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Artificial intelligence density model for oxide glasses

Shaik Kareem Ahmmad ^a✉, Nameera Jabeen ^c, Syed Taqi Uddin Ahmed ^d, Shaik Amer Ahmed ^b, Syed Rahman ^b

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Abstract

A comprehensive study to perform glass density prediction employing artificial intelligence using a dataset of 6630 oxide glass samples. The prediction is done based on Ionic packing ratio as the independent variable and experimental densities from the dataset as the dependent variable. Random forest regression and artificial neural networks were observed as the best models training the density datasets. The random forest regression had the least average R^2 score for large datasets. Artificial neural networks employing sigmoid and ReLU activation functions dominate in predicting the glass density as compared to tanh and identity activation functions. Based on this study we can theoretically predict the density of any oxide glass to an extent of maximum accuracy for a known glass composition.

Next

M. Jabeen
28/04/22
PRINCIPAL
Mufakkham Jah College Of
Engineering & Technology
Banjara Hills, Road No. 3,
HYDERABAD-500 034.(T.S.)


Keywords

Oxide glasses; Density; Ionic packing ratio; Artificial intelligence

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Optical Properties of Mixed Alkali Borate Glasses

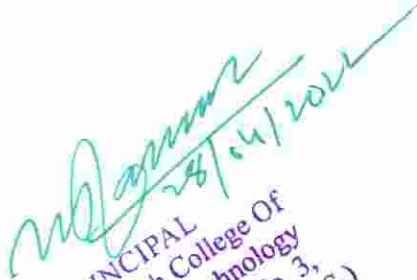
M. A. Samee, Shaik Kareem Ahmmad , Shaik Amer Ahmed, Salavadi Stalin, A. Edukondalu & Syed Rahman

Glass Physics and Chemistry **47**, 104–117 (2021)

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Abstract


In the present study glass samples of $(40 - x)\text{Li}_2\text{O} \cdot x\text{Na}_2\text{O} \cdot 10\text{K}_2\text{O} \cdot 50\text{B}_2\text{O}_3$ and $(40 - x)\text{Li}_2\text{O} \cdot x\text{K}_2\text{O} \cdot 10\text{Na}_2\text{O} \cdot 50\text{B}_2\text{O}_3$ ($0 \leq x \leq 40$ mol %) were prepared by melt quench technique. The cut-off wavelength varies non-linearly when Li_2O is replaced with Na_2O or K_2O . The type of electronic transition in the present glass systems is indirect allowed. Using single oscillator model, the oscillator energy E_0 , the dispersion energy E_d , the static refractive index n_0 , the oscillator strength S_0 and average oscillator wavelength λ_0 were determined. The ratio of free carrier concentration to the free carrier effective mass N_c/m^* , the optical relaxation time τ and ϵ_∞ the high frequency dielectric constant were determined in the present glass systems. The real and imaginary parts of the optical conductivity


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Engineering & Technology
Banjara Hills, Road No. 3,
HYDERABAD-500 034.(T.S.)

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Nitrogen implantation of zinc arsenic tellurite glasses

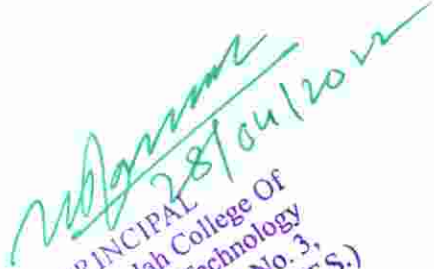
Shaik Kareem Ahmmad , P. Magudapathy, Avula Edukondalu, Shaik Amer Ahmed & Syed Rahman

Journal of the Australian Ceramic Society **57**, 185–194 (2021)

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Abstract

We have implanted $x\text{ZnF}_2-(20-x)\text{ZnO}-40\text{As}_2\text{O}_3-40\text{TeO}_2$ ($x = 4$ and 20 mol%) glasses with nitrogen ions at different doses. The glass samples were characterized by Rutherford backscattering spectrometry for the concentration depth profiles of the implanted atoms, by SEM analysis for surface morphology, and also by UV–vis absorption spectroscopy. It was observed that in both the glass systems, there is an increase in the values of penetration depth R , projected range R_p , and straggle ΔR_p as the N^+ implantation dose grows from 5×10^{16} to 5×10^{17} ions/cm². Scanning electron micrographs show a considerable change in the surface topography between the unimplanted and nitrogen-implanted regions. After nitrogen ion implantation, the transmittance was found to


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Engineering & Technology
Banjara Hills, Road No. 3,
HYDERABAD-500 034.(T.S.)

A Novel Approach For Identification Of Exon Locations In DNA Sequences Using GLC Window

P.Kamala Kumari¹, J.B. Seventline²,

¹Muffakham Jah College of Engineering and Technology,
Hyderabad,500049, India.

²GITAM University, Visakhapatnam, 530045, India.

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Abstract— The application of signal processing techniques for identification of exons in Deoxyribonucleic acid (DNA) sequence is a challenging task. The objective of this paper is to introduce a combinational window approach for locating exons in DNA sequence. In contrast to the traditional single window function for evaluation of short time Fourier transform (STFT), this work proposes a novel method for evaluating STFT coefficients using a combinational window function comprising of Gaussian, Lanczos and Chebyshev (GLC) windows. The chosen combinational window GLC has the highest relative side lobe attenuation values compared to other window functions introduced by various researchers. The proposed algorithm incorporates GLC window function for evaluating STFT coefficients and in the design of FIR bandpass filter. Simulation results revealed its effectiveness in improving the evaluation parameters like Sensitivity, Specificity, Accuracy, Area under curve (AUC), Discrimination Measure (DM). Furthermore, the proposed algorithm has been applied successfully to some universal benchmark datasets like C. elegans, Homosapiens, etc., The proposed method has shown to be an efficient approach for the prediction of protein coding regions compared to other existing methods. All the simulations are done using the MATLAB 2016a.

Keywords—DNA sequences, Dolph-Chebyshev window, Exons, Gaussian window, Lanczos window.

I. INTRODUCTION

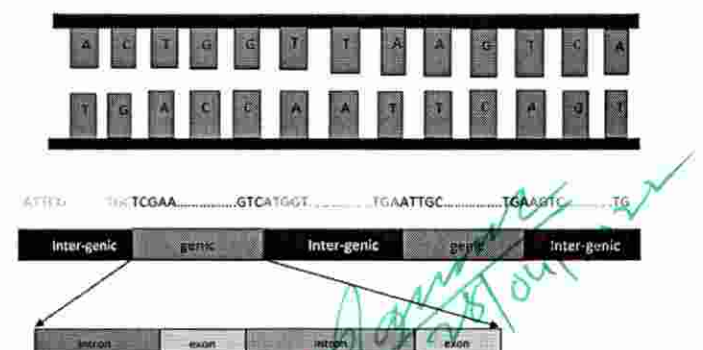
DNA is the genetic material responsible for the growth and genetic transfer of individuals. This genetic information is stored in the form of a particular order comprising of the four nucleotides namely Cytosine(C) Adenine(A), Thiamine(T) and Guanine(G). The entire DNA sequences are segregated into genic and intergenic region. Genic region stores information for making proteins. The genes are further subdivided into two regions: exons (coding regions) and introns (noncoding regions) as depicted in Figure.1

Proteins are considered as the essential component of every cell in the body. Proteins are the most profuse kind of molecules present in the body, next to water. They are made up of hundreds of compact units called amino acids that are linked together by peptide bonds to form a long chain. There are 20 different amino acids present in the body. Each amino acid is

encoded as a sequence of three successive nucleotides in protein coding regions. Human genome constitutes approximately 3 billion basepairs Out of which only 2% are associated with protein coding regions while the rest 98% are probably junk DNA which is associated with either intergenic or introns. Locating such a low-density coding sequences makes it an arduous task.

