Survey on Design Of Smart Structures

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Abstract : *In real time situation machine members are subjected to variable and impact loading experience displacement patterns that may through loading of beam members beyond the yield stress. This causes permanent deformations and excessive fatigue making the beam weak and unserviceable*
Keywords – *Smart, Structures, Beam, Actuator*

I.   INTRODUCTION

Transient vibration problems induced in a flexible beam are considered for analysis and damped using piezo electric smart shapes affined there on Flexible structutres are modeled using trail and error method called Taguchi method. This method essentially optimizes the location of piezo electric dampers to suppress the transient vibrations induced in beams to strengthen the beam members.

II.   VARIOUS METHODS

Daraji A.H ., HaleJ. M. and bicker R. proposed "Active vibrations control of smart structures" finite element analysis and genitic algorithm were used to design of smart cantilever beams for locating and placing smart materials to minimize transient vibrations

Gabor Szasz have examined utilization of taguchi - quality confirmation technique if there should be an occurrence of mechanical structures on the premise of ssi model that the taguchi strategy was utilized for abatement of the fluctuation of parameters . While building and assembling mechanical structures this implies the reduction of the scattering of quality amid operations stress is fluctuating also. At the stipulated level of the unwavering quality the worthy scattering of stress might be controlled by methods for the ssi demonstrate while the satisfactory scattering of quality might be resolved knowing the change of stress. The model might be productive for mechanical structures as well as for different sorts of mechanical hardware and notwithstanding to model social clashes too.

Shiang, analyzed "Development of Indigenous Smart System with sensor/Actuator Energy Harvester and micro strip Antenna" vibrations are supported by using a smart layer module of higher structural strength and stiffness. A 3000*3000*500m vibration energy harvester based on in-plane gap overlap, electrostatic comb-drive design is also developed to drive the sensor/Actuator which are powered by power harvesters a rectangular micro strip antenna is also embedded in composite laminated structures.

U.Gabbert W.Kreher[*], H.Koppe investigated " Scientific Modeling and numerical reenactment of brilliant structures controlled by pizeo electric wafers and filaments" it is Affined that the vibration and clamor control and additionally fit as a fiddle control of piezo electric wafers and strands embebbed in composite materials are extremely normal shrewd auxiliary composite in Strutonic (Structure + Electronic) framework. The limited Element strategy was utilized to dissect the conduct of vibration.

Shih-Hundg [5] L 1990) experimentally investigated Automated Robotic Assembly using vibrators work table for Optimal tuning of vibrators .Based on the Taguchi method. To perform complex assembly tasks, robot assisted by a multi-axis vibrator is used which reduces friction and avoids jamming. The tuning of the vibrator performance is evaluated by Taguchi method and used the root mean square of reaction force and moment during assembly, which indicates the magnitude of stick slip and the effect of friction.

C.K.Lee6, S H Chang and Pei-ZAN Chang - (1990) proposed "Smaller than expected piezo electric Actuators: plan idea, creation and execution evaluationthat a laser Doppler interferometer was utilized to assigned and assessed the execution of scaled down piezo electric actuators.

O Sigmund7 and S Torquato(1999) examined Design of Smart Composite materials utilizing topology Optimization that topology improvement strategy to discover the dissemination of material staged at limits . A target work subject to limitations, for example, flexible symmetry and volume capacity of the constituent stages, with in an occasional base cell was created. The viable properties of material structures are discovered utilizing a numerical homogenization technique in view of limited component discretization of the base cell. The improvement issue has been illuminated by utilizing a consecutive straight programming.

T.Taguchi 8 and M.Okugawa (2003) concentrated Mass estimation technique under weightless condition by utilizing a shrewd cantilever pillar have portrayed a novel mass estimation strategy under weightless conditions utilized a savvy cantilever bar fixed piezoelectic materials. The idea of brilliant structures

and the framework distinguishing proof hypothesis were utilized to quantify of mass under weightless conditions.

S J Hyder 9, M Sunar and F Mahmeed (march2004) broke down piezo electromagnetic brilliant structures. They have surmised that piezo electromagnetic materials are regularly used as wise media in the plan of circulated sensors and actuators of shrewd structures. A piezo electric medium shaped by holding piezo electric and magneto strictive layers on decreased shafts. To assess the voltage and attractive reaction of adaptable structures subjected to tweaked compel input a ghastly limited component demonstrate utilized. Taguchi strategy connected to concentrate the impact of outline factors, for example, the thickness of the magnetostrictive and piezo electric layers, the decrease proportion of the shaft and limit condition.

Der Ho Wu Wen 10 Tung Chien, Chih Jen Yang, Yu Tang Yen (April 2004) proposed Couple-Field Analysis of piezoelectric shaft actuator utilizing FEM . they have examined and reenacted the auxiliary and electrical attributes of piezo electric shaft actuators. A silicon-based clasp free shaft mounted with a PTZ layer on both sides. Limited component strategy used to find the PZT and to accomplish the precise outcomes and efficient.

Zhao Lijie11 , Heung Soo Kim, Jaehwan Kim (2005) have explored Optimal Design of shrewd board utilizing Taguchithat an entire 3-dimensional limited component models used to reproduce vibration of savvy board and to get the permission of the piezo electric shunt framework. Taguchi technique connected to decide the ideal design of PZT(Lead Zirconate-Titanate) fix on the host structure for enhancing the execution of piezo electric trick framework utilized this strategy in Minitab, and the ideal model is gotten.

A.Ahmad 112 , George McDonald 1, S.Eswar Prasad 2, D.F.Waechter 2 and R. G.Blacow (2005 International Work shop on brilliant materials and structures) have considered Development of piezo Electric Ceramics. that impact of different handling parameters on the sintering, microstructure and in addition the dielectric and electromechanical qualities of lead magnesium niobate-lead ziconate titanate (PMNPZT) artistic composite materials. To break down the trial information Taguchi Statistical outline of tests philosophy has been utilized.

