's Alpha value model can be considered for analysis. the outcome of Cronbach's Alpha Reliability. The model's total Cronbach's Alpha score is. 497which denotes a 49% dependability level. The 32% Cronbach's Alpha value model mentioned above from the literature review may be used for analysis.

Keywords: Tool Wear Monitoring, Direct, Indirect, Offline.

1. Introduction

Machine condition checking incorporates observing of machine parts like pinion wheels and orientation, while machining process observing incorporates checking of cutting instruments and work pieces. The two sorts of exploration intend to understand the reception and variation of robotized machine observing framework. This survey zeroed in on machine process condition checking and a sum of 60 diary articles were tracked down connected with this theme. [1] Late improvements in discourse acknowledgment methods recommend the chance of fostering a sound observing framework that can distinguish different practical sounds transmitted by a machine. Discourse acknowledgment strategies can perceive the human voice, and it is accepted that it can likewise be applied to the acknowledgment of discernible utilitarian sounds. [2] To improve machining framework observing capacities, this study fosters a savvy machine checking framework in CPPS structure. Three contextual analyses have shown its abilities in physical and digital framework displaying of machining frameworks. [3] In this way, online apparatus wellbeing checking frameworks (THMS) are created involving different criticism methods for machine wellbeing prerequisites in hard metals handling. This course primarily centers on the advancement of online THMS utilizing various sensors. Force, device vibration and surface harshness signals were recorded during machining utilizing covered EN24 solidified steel. Carbide embed on CNC machine.[4] Luckily, the arising MT Interface standard makes it workable for the checking framework to gather information precisely and constantly. From any MT Associate viable machine, paying little mind to brand or beginning. This paper presents an online machine checking framework that gives information assortment, examination and machine occasion warning for MT Interface viable machines. The arrangement furnishes shop administrators with the data they need to further develop shop floor process productivity and increment by and large hardware adequacy (OEE).[5] As the exhibition of a device changes during machining, a multi-objective improvement strategy is integrated to distinguish instrument condition data tradeoffs. The proposed observing framework is supposed to suggest the perfect proportion of hardware use by enhancing the producer's necessities. Suggested values empower better independent direction, which can likewise assist with lessening how much piece by controlling item quality.[6] Information got from machine apparatuses are for various

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Blind Image Quality Assessment: An Overview

Sayali S. Deshmkh[1,*], H.K. Waghmare[2]

Abstract

We have develop an efficient model for improving image quality using IQA and NSS based on blind image Quality Assessment. This algorithm does computation for the parameters which user expect at output. These extracted features are based on Bayesian Model for improving image quality scores. The project features are based on statistic scenes of discrete cosine transform for images. The parameters which are featured are then used for perceptual quality of image. Before calculating the parameters as the bilateral filter is applied, so it gives the processing time of the bilateral filter which may vary depending upon the input provided by the user. So using this model we calculate PSNR, Mean, Standard Deviation and entropy for indication of errors if any while processing. There are many algorithms which are based on no reference picture to calculate image quality such as Visual Information Fidelity (VIF) algorithm, BRISQUE and NIQE. Consequently, if these algorithms are performed on image distortions, then these algorithms are expected to perform as per desired on the distortions they have raised during processing. It is highly required for much application to improve image quality with zero level of error. The algorithm does computation for the parameters which user expect at output. The certain extracted features to predict image quality scores approach depends on a simple Bayesian inference model

Keywords: Natural scene statistics, Discrete cosine transform, (VIF), IQA, Blind image

INTRODUCTION

The modifications to the original image cause due to processes all introduce acquisition, digitization, compression, storage, transmission, and display. These modifications, also includes many distortions which may get involved in image processing but may not get identified by humans [1]. If that distortion is visible then also we are not able to find exact error. Process for improving the quality of service in applications is important. Our model relies on IQA algorithm for finding various perceptual levels of image quality assessment using Natural scene statistics against various distortion [1]. The learning model is then used to predict perceptual image quality scores. system

LITERATURE SURVEY

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Z. Wang, A.C. Bovik, H.R. Sheikh, and E.P. Simoncelli, "Image quality assessment: From error visibility to structural similarity," IEEE Trans. Image Process., vol. 13, no. 4, pp. 600–612, Apr. 2004. To measure the errors present in distorted image and reference image there are variety of visual systems which adopts Objective methods for assessing perceptual image quality [1]. As assuming that many of algorithm follows visual perception for identifying various information from scene, Z. Wang et al. has developed an system which is based on quality assessment for degradation of various information in any image