A wide variety of Digital signal processing (DSP) tools and algorithms have emerged to solve the problem of identification of protein coding regions[1,2,3]. "Researchers revealed that exonic regions have strong power spectrum density (PSD) peak at $f=1/3$, which is absent in introns"[4,5]. This three-base property (TBP) is used extensively by the researchers for exon prediction in DNA sequences in conjunction with signal processing techniques. Prior to applying DSP algorithms, the DNA sequence has to be converted in discrete sequence by using mapping techniques. "The two major objectives of this genomics is 1) To discover families of genes or gene products that can be used to classify disease, thereby leading to molecular-based diagnosis and prognosis. 2) To characterize genomic regulation thereby leading to a functional understanding of disease and the development of system based medical solutions"[6].

In recent decade, quite a good number of mapping schemes have been introduced to convert alphabetical DNA sequence into numerical values. These include Voss, the Electron Ion Interaction Potential (EIIP), the Pseudo EIIP, the tetrahedron, the Paired numeric, the complex, the trigonometric, the integer, the variable mapping using twiddle factor, the real and the quaternion.



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“SERVICLE” – Smart System to Detect Dents and Scratches in Vehicle Body

Dr. Shantakumar B Patil^[1] Dr. Premjoti Patil^[2] Mrs. Gouri Patil^[3] Mr. Mahesh B Patil^[4]

^{[1][2]} Professor

Nagarjuna College of Engineering & Technology, Bengaluru, Karnataka.

^[3] Assistant Professor

Muffakham Jah College of Engineering and Technology (MJCET).

^[4] Assistant Professor

SDM Institute of Technology -[SDMIT] Ujire.

shantakumar.p@gmail.com[1]

1. ABSTRACT:

Automatic minor damage recognition for vehicles (e.g. recognition of dents and scratches) allows car rental and car sharing companies to assign damage to a guilty customer. This can be done by comparing the point of time when the damage occurs with the booking time of customers. If necessary, the companies inform the customer about an event during his booking time. In particular, the damage detection system creates the necessary transparency between the customer and claims management in the car sharing business. The philosophy of car sharing and the growing number of users sets high requirements to the check-out procedure during usage. These worsen the relationship between customer and car sharing company, since there is a possibility that the damage is assigned to a wrong person.

Keywords: Servicle, Detection, Dents

2. INTRODUCTION:

The presented approach deals with the algorithm development for minor damage identification in vehicle bodies using adaptive sensor data processing. It ensures the correct and error-free classification of the detected damage events, and increases the credibility of the damage messages.

A new automatic dent detection system which can automatically obtain the surface information of the car bodies, extract features, reduce noise effects and distinguish dents from features, noise and detect the dents, scratches and broken glass. The system will also

generate position information that is mark the particular dent, scratch, broken glass area.

First stage is car reception where the system will take pictures to the car from its different sides by using

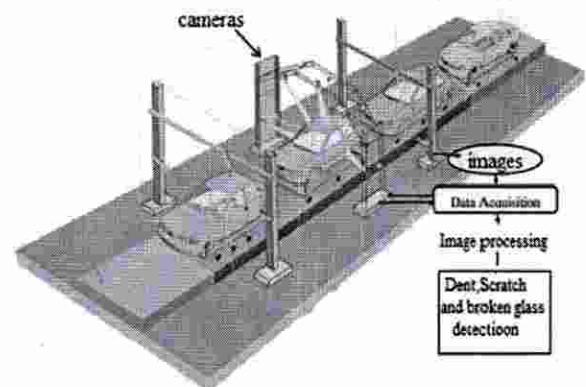


Figure 1: Proposed system

3. SYSTEM ARCHITECTURE

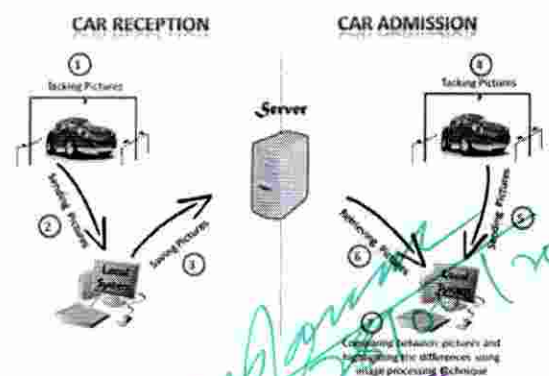


Figure 2: System Architecture Diagram of the proposed model

A Review on Mechanical Strength of Fibre and Hybrid Fibre Reinforced Geopolymer Concrete

V. Kiranmayee^{*1}, Dr.A.Aravindan², Dr Hamraj³

¹*Research Scholar, KoneruLakshmaiah Education Foundation, Vaddeswaram, A.P, India.

²Professor, Department of Civil Engineering, KoneruLakshmaiah Education Foundation, A.P, India.

³Professor & Head CED, MJCET, Banjara hills, Hyderabad.

Abstract –Global warming is one of the best articulated terms right now. Subsequently decreasing the ozone depleting substance discharges, which is the reason behind overall warming, is the need of great importance thus endeavors are direly in progress everywhere throughout the world to grow organically agreeable development materials, which make least utility of quick lessening characteristic assets and help to diminish ozone depleting substance emanations. Five to eight percent of the world's artificial Greenhouse gas outflows are from the Cement business itself. The green house gas discharges are decreased by 80% in Geopolymer solid opposite the traditional Portland concrete assembling, as it doesn't include carbonate copies. Right now, are demonstrating extraordinary potential and a few scientists have basically analyzed the different parts of their feasibility as cover framework. Significant research has been done on improvement of Geopolymer cements (GPCs), which include heat relieving. A couple of studies have been accounted for on the utilization of such GPCs for basic applications.

Geopolymer fasteners are delivered by polymeric response of soluble fluid with alumino-silicate materials including the modern squanders like fly debris, impact heater slag, rice husk debris and so on. Geopolymers are normally fragile and described by low rigidity and break durability. Strands are added to diminish the weak idea of geopolymer concrete. This paper presents a survey of the writing, sketching out the different research approaches embraced with an end goal to check the achievability of geopolymer to structural designing applications.

Key Words: Geopolymerisation, Blast furnace slag, Green binder, Brittle nature Hybrid fibre.