Ikeda, H13; Hanamoto, T; Tsuji, T; Tomizuka,) M. (may 2006) Design of vibration Suppression Controller for 3-Inertia frameworks utilizing Taguchi Method" proposed "that a novel vibration concealment technique for a 3-inactivity control framework by an adjusted IPD(Integrated in addition to Proportional in addition to Derivative) controller. The control picks up in IPD structure dictated by utilizing Taguchi strategy.

Mingsian R.Bai14, Rong-Liang Chen, chung-Yuan Chuang , Cheng – Sheng Yu2and huey-Lin hsieh proposed "Limited Element Electro acoustic Analysis and Taguchi Design of Piezoelectric ringers in view of the vibration safeguard display – 2008" have investigated that limited component methos model is then changed over into electromechanical o ports to fit into the electro mechanoacoustical (EMA) closely resembling model. An 'additional mass' technique was created to recognize the lumped parameters with limited component based electro acoustic parameter of piezo electric signals. Taguchi strategy was connected to establish out the ideal basic parameters and the designs for the signal to augment sound weight yield.

Hsuan-heng Tsai15 , Der Ho Wu, Ting-Lung Chiang a Hsin Hua Chen dissected "Hearty plan of SAW Gas sensors by Taguchi Dynamic Method-2009" have utilized taguchi strategy for streamlined the dynamic qualities of SAW Gas Sensor framework and explored the impacts of stored mass upon the thunderous recurrence yield of the SAW biosensor used by limited component technique.

Y.S. Kumar Swamy16 Analyzed an Efficient model for Vibration control by Piezoelectric keen structure utilizing limited component technique 2009" limited component strategy detailed a scientific model to wipe out the threatening impacts of such pillar twisting because of vibrations without subterranean insect computational and additionally execution complexities.

III.   CONCLUSION

K.B. waghulde17, Dr. Bimlesh Kumar, Prof. T.D Garse, Prof. M.M. Patil proposed " Vibration examination and control of cantilever plate by utilizing limited components investigation Sep 2011" have utilized limited component examination and hereditary calculation to plan of keen cantilever bars for area and putting savvy materials to limit transient vibrations.

Deepak Chhabral18, Pankaj chandana2, Gian Bhushan in tentatively proposed "Outline and examination of shrewd structures for Active Vibration Control utilizing Piezo-precious stones December 2011." Have broke down the brilliant structures utilizing limited component strategy and inferred that savvy structures with vibrations control/damping can be intended for assortment of field applications

REFERENCES

[1] Daraji A.H., Hale J.M. and Bicker R. "Active Vibration control of Smart Structures"

[2] Gabor szasz – "Application of Taguchi-quality assurance method in case of mechanical structures, on basis of ssi model"

[3]Shiang, - "Development of indigenous smart systems ith sensor/Acutator Energy Harvester and Micro Strip Antenna"

[4]U.Gabbert W. Kreher, H. Koppe – "Mathematical Modelling and Numerical Simulation of smart structures controlled by Piezo Electric Wafers and Fibers.

[5]Sihh-Hundg L experimentally investigated 1990- " Automated Robotic Assmebly using Bibrators work table: Optimal Tuning of Vibrators based on the Taguchi Model.

[6]K.Lee6, SHChang and Pie-ZAN Chang -1990- "Miniature Piezoleectricactuators:Design concept, Fabrication and performance evaluation"

[7]Sigmund and S Torquato -1999- "Design of smart composite materials using Topology optimization.

[8]T.Taguchi and M okugawa -2003- "Mass Measurement Method under Weightless Condition by using a Smart Cantilever Beam"

[9]S J Hyder 9, M Sunar and F mahmeed –march 2004- "Piezo electromagnetic Smart Structures.

[10] Der Ho Wu Wen Tung Chien,Chih Jen Yang,Yu Tand Yen- April 2004- "Couple-Field analysis of Piezoelectric beam actuator using FEM"

[11] Zhao Lijie 11, Hueng Soo Kim, Jaehwan Kim -2005- "Optimal Design of Smart Panel using Taguchi Method."

[12]A.Ahmad12,George Mc Donald 1,S Eswar Prasad 2, D. F.Waechter 2 and R.G. Blacow2 have studied "Development of Piezo electric ceramics -2005- International Work shop on smart Materials and Structures"

[13] Ikeda, H; Hanumoto13, T Tsuji; Tomizuka, M.Power Electronics, Electrical Dives, Automation and motion- may- 2006- "Design if Vibration Suppression Controller for 3- Inertia Systems using Taguchi Method"

[14] Minigsian R Bai14, Rong-Laing Chen, Chung-Yuan Chuang, Cheng Sheng Yu and Huey-Lin Hsieh -2009- : "Finite Element electro acoustic Analysis and Taguchi Design of Piezoelectric buzzers based on the Vibration Absorber Model.

[15] Hsuan-Heng Tsai15, Der Ho Wu, Ting Lung Chiang an Hsin Hua Chen 2009- "Robus Design of SAW Gas sensors by Taguchi Dynamic Method"

[16]Y S Kumar Swamy16 -2009- "An efficient model for vibration control by piezoelectric smart structure using finite elements method.

[17]K.B. Waghulde17, Dr.Bimlesh Kumar, Prof.T.D.Garse, Prof. M.M.Patil Proposed "Vibration analysis and control of cantilever Plate by using Finite element Analysis-Sep-2011.

[18]Deepak Chhabra 18, Phankaj Chandana2,GianBhushan– Decemeber 2011 "Design and analysis of Smart Structures for Active Vibration Control using Piezo-Crystals".