INVESTIGATION OF EFFECTS OF DAMPED AND NON-DAMPED SYSTEM ON A PLATFORM STRUCTURE.

Adeniran S. Afolalu[1], Samson O.Ongbali[1], Abiodun A. Abioye[1], Oluseyi O. Ajayi[1], Oluwasegun J. Adelakun[1], Ademola Abdulkareem[2],

[1]Mechanical Engineering Department, College of Engineering, Covenant University, Ota, Nigeria

[2]Department of Electrical and Information Engineering, Covenant University, Ota, Nigeria.

ABSTRACT

Damping is one of the significant way of isolating vibration or remoteness of oscillation in a platform structure system which is usually carried out to reduce the effect of loads on the system and entire platform structures from been damages. The area of focus of this research work is to investigate the effects of damping and non-damping system on a platform structure and to analyze the effects of wave load on periodic support of isolation system. The platform on offshore was considered as area of focus to investigate the performance of the suggested mitigation system of oscillation about an equilibrium point for offshore platform. This work study will examined the value of parameter and modeling the fitting of an intermittent strut on offshore platform to enhance isolation system due to its attenuations ability over broad frequencies was presented. It was observed that the peak acceleration of the platform and the peak displacement on the platform under wave load excitation gave maximum periodic effects at minimum inter-structure drift and verse versa.

Keywords: Damping, Non-Damping, Isolation, Vibration, Wave-load

1.0 INTRODUCTION.

In a past study, a scale model of the steel jacket for fixed offshore platform started from Gulf of Mexico and has now extended globally [1]. It is appropriate to build in water depth starting from minimal level in meters than a high structure serving as support for pile driven into the soil through the part of a jacket structure fixed with deck component [2]. The ice-induced structural oscillation about an equilibrium point was examined with instu measured force data and also carried out mathematical analysis and hypothesis on mitigating structure that are offshore using visco elastic dampers and viscous dampers [3]. Most of the previous experimental investigations and theoretical studies were concentrated in the analysis of dynamic properties, vibration isolation schemes and vibration-reduction effectiveness. Provide brace for gear box located on the plane airframe[4]. If the design is done well, the transmission of vibration from the gear box to a vital band occurrence having airframe can be halted by passive intermittent support thus reducing the impact of detrimental vibration and sound emission to the airplane compartment [5]. Mead and Yaman (1991) analyzed the reaction of a dimensional intermittent structure undergoing periodic loading. Their findings were based on revolving and displacement springs together with resistance of component arising from effects of ohmic resistance and reactance through an overview. Impact of applying energy with an expandable strut distinctiveness on the process and discontinue characteristics of the structural element that can resists load showed that power transmitted in both directions been applied by single point force was the same in spite of the position the energy is been applied.[6]. Langley used an applied energy techniques in examining the restriction of wave in a damped dimensional intermittent component [7]. This technique focused on flow of energy oscillating about equilibrium and conformity with precise findings is established for an intermittent structural element that can resist load. The most widely used studied method of reducing oscillation in an intermittent structure was through haphazard disorder. The study of transmitting wave mechanically through transfer matrix technique was introduced by the concept of restricting the wave to a particular place[8].The impact of haphazard differences in element of a periodic beam on the restricted element was investigated by introducing haphazard differences in the intermittent of a dimensional double-periodic component with facts that oscillation about an equilibrium position can be restricted to an interruption source. As a matter of fact, wave structure equivalent to higher transmission zones breaks through the component [9]. It was noticed that the right border of the transmission zone is the mean restricting factor approaching a given arbitrarily closely. Conventional developed set of an intermittent structures called passive intermittent support can be utilized in a gear box by acting as support on the airframes of an airplane. Provided the design is done properly, the passive intermittent support can hinder the transmission of oscillation about an equilibrium from the gearbox to vital bands occurrence with an airframe thereby reducing the impact of the propagation of detrimental oscillation and sound emission to the airplane compartment [10]. The assumption deals with the working principle of this set of passive intermittent support been introduced and their distinctiveness is exhibited practically as a role in design element [11].

2.0 Methodology

2.1 Impact of the element on the remoteness system.

Reducing oscillating ratio and the rigidity in remoteness level are vital element hindering the inter-story flow of the level. In regards to this analysis time ratio t is defined as follows ;