Introduction

Concrete is the most widely recognized, adaptable, and solid development material on the planet. The utilization of Ordinary Portland Cement (OPC) makes contamination the earth because of the emanation of CO₂ and to lessen the illeffects to natural due to OPC creation, Geopolymer concrete (GPC) was presented. Geopolymers are inorganic polymers incorporated by means of a substance response between an exceptionally antacid arrangement and the Si–Al minerals present in the fly debris [17]. This procedure is named geopolymerization. This outcomes in a 3-D polymeric system comprising of Si–O–Al–O bonds with the equation of $Mn-(SiO_2)_z-AlO_2-wH_2O$ where M is an antacid component, n is the level of polymerization, z is an incentive somewhere in the range of 1 and 32, and w is the hydration degree, which is an element of the sort and measure of the basic arrangement utilized. Basic aluminosilicate material utilized for creating geopolymer is fly debris and slag, which are both modern side-effects and both of these materials have a lot of lower carbon dioxide emanation factor contrasted with concrete [9]. The antacid fluids are typically sodium or potassium based. The most widely recognized soluble fluid utilized in geopolymerization is a blend of sodium hydroxide (NaOH) or potassium hydroxide (KOH) and sodium silicate or potassium silicate [10].

Common Portland concrete has been a folio for Civil Engineering errands for quite a while. Be that as it may, at present, there are numerous new issues stretching from its regularly expanding use. Concrete creation expends immense amounts of virgin materials, is vitality serious, and prompts high discharge of the ozone harming substance CO₂, which is the primary explanation for Global warming. Once more, Sulfur dioxide emanation likewise can be exceptionally high, contingent on the sort of fuel utilized. Establishment of new concrete plants is turning out to be progressively capital-escalated. At last, many concrete solid structures have displayed early pain and issues, which adversely affects the asset efficiency of the business. To conquer every such constraint, another cementitious composite called "Geopolymer" is developed. The name geopolymer was authored by a

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*Corresponding Author: V. Kiranmayee

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PRINCIPAL
Muffakham Jah College Of
Engineering & Technology
Banjara Hills, Road No. 3,
HYDERABAD-500 034.(T.S.)

Article

Capacity Analysis of Lattice Reduction Aided Equalizers for Massive MIMO Systems

Samarendra Nath Sur^{1,*}, Rabindranath Bera¹, Akash Kumar Bhoi², Mahaboob Shaik³ and Gonçalo Marques⁴

¹ Department of Electronics and Communication Engineering, Sikkim Manipal Institute of Technology, Sikkim Manipal University, Majitar 737136, Sikkim, India; rbera50@gmail.com

² Department of Electrical and Electronics Engineering, Sikkim Manipal Institute of Technology, Sikkim Manipal University, Majitar 737136, Sikkim, India; akash730@gmail.com

³ Department of Electrical Engineering, Muffakham Jah College of Engineering and Technology, Hyderabad 500034, India; 44.maha@gmail.com

⁴ Instituto de Telecomunicações, Universidade da Beira Interior, 6201-001 Covilhã, Portugal; goncalosantosmarques@gmail.com

* Correspondence: samar.sur@gmail.com

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Abstract: Massive multi-input-multi-output (MIMO) systems are the future of the communication system. The proper design of the MIMO system needs an appropriate choice of detection algorithms. At the same time, Lattice reduction (LR)-aided equalizers have been well investigated for MIMO systems. Many studies have been carried out over the Korkine–Zolotareff (KZ) and Lenstra–Lenstra–Lovász (LLL) algorithms. This paper presents an analysis of the channel capacity of the massive MIMO system. The mathematical calculations included in this paper correspond to the channel correlation effect on the channel capacity. Besides, the achievable gain over the linear receiver is also highlighted. In this study, all the calculations were further verified through the simulated results. The simulated results show the performance comparison between zero forcing (ZF), minimum mean squared error (MMSE), integer forcing (IF) receivers with log-likelihood ratio (LLR)-ZF, LLR-MMSE, KZ-ZF, and KZ-MMSE. The main objective of this work is to show that, when a lattice reduction algorithm is combined with the convention linear MIMO receiver, it improves the capacity tremendously. The same is proven here, as the KZ-MMSE receiver outperforms its counterparts in a significant margin.

Keywords: MIMO; ZF; MMSE; LLR-ZF; LLR-MMSE; KZ-ZF; KZ-MMSE; capacity

1. Introduction

The continuous demand for high speed and reliable communication systems puts the MIMO systems the most demanding research topic [1]. As a further enhancement of MIMO technology, massive MIMO can increase the capacity in many folded and also enhance the system energy efficiency [2,3]. However, all the benefits come with the burden of challenges. In the MIMO system, the design of low complex signal processing techniques is the main challenge of concern. Therefore, it is critical to address the challenge of developing low complex signal processing techniques for increasing the capacity of the massive MIMO system. In this paper, the authors discuss this critical problem and examine the low complex LR-aided receivers for the channel capacity enhancement.

Several studies state that maximum-likelihood (ML) is the optimal receiver for a MIMO system. Nevertheless, it is practically unimplementable as its complexity increases exponentially with the number of antennas used in a MIMO system [4–6]. The linear receivers such as matched filter (MF),

Decision-making on the existence of soft exudates in diabetic retinopathy

A. Reyana* and
V.T. Krishnaprasath

Department of Computer Science and Engineering,
Nehru Institute of Engineering and Technology,
Coimbatore, Tamil Nadu, India
Email: reyareshmy@gmail.com
Email: prasathkriss@gmail.com
*Corresponding author

Sandeep Kautish

Department of Computer Science and Engineering,
Lord Buddha Education Foundation (LBEF) Campus,
Kathmandu, Nepal, India
Email: dr.skautish@gmail.com

Ranjit Panigrahi

Department of Computer Science Applications,
Sikkim Manipal University,
Gantok, Sikkim, India
Email: ranjit.panigrahi@gmail.com

Mahaboob Shaik

Department of Electrical Engineering,
Muffakham Jah College of Engineering and Technology,
Hyderabad, Telangana, India
Email: 44.maha@gmail.com

Abstract: Medical image analysis is recognised to be the most important research area for diagnosis and screening of a wide range of medical problems. The commonly discussed diabetic retinopathy has become a vital factor of serious eye diseases leading to eye blindness. Diabetes mellitus, a remarkable metabolic disorder, is rapidly increasing health threats worldwide. The major cause of Diabetic Retinopathy (DR) is the increase in blood insulin levels. The DR lesion thresholds inferred have protective effects and have no benefits for patients. From the fundus images the prediction of micro-aneurysms is still the major challenge. Micro-aneurysms formulation is the initial sign of DR to reduce the risk of non-proliferated DR. With this in mind, there exists a need for a diagnostic system, for early detection of DR to be used by the ophthalmologist to identify different types of lesions like haemorrhages and exudates. This paper presents a new approach to detect and classify exudates in coloured retinal images, eliminating the replication of exudates by removing the optic disc region. Our research aimed to extend the current knowledge of several image processing techniques including image enhancement, segmentation, classification, and registration for early diagnosis preventing visual impairment and blindness.

Keywords: diabetic; retinopathy; homogeneity; segmentation; blindness.

Reference to this paper should be made as follows: Reyana, A., Krishnaprasath, V.T., Kautish, S., Panigrahi, R. and Shaik, M. (2020) 'Decision-making on the existence of soft exudates in diabetic retinopathy', *Int. J. Computer Applications in Technology*, Vol. 64, No. 4, pp.375–381.

Biographical notes: A. Reyana is currently working as an Assistant Professor in the Department of Computer Science and Engineering at Nehru Institute of Engineering and Technology, Coimbatore, Tamilnadu. She is pursuing her doctoral degree in the field of Information and Communication Engineering at Anna University, Chennai. She has done her Masters in Computer Science & Engineering and her research interests include multisensor fusion, internet

MUFFAKHAM JAH COLLEGE OF
ENGINEERING & TECHNOLOGY
Banjara Hills, Road No. 3,
HYDERABAD-500 034.(T.S.)