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Assessment of Materials Used in Penstock in Small Hydro Power by TOPSIS Method

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Abstract

There are three kinds of energy resources: fossil fuels, renewable resources, and nuclear resources. An impulse or response turbine is used in a small hydropower (SHP) facility, which is mostly a "run-off-river" in nature. SHP technologies are being employed to generate power for rural electrification in both wealthy and undeveloped nations, and they have minimal maintenance costs and assist to slow down climatic change (but high capital costs). When compared to fossil and nuclear fuels, hydropower constitutes a considerable source of electrical energy today. Hydro resources are also widely available. In many countries, small, mini, and micro-hydro plants are crucial for rural electrification and have the fastest turnaround time for any renewable energy source. This allows them to quickly replace fossil fuels. Selecting the right material plays a crucial part in product design to satisfy all functional criteria. Design is the formulation of data or information, both quantitative and qualitative, where there is always some element of risk and uncertainty. A probabilistic or utilitarian strategy is best adapted to deal with risk and uncertainty. MCDM approach in this study, TOPSIS is utilized to choose the components of the tiny hydropower penstock. The analysis took into account four alternative materials, including polyvinyl chloride (PVC), high-density polyethene (HDPE), glass-reinforced polymer (GRP), and mild steel (MS), as well as five assessment attributes/criteria, including yield strength, life, thickness, material cost, and maintenance cost. polyvinyl chloride (PVC) ranked two, high-density polyethene (HDPE) has rank one, glass-reinforced polymer (GRP) has rank four and mild steel (MS) is having rank three. According to the findings of this investigation, the best materials for penstock in small hydropower are high-density polyethene (HDPE), polyvinyl chloride (PVC), followed by mild steel (MS), and glass-reinforced polymer (GRP).

Introduction

Fossil fuels, renewable energy sources, and nuclear energy are the three main types of energy resources. When compared to fossil and nuclear fuel, hydropower constitutes a considerable source of electrical energy today. Hydro resources are also widely available. It makes up one-fifth of the world's power and is sometimes the only home source of electrical generation [1]. Coal and petroleum are traditional sources of energy available in practically all nations, but their rapid depletion, high prices, and environmental concerns compel researchers to look for alternate clean and sustainable energy sources. Pollution problems are a challenge to the sustainability of people since access to clean air, water, and other natural resources is necessary for a thriving, developed civilization. Therefore, finding answers to environmental problems is essential for sustainable development. Respecting the laws of mass and energy balance is necessary for human sustainability [2]. Energy and development go hand in hand. Growing the production of energy based on fossil fuels has a huge negative impact on the environment, both locally and worldwide. Regulations on greenhouse gas emissions and rising electricity consumption are problems for the power sector. Finding efficient, widely applicable sustainable generating techniques is essential. There are just a few options for electricity generation that meet this condition, including solar, wind, and modest hydropower [3]. 19% of the world's electricity, large and small, from hydroelectricity, which still is "Renewable Energy" for electricity generation and is a very important source. Small Scale hydro is low in Rural in developed countries Electrification is very affordable and environmentally friendly One of the reliable energy solutions is Because it is primarily dam or water "Running down the river" without storage. [4]. Hydropower projects may provide a cheap source of energy and promote the growth of small businesses using a variety of modern technology. The sustainable and environmentally friendly source of power is the energy of moving water. One of the first sources of energy employed by humans, hydraulic power is used in manufacturing and irrigation. Multiple irrigations and drinking water proposals can benefit from installing modest hydro plants [5]. The cost of the project varies depending on the location and the penstock material used, the alignment, the design, and the implementation. Geographical and geological factors have a major role, but so do the manner of construction and the substance [6]. Because of this, it is important to carefully consider the material selection for penstock as well as related factors including surface roughness, design pressure, method of jointing, weight, simplicity of installation, availability, and maintenance [7]. Water is transported from the intake to the powerhouse using penstocks (pipes). They can be built above or below the ground, depending on the conditions and requirements of the location, the kind of ground, the materials used for the penstock, and the temperature [8]. A separate penstock for each turbine Unlike a hydro plant with a common one that provides multiples Separate penstocks from tunnels Branches out to units are hydraulic The link gives results. [9]. Because of their compatibility, availability, and approval, the most typically used materials for a penstock are mild steel, high-density polyethene (HOPE), and un-plasticized polyvinyl chloride (uPVC). In