DESIGN OF CHANNEL FEED-BACK CODEBOOK AND ADDRESSING POWER LEAKAGE PROBLEM IN MM- WAVE MASSIVE MIMO SYSTEM WITH LENS ANTENNA ARRAYS

¹Nazeerunnisa , ²Dr. Madhavi Tatineni , ³M. Shahid Ali Khan , ⁴Shagufta Hafeez

¹MuffakhamJah College of engineering and technology, Hyderabad, India, 500034.

²Gitam (Deemed to be university), Vizag, Andhra Pradesh.

³MuffakhamJah College of engineering and technology, Hyderabad, India.

⁴MuffakhamJah College of engineering and technology, Hyderabad, India.

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Abstract

Objective

The modernistic theory of beamspace MIMO, which involves millimeter wave (mm-Wave) and massive MIMO system depending on lens antenna array (LAA) can efficiently decrease the count of power consuming radio frequency (RF) chains. Hence, it is perceived as an optimistic approach for the 5G technology and its successors. Research in beamspace (BmSp) MIMO has yet to be taken into debate the issues of power leakage in channels, therefore resulting in remarkable deterioration in SNR and the sum-rate (SR). A precoding technique for beam aligning and to tackle power leakage issue has been proposed. Initially a network using phase shifters has been designed, which helps RF chains choose beams and collect leaked power in beamspace MIMO. An algorithm based on rotation for precoding, for the available phase shift networks is proposed to align the gains of the channels in the same direction to maximize SNR received by the users. In systems that employ frequency division duplexing (FDD), it is necessary that the channel is fed back to the base station (BS) via feedback based on codebook. There is no devoted codebook for the LAA dependent mm-Wave systems. The codebook design is proposed to address the gap for these systems. In this codebook, initially a large dimension vectors based on recent idea involving angle coherence time are generated. Then relying on obtained vectors in channel subspace, codebook is created by considering lens and beam selection. After that the channel is quantized and given as feedback to the BS.

Results

Simulation results conveys that the overhead in feedback is proportional to dominant paths for each user which are few and the proposed approach with uniform linear array (ULA) attains the near optimal performance in SR comparing to ideal case of zero power leakage and also obtains superior Energy efficiency (EE) than existing single beam precoding and Multiple beam via multiple RF (MBMRF) structure precoding methods.

Key words: beamspace, codebook, millimeter Wave, MIMO, path power leakage, precoding.

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INTRODUCTION

The coalition of mm-Wave communication and massive MIMO is reasoned to be prevailing technique for the forthcoming 5G-NR [1], due to their significant bandwidth potential [2]. The enormous attainable bandwidth not only enhances the throughput of wireless communications, but also increases the fine array gains given by massive MIMO to counterbalance the path loss in signals of mm-Wave frequencies [3, 4]. Precoding is one of the dominant techniques that achieves system throughput gain in mm-Wave massive MIMO technology [5, 6]. The conventional method to implement mm-Wave massive MIMO is to use fully digital precoding, which involves one RF chain dedicated to each transmitting and receiving antenna. This results in large utilization of power as RF chains used at mm-Wave frequency are power hungry and exorbitant [7]. Systems with combination of mm-Wave and massive MIMO have accepted the newly proposed BmSp MIMO theory with the objective to lessen the usage of RF chains [8]. By making a productive use of the capability of LAA to focus energy, the signals approaching from various angles can be directed on distinct points on the antenna array, so as to transform the conventional spatial channel to a BmSp channel. As there is high attenuation in mm-Wave spectrum, the number of dominant paths are restricted in mm-Wave communication systems [9]. Hence, the BmSp channel formed by the lens is sparse due to the less amount of scattering in mm-Wave systems [10]. Path division multiplexing paradigm for single users was proposed [11] to transmit distinct data streams on distinct paths and it was further generalized for the multiple user conditions. In the interest of increasing the spectral efficiency diverse beam selection methods were studied on the

basis of various standards in MIMO systems using the BmSp approach [12]. Similar angle of departures (AoDs) were coincidentally shared between various multiple users which lead to the proposal of a new beam selection technique which factored for the possible inter-user interference [13]. There were many algorithms proposed for hybrid precoding in order to achieve spatial multiplexing gains. In systems that adopt FDD, the feedback has to be given to signal the channel towards BS using feedback path based on codebook [14]. However the traditional codebook design using random vector quantization is not useful for systems depending on LAA. The major issue in BmSp channels is of power leakage which is not much addressed in current studies. Since there are finite elements in LAA, it is not possible to impeccably sample the randomly distributed AoD's of path all the time, hence the power of few paths will dissipate on the extent of antennas and power leakage occurs. (Refer Fig. 1) [18].

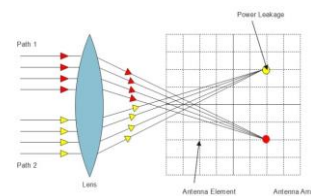


Fig 1. Lens-Path power directing functionality and problem of power leakage in beamspace channels



A Modified Cylinder Block-IC Engine Experimentation

Mohd Abdul Samad, Syed Nawazish Mehdi, Syed Khader basha

Abstract: In Internal combustion Engines, the adequate cooling plays vital role for proper functioning and enhanced efficiencies. In the present scenario, the demand for Air cooled Engines with higher powers is increasing and hence necessity for Augmented heat transfer through fins. The present work confined to fins mounted on the cylinder block. In the present work, Internal Combustion Engine test rig is used, which consist of 4S, single cylinder, vertical, air cooled, SI Engine with Instrumentation panel, Throttle control mechanism and Electrical Loading system. The performance test on IC engine is carried out for three various configurations of cylinder blocks i.e., 1. Actual cylinder block 2. Cylinder block with triangular profile fins 3. Cylinder block with perforated triangular profile fins. Performance parameters are evaluated, plotted and compared & eventually conclusions are made.

Keywords: Cylinder Block with Perforated Triangular Profile Fins.

I. INTRODUCTION

Engines are broadly classified into internal combustion engines and external combustion engines. In internal combustion engines, combustion takes place inside the cylinder. During combustion hot gases are produced at temperature of about 2500°C. Consequently heat is absorbed by cylinder walls, piston, cylinder head and valves and further, temperature of these parts increases. Subsequently leads to malfunctioning of the engine. Hence this necessitates the proper cooling system. Cooling system can be either water cooled or air cooled. Due to light weight and other advantages, air cooled engines are mostly used for automobile applications.

II. ENGINE SPECIFICATION

TABLE 1: IC ENGINE SPECIFICATION

Number of Cylinders	One (1)
Bore Dia	57.30mm
Stroke Dia	57.80mm
Displacement of Piston	149.2 Sq. cm

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*Corresponding Author

Mohd Abdul Samad*, Assistant Professor, Department of Mechanical Engineering, MJCET, Hyderabad, India. Email: masamad@mjcollege.ac.in

Dr. Syed Nawazish Mehdi, Research Supervisor, Department of Mechanical Engineering, Mewar University, Rajasthan, India. Email: nawazishmehdi@yahoo.co.in

Dr. Syed Khader Basha, Assistant Professor, Department of Mechanical Engineering, MJCET, Hyderabad, India. Email: khader.basha@mjcollege.ac.in

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C.R (Compression Ratio)	9.1:1.0
Fuel	Petrol
Position of the Engine	Vertical

III. EXPERIMENTAL APPARATUS AND METHODS

Experimentation is being carried out with internal combustion Engine test rig which consists of following components

1. I.C Engine
 2. Instrumentation panel, which consist of burette, manometer, rpm indicator and energy meter.
 3. Throttle control mechanism
 4. Anemometer
 5. A.C Generator with electrical load bank.
- once the test rig is being prepared, internal combustion engine is started with self stator with the help of battery.

The below mentioned parameters are noted after observation for different wind speeds at constant speeds of the I.C engine

1. Fuel consumed in the burette
2. Water level difference in manometer
3. Speed of the engine
4. Energy meter reading
5. Wind speed



Fig.1: IC ENGINE TEST RIG

With the aide of above parameters, performance factors like, $\eta_{Br.th.}$, B.S.F.C etc., are evaluated. The above experiment is repeatedly carried out for three various configurations of cylinder blocks i.e., 1. Actual cylinder block 2. Cylinder block with fins of triangular profile. 3. Engine block with perforated fins of triangular profile.



DESIGN AND DEVELOPMENT OF 30 KVAR DSTATCOM FOR REACTIVE POWER COMPENSATION IN AN 800 KW RADIAL DISTRIBUTION SYSTEM

K. Mahammad Rafi¹ and P. V. N. Prasad²

¹Department of Electrical and Electronics Engineering, Muffakham Jah College of Engineering and Technology, Hyderabad, Telangana, India

²Department of Electrical Engineering, University College of Engineering, Osmania University, Hyderabad, Telangana, India
 E-Mail: kk.rafi@gmail.com

ABSTRACT

This paper presents the design, analysis and development of 30 kVAr DSTATCOM for compensation of reactive power in an 800 kW radial distribution system, feeding power to crucial loads of an educational institution. In this paper the study of radial distribution system is analyzed in terms of electrical power system of institute, power consumption pattern and tariff related issues. We made some conclusions to improve the system performance in terms of power factor and reduction in tariff. The DSTATCOM performance depends on the calculation of the reference source currents that generates the gating pulses of the voltage source converter (VSC) based DSTATCOM. For this purpose the control strategy adopted is IRP (Instantaneous Reactive Power) and SRF (Synchronous Reference Frame) theory and ADALINE is implemented in this system using MATLAB/ SIMULINK software. Generation of the PWM pulses triggers the IGBT of the VSC based DSTATCOM. This is achieved using DSP TMS 320 F 2812, a 32 bit processor that is programmed with CCS V8.0. The performance of the selected distribution system is analyzed experimentally in a hardware prototype to evaluate the effect of DSTATCOM. It is observed that the selected radial distribution system with DSTATCOM provides voltage sag mitigation, reactive power compensation and power factor improvement.

Keywords: DSTATCOM; power quality; reactive power; power factor; point of common coupling (PCC).

1. INTRODUCTION

Reactive power supervision in a power distribution system of a power utility or industry plays a key role in i) reducing distribution loss, ii) maintaining constant distribution voltage and iii) improving power factor. The perfection of power factor enables the reduction of current demand from the Utility resulting in efficient utilization of distribution transformer and reduced electricity bills. The performance of conventional switched capacitors used for reactive power compensation would only give step control and results in over compensation or under compensation for varying loads and changeable reactive power demand. To overcome these problems, in this project, it is proposed to develop a prototype 30 kVAr DSTATCOM for reactive power compensation which would provide instantaneous correction of power factor and always maintains the set power factor. The prototype consists of a power panel with IGBT based voltage source inverter, DC filter capacitor and a DSP based controller along with necessary power supply units, protection cards and firing pulse generating units. By suitable control strategy, the STATCOM would generate leading or lagging reactive volt-amp (VAR) at the PCC (Point of Common Coupling) and avoid problems connected with lag and lead power factor. The power factor can be maintained at the desired level irrespective of system voltage.

A. Objective

The objective of this paper is

- a) To Design, simulate and fabricate a +/-30 kVAr prototype DSTATCOM

- b) To develop control hardware and software for reactive power compensation
- c) To evolve novel testing strategies

B. Project Significance

DSTATCOM is an acronym for Distribution STATic synchronous COMPensator, and forms a member of the family, widely known as FACTS (Flexible AC Transmission System) or Custom Power devices.

Development of DSTATCOM and knowledge of Practical aspects of advanced power electronics enables the research centre in Electrical Engineering Department (EED) to be a unique one with in-house capability to design and develop a FACTS device. The idea of combining capabilities of IGBT-based voltage source converter, DSP based controller and allied power electronics as proposed in the Project ushers in an original generation of FACTS controllers. The present development would open up a path for further studies in the region of other FACTS / Custom Power devices. The know-how gained in the present development will result in tools and techniques for design of other FACTS devices such as, high power STATCOM, Static Synchronous Series Compensator (SSSC), Interline Power Flow Controller (IPFC) and Unified Power Flow Controller (UPFC), Dynamic Voltage Restorer (DVR), active power harmonic filter, active power line conditioner etc. The basic building control block diagram of DSTATCOM is shown in Figure-1. The complete Electrical Substation Layout of sultan Ul-Uloom education society as shown in Figure-2. The incoming supply is 11 kV/440V is divided

A Method for Design of DSTATCOM Fast Acting DC Link Voltage Controller

¹ K. Mohammad Rafi and ² P. V. N. Prasad

¹ Department of Electrical and Electronics Engineering, Muffakham Jah College of Engineering and Technology, Banjara Hills, Hyderabad- 500034, India.

² Department of Electrical Engineering, University College of Engineering, Osmania University, Hyderabad-500007, India.

E-mail: ¹ kk.rafi@gmail.com, ² pvnprasad09@gmail.com

ABSTRACT

This paper explains the detailed design analysis and simulation of Distribution Static Synchronous Compensator (DSTATCOM) in terms of compensated to be in command of Voltage Source Converter (VSC) input voltage, recombine of reactive power and enhancement of power factor for radial distribution system of 11kV/415V, 800 kW rating. The model has been simulated and tested in Matlab/Simulink using Simscape tool block set version of Matlab R2019a. The same is achieved using DSP TMS 320 F 2812, a 32-bit processor that is programmed with CCS V 6.1 software. The methods are Back Propagation Control Algorithm (BPCA), and Synchronous Reference Frame Theory (SRFT). BPCA is based on the elementary extracted biased value of Reactive Power (Q) and Active Power (P) components of load currents. These current values are necessary for the reference source current evaluation. The reference source currents are evaluated from the available source currents to generate firing pulses for the SRFT and BPCA. SRFT is based on the transformation of synchronously rotating load currents in direct axes and quadrature axes frame. BPCA and SRFT based DSTATCOMS are simulated for linear and nonlinear load circumstances.

Keywords: FACTS Device, DSTATCOM, VSC, PCC, BPCA, SRFT.

1. INTRODUCTION

Reactive power control is very important present days due to more nonlinear load are connected to Electrical Distribution System (EDS), so that the system gets polluted due to the nonlinear load on the load side [1]- [4]. The control of reactive power enables the system to get better power factor (PF) this leads to reduction in line current follow-on in proper consumption of distribution transformer and reduced power bills. The excessive reactive power demand and harmonics in the system due to non linear and variable loads reduces the real power flow of the distribution system. To overcome these problems, in this paper fast acting voltage source converter (VSC) input voltage control and reactive power control algorithms are studied and finally analyzed the best suitable control methodology is proposed to DSTATCOM for reactive power compensation. By these controllers the DSTATCOM would generate under voltage or over voltage at PCC this lead to lagging or leading power factor at the bus. To stay away from problems connected with lagging and leading power factor and minimized harmonics in the system. The power factor can be maintained at the desired level irrespective of system terminal voltage [5]. These loads can be grouped as resistive type, inductive type and some harmonic injecting variable type of non linear loads. This paper, deals with two major types of controls as mentioned in the above.

The static synchronous compensator is connected parallel to a 3- phase load side, the connected source

resistance and reactance which are shown in Fig. 1. The controller control performance depends upon the correctness of reactive power injection at the bus. The tuned values of coupling reactor (L_f) are connected at the ac output of the voltage source converter. The controller injects the required amount of currents to control the reactive power at the bus. The rating of injecting current at the bus decides the rating of the VSC. The choice of VSC input voltages, rating of coupling capacitor value, interfacing reactor value, are very important for controlling of VSC converter as a DSTATCOM control mode.

2. DSTATCOM MODELLING

The DSTATCOM control in this paper can be divided in to two types they are SRFT and BPCA, these controllers are computer modeled using Matlab software, and the results are presented with fast acting and normal PI control strategy. The Synchronous Reference Frame Theory (SRFT) control methodology can be adopted from [4] - [6]. In this SRFT the line currents are transposed to d, q quantities and using LP filter and gains the equivalent direct axis real and reactive currents can be calculated, from this the reactive current requirement can be estimated. Simultaneously the DC side voltage control also can be

Prediction of Ground Water Quality Index Using Artificial Neural Networks

Dr. Qamar Sultana

Associate Professor, Civil Engineering Department, Muffakham Jah College of Engg. & Tech, Hyderabad, India. Corresponding Emails: gamarsultana4@gmail.com

Abstract: The information of quality of ground water in terms of its physio-chemical and biological properties is essential to use the ground water for various purposes including the drinking purpose. The ground water of Hyderabad city is contaminated due to many reasons, of which urbanization and industrialization is the main. The lack of proper sewerage system and treatment plant capacities, the domestic sewerage and industrial effluents are carried into the nalas and streams, which is causing severe ground water contamination. Various physical and chemical parameters of ground water quality are analyzed and water quality index (WQI) is determined. The evaluation of groundwater quality index WQI could be useful for groundwater users and policy makers to take remedial measures. Further in this study, Artificial Neural Network (ANN) is applied in estimating the water quality index (WQI) for Hyderabad city. The ANN is trained and tested using the data of 20 sample points. It is seen that ANN is capable of estimating WQI with acceptable accuracy.

Key Words: Water quality index , Multiple Linear Regression, Artificial Neural Networks .

1. Introduction

Though water forms the basic requirement for life and growth of all the living beings, it is a fact that it also becomes a source to cause diseases, when it is contaminated. Good quality drinking water plays an important role in the wellbeing of mankind, which in turn effects the infant mortality rate. The World Health Organization (WHO) assessed that, almost 80% of the human diseases are caused by water and in India 21 % of all communicable diseases (11.5 % of all diseases) are water related. For a good management of ground water, its quality assessment is very important. Conventional ways to assess the quality of water is based upon the experimental determination of various parameter values as per the guidelines laid by WHO and in most cases, the use of this methods led to enough identification of contamination sources and its vulnerability. But it does not give easily the overall view of the water quality spatial and temporal trends in an area. One major problem faced by the water resource persons is to convert the interpretation of complex environmental information into understandable and useful technical way to policy makers and the common man. Much effort has been made to arrive at a methodology to integrate the data sets and convert it to easy and handy information.

After Horton proposed the first water quality index (WQI) in 1965, much effort is applied in developing a tool in simplifying the reporting of the water quality data. The WQI method works by comparing the water quality parameters with the standards laid by a regulatory body. These methods of water quality assessment do not take into consideration, the uncertainties involved both in measurement of water quality parameters and in the limits provided by the regulatory bodies.

Analysis of Uncertainty of Sediment Rating Curve Parameters

Dr. Qamar Sultana

*Associate Professor, Civil Engineering Department,
Muffakham Jah College of Engg. & Tech, Hyderabad, India.*

ABSTRACT

The knowledge of the quantity of the suspended sediment in the flowing stream is very important for the effective water reservoir and the basin management. The present study aims at the estimation of the suspended sediment in the river Godavari at Yelli gauge point using sediment rating curve method. This analysis is carried out for the daily, annual, monthly and seasonal variations over a period of 31 years. Nash Sutcliffe model is used to check the efficiency of the predicted sediment by the sediment rating curve method. It is seen that the sediment predictions using sediment rating curve method is best for the monthly data sets followed by the seasonal data sets when compared to the annual data sets for this stream. Suspended sediment rating curve parameters were also analyzed to investigate the relationship of suspended load and discharge. The parameters of the rating curve are deduced from the power function of the sediment load and river discharge.

Key Words: *Suspended Sediment Load, Efficiency, Sediment Rating Curve, Regression.*

1. INTRODUCTION

In the recent years it has been observed that there is an increased interest in the study of the transport of suspended sediment by streams and in the magnitude of sediment yields from both individual basins and larger areas. The main reason for this increased interest is from the considerations of sediment-water quality interactions, reservoir sedimentation, channel and harbor silting, soil erosion and soil loss, ecological and recreational problems, the impact of man and from the viewpoint of the geomorphologist, rates of erosion and the operation of fluvial processes. The suspended sediment yield has gradually declined in the past 50 years due to changes of river structure and flow regime, which have resulted from human activities such as engineering structures and conservation practices on agricultural land use (Meade 1995; Meade and Moody 2010; Horowitz 2010; Heimann et al. 2011). Accurate information of suspended sediment loads is therefore required for many purposes.

Researchers are interested in collecting more data for studies of suspended sediment transport. However, monitoring suspended sediment concentration is prohibitively expensive. Another method is to use the observed data of sediment concentration and discharge and develop the sediment rating curve (Colby 1956; Asselman 1999; Asselman 2000 Horowitz 2003). The rating curve is used to estimate sediment concentrations (mass per volume of water) at known discharges, which can later be used to calculate the sediment load (mass per time) (Walling 1977; Horowitz et al. 2001). Similarly, the sediment rating curve can be generated with the data of suspended sediment load (Leopold and Maddock 1953; Syvitski et al. 1987; Syvitski et al. 2000). In this study, the sediment rating curve are derived from estimates of suspended load and stream discharge. In the absence of financial and labour resources, which makes it insufficient to maintain an intensive sampling programme, or where the rapidly fluctuating response of a basin would make such a programme impractical, effort is often made to use of sediment rating curves.

An Experimental Study on the Bond Strength of Basalt FRP bars partially Replacing Coarse Aggregates with Steel Slag Aggregates

Toufeeq Anwar¹, SyedYousuf Hussaini², Syed Jawwad Ahmed³, Syed Mushtaq Hashmi³, Mohd Nazim Raza⁴

¹ Associate Professor, Department of Civil Engineering, Muffakham Jah College of Engineering and Technology, Hyderabad, India

^{2,3,4,5} Assistant Professor, Department of Civil Engineering, Muffakham Jah College of Engineering and Technology, Hyderabad, India

e-mail: syed.jawwad@mjcollege.ac.in³

Abstract—The bond stress system of the force transmission between the steel bar and the surrounding concrete is the basis for the existence of reinforced concrete. Without proper stress transfer between concrete and steel bars, it is not possible to use reinforced concrete structures without end anchoring. In order to construct a more durable reinforced concrete structure, corrosion of the steel bars should be prevented under the most severe environmental conditions. One possible approach is to replace traditional steel bars with basalt fiber reinforced polymer (BFRP). Despite extensive research in this area, the use of FRP as a built-in reinforcement in new structures is relatively slow. The use of concrete in the construction industry has wide range of application. Many materials can be reused in concrete in different forms. Steel slag aggregates have nearly similar properties compared to conventional aggregates and can be obtained in large quantities. This paper presents the effect on the bond strength of Basalt Fibre Reinforced Polymers (BFRP) bars and steel slag aggregates. Test parameters are Basalt FRP bars, HYSD bars and bar diameters. Total forty eight cylinders of diameter 100mm and height 250mm were casted. Concrete specimen of M30 grade in which steel slag aggregates were replaced by 40% in the twenty four specimens. All Basalt FRP bars and HYSD bars specimens of 6mm ϕ , 8mm ϕ , 10mm ϕ & 12mm ϕ failed in pullout test

Index Terms- Basalt Fibre Reinforced Polymers (FRP) bars, Steel Slag Aggregates, Pull out test etc.

I. INTRODUCTION

Concrete is a heterogeneous material that has a wide range of uses in structural design. Concrete is a widely used building material with various advantages such as low cost, availability, and fire resistance. Concrete is the most important essential material in building materials in various civil engineering projects. Due to the changes in concrete as a building material, a great deal of research and research has been created to develop its superiority, strength and durability. Similar time efforts have been made to save concrete structures compared to alternative materials. Concrete is generally considered to be the most commonly used in the construction sector. Current construction follows the strength equivalent meaning to give durability to concrete. Researchers are constantly striving to improve the performance of concrete which led to the development of Fiber Reinforced Concrete, Ferro cement etc.

Bond is a force acting on the interface of the reinforcing bar & concrete which composed of chemical adhesion, frictional resistance and mechanical interaction between steel and concrete. So long the bond

Study on behaviour of uniaxial column bonded with basalt FRP wraps

Syed Jawwad Ahmed¹, Toufeeq Anwar², Syed Yousuf Hussaini³, Mohd Nazim Raza⁴, Syed Mushtaq Hashmi⁵

^{1,3,4,5} Assistant Professor, Department of Civil Engineering, Muffakham Jah College of Engineering and Technology, Hyderabad, India.

² Associate Professor, Department of Civil Engineering, Muffakham Jah College of Engineering and Technology, Hyderabad, India
*e-mail: syed.jawwad@mjcollege.ac.in*¹

Abstract—The resistances of the structure along with stability provided by columns under different load conditions have an impact in determining the overall performance of the structure. Thus any deficiency caused by the supporting columns may affect the operation of the supporting member and the structure itself. Therefore it is necessary that the column should provide adequate strength for which it is designed for throughout its life. But it is noticed that due to improper design, changing the purpose of use of structure, and damage caused due to earthquake or impact load in the structural member. Due to this the column can possibly subjected to load greater than the design loads. To overcome the deficiency discussed, the column needs strengthening in order to ensure that the structure can overcome all the odds.

In this study, the behaviour of uniaxial column reinforced with basalt fibre reinforced polymer fabrics (BFRP) was carried out. The columns wrapped with different types of FRP materials shows increase in capacity having different configurations. In this study the effect of Basalt FRP was found. Hence, the specimens in the form of C shape were casted and their behaviour with Basalt FRP is observed

Index Terms- uniaxial column, basalt fibre reinforced polymer

I. INTRODUCTION

A. Background

Since the first structures were formed, whether by nature or human beings, they have been damaged by deterioration and destruction. Both deterioration and destruction are common in nature that effects even the most modern or recent structures. Modern structures like bridges and skyscrapers are costly to construct and therefore the construction time will sometimes be disturbing to nearby people and society. Therefore it is necessary to have structures durable having long life with low cost of maintenance. Maintenance is not only about cost but also to keep a structure at a service performance level. The performance includes its load capacity, durability, function of usage, and aesthetic view. If a structure that fulfill all demands of load carrying capacities might at the same time not satisfy serviceability demands or the society's demands for aesthetic appearance. Absence of maintenance or incorrect maintenance results in

TECHNIQUES FOR DAMPING THE VIBRATIONS IN MACHINE TOOLS

M A Mujeeb Iqbal¹, Dr. Ishrat Meera Mirzana², Dr. Sirajuddin Elyas Khany³, S. Irfan Sadaq⁴

^{1,4}Assistant Professor, Mechanical Engineering Department, Muffakham Jah College of Engineering & Technology, Hyderabad, Telangana, Hyderabad, India.

²Professor, Mechanical Engineering Department, Muffakham Jah College of Engineering & Technology, Hyderabad, Telangana, Hyderabad, India.

³Associate Professor, Mechanical Engineering Department, Muffakham Jah College of Engineering & Technology, Hyderabad, Telangana, Hyderabad, India.

mujeebiqbal@mjcollege.ac.in, ishratmirzana@mjcollege.ac.in, sirajkhany@mjcollege.ac.in,
irfan.sadaq@mjcollege.ac.in

ABSTRACT

Vibrations in machine tools like milling machine, lathe, grinding machine is one of the main problem as it affects the quality of the machined component, tools life and noise during machining operation and will lead to rejection of the product affecting the surface finish and other important parameters of the manufactured component. Approximately half of all operating costs in most processing and manufacturing operations can be attributed to maintenance. This is ample motivation for studying any activity that can potentially lower these costs- precise, accurate and reliable product.

Hence these vibrations are needed to be suppressed or damped out while machining. Therefore, the present work concentrates and aims on study of different controllable parameter that affects the responses like vibrations amplitude, surface finish, cutting forces, and dimensional tolerances.

1. INTRODUCTION

Machine tools in today's industry are old and hence they will be subjected to vibrations during various machining of parts by cutting operations. These vibrations could be due to very old machine floor bed foundations, worn out of bearing, gears, etc.

Severe vibration occurs in the manufacturing process due to a dynamic motion between the cutting tool and work piece. The monitoring of manufacturing process and equipment conditions are the essential parts of a critical strategy that drives manufacturing industries towards being leaner and more competitive.

In metal cutting operations, chatter is one of the disastrous threats to the quality of parts production. Finding different methods to solve the chatter problem is the center of interest for researchers since a long period of time. Chatter free behavior will have a definite link between the cutting process and dynamic characteristics of the components of machines so as to decrease drastically the metal removal rate (MRR), to attain a high flexibility of the structure.

The chatter mitigation method can be used to modify the dynamic response characteristics of machine tools. Utilizing the natural dynamic interaction among tool, spindle, tool holder and the effect of the dynamic absorber, is the subject of study by the researcher in their paper.

The best way to match the modes of tools structures of machine tools is by using tool length tuning, so as to dampen or in the suppression of FRF. In order to fully utilize the machine tool power, the researchers adjusted the tool length making it coincident with the maximum speed of the spindle and took approach which is based on tool length tuning so as to match the natural frequency with the integer multiple of tool passing.

2. LITERATURE REVIEW

Vibration of tools and surface roughness are two major important parameters that affect the tool and the quality of the component and also the cost of the component. Sukhdev et al., [1] studied about the various parameters that affect the surface roughness and vibration of tool used in end milling machine of EN-31 tool steel. They



A Modified Cylinder Block-IC Engine Experimentation

Mohd Abdul Samad, Syed Nawazish Mehdi, Syed Khader basha

Abstract: In Internal combustion Engines, the adequate cooling plays vital role for proper functioning and enhanced efficiencies. In the present scenario, the demand for Air cooled Engines with higher powers is increasing and hence necessity for Augmented heat transfer through fins. The present work confined to fins mounted on the cylinder block. In the present work, Internal Combustion Engine test rig is used, which consist of 4S, single cylinder, vertical, air cooled, SI Engine with Instrumentation panel, Throttle control mechanism and Electrical Loading system. The performance test on IC engine is carried out for three various configurations of cylinder blocks i.e., 1. Actual cylinder block 2. Cylinder block with triangular profile fins 3. Cylinder block with perforated triangular profile fins. Performance parameters are evaluated, plotted and compared & eventually conclusions are made.

Keywords: Cylinder Block with Perforated Triangular Profile Fins.

I. INTRODUCTION

Engines are broadly classified into internal combustion engines and external combustion engines. In internal combustion engines, combustion takes place inside the cylinder. During combustion hot gases are produced at temperature of about 2500°C. Consequently heat is absorbed by cylinder walls, piston, cylinder head and valves and further, temperature of these parts increases. Subsequently leads to malfunctioning of the engine. Hence this necessitates the proper cooling system. Cooling system can be either water cooled or air cooled. Due to light weight and other advantages, air cooled engines are mostly used for automobile applications.

II. ENGINE SPECIFICATION

TABLE 1: IC ENGINE SPECIFICATION

Number of Cylinders	One (1)
Bore Dia	57.30mm
Stroke Dia	57.80mm
Displacement of Piston	149.2 Sq. cm

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*Corresponding Author

Mohd Abdul Samad*, Assistant Professor, Department of Mechanical Engineering, MJCET, Hyderabad, India. Email: masamad@mjcollege.ac.in

Dr. Syed Nawazish Mehdi, Research Supervisor, Department of Mechanical Engineering, Mewar University, Rajasthan, India. Email: nawazishmehdi@yahoo.co.in

Dr. Syed Khader Basha, Assistant Professor, Department of Mechanical Engineering, MJCET, Hyderabad, India. Email: khader.basha@mjcollege.ac.in

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C.R (Compression Ratio)	9.1:1.0
Fuel	Petrol
Position of the Engine	Vertical

III. EXPERIMENTAL APPARATUS AND METHODS

Experimentation is being carried out with internal combustion Engine test rig which consists of following components

1. I.C Engine
 2. Instrumentation panel, which consist of burette, manometer, rpm indicator and energy meter.
 3. Throttle control mechanism
 4. Anemometer
 5. A.C Generator with electrical load bank.
- once the test rig is being prepared, internal combustion engine is started with self stator with the help of battery.

The below mentioned parameters are noted after observation for different wind speeds at constant speeds of the I.C engine

1. Fuel consumed in the burette
2. Water level difference in manometer
3. Speed of the engine
4. Energy meter reading
5. Wind speed



Fig.1: IC ENGINE TEST RIG

With the aide of above parameters, performance factors like, $\eta_{Br.th.}$, B.S.F.C etc., are evaluated. The above experiment is repeatedly carried out for three various configurations of cylinder blocks i.e., 1. Actual cylinder block 2. Cylinder block with fins of triangular profile. 3. Engine block with perforated fins of triangular profile.

ANALYTICAL AND NUMERICAL ANALYSIS OF KNUCKLE JOINT BY USING DIFFERENT MATERIALS

G. Sailaja¹

¹Associate Professor, Mechanical Engg. Dept., Muffakham Jah College of Engineering & Technology, Hyderabad, Telangana, India.

Mohammed Jafar Sadiq Omair²

ME Student, Mechanical Engg. Dept., Muffakham Jah College of Engineering & Technology, Hyderabad, Telangana, India.

ABSTRACT: The aim of the project work is to calculate the stresses in Knuckle joint using analytical and numerical method. In order to do the stress analysis; mesh was developed for the knuckle joint. Based on the ANSYS analysis it shows that a pin of 24mm diameter can withstand a load of 25 KN if we use a factor of safety. Knuckle joint is a joint between two parts allowing movement in one plane only. if there is a stress concentration at certain locations. The FEA Analysis of Knuckle joint is done and various shear and tensile stresses results are plotted. The Analytical solution of knuckle joint is found out using standard calculations. Now, these results are validated by theoretical calculations available for knuckle joint. The force applied knuckle joint is 25 KN .The diameter of pin is proposed to be around 24 mm. The stress results by theoretical calculations and FEA software are validated. This proves that the FEA software results are correct. Secondly it also shows that certain high stresses are generated near knuckle joints. The material of the knuckle joint here is considered to be three materials, stainless steel, structural steel and Teflon in order to do the stress analysis. In the present work ANSYSR1 has been used for analysis of knuckle joint with modified material and applied loads. Nowadays growth in competition and innovation it is needed to modify the existing products or replace old and out dated products by newly innovated and advanced material products. The aim of the project is to study and calculate the stresses in Knuckle joint using finite element method for different material and out of that one material which satisfies the objective of project is selected as a optimized material. The knuckle joint is analyzed for structural steel, stainless steel, Teflon.

Introduction

Most of the industries carry out machining process for manufacturing, and now days, majority industries use manufacturing process which have advanced technology in order to get effective and efficient output with economy. A Knuckle joint connects two rods under tensile loads. The basic design of a knuckle joint is simple and it can be easily assembled and disassembled when required. Typical applications of knuckle joints are: joints between the links of a suspension bridge, valve mechanism of a reciprocating engine, fulcrum for the levers, etc. It is unsuitable to connect two rotating shafts which transmit torque. Knuckle joint has mainly three components: Eye, fork and pin. Eye is formed on one of the rods and fork is formed on the other. Eye fits inside the fork and the pin is passed through both the fork and the eye. This pin is secured in its place by means of split-pin. Screwed connections often play an important part in the transmission of load through machine assemblies. In large circuit breaker they are subjected intermittently to high impulsive loads transmitted through large-scale linkages. The material used for the joint is usually steel or wrought iron.

1. THEORETICAL CALCULATIONS FOR STRESS OF KNUCKLE JOINT COMPONENTS DESIGN OF KNUCKLE JOINT:

Dimensions of Various Parts of the Knuckle Joint The dimensions of various parts of the knuckle joint is fixed by empirical relation as given below it may be noted that all the parts should be made of same material and the calculation of the design data is obtained from many sources If d is the diameter of rod, The diameter of pin - $d_1 = d$

Outer diameter of eye, $d_2 = 2d$

Diameter of knuckle pin head and collar - $d_3 = 1.5d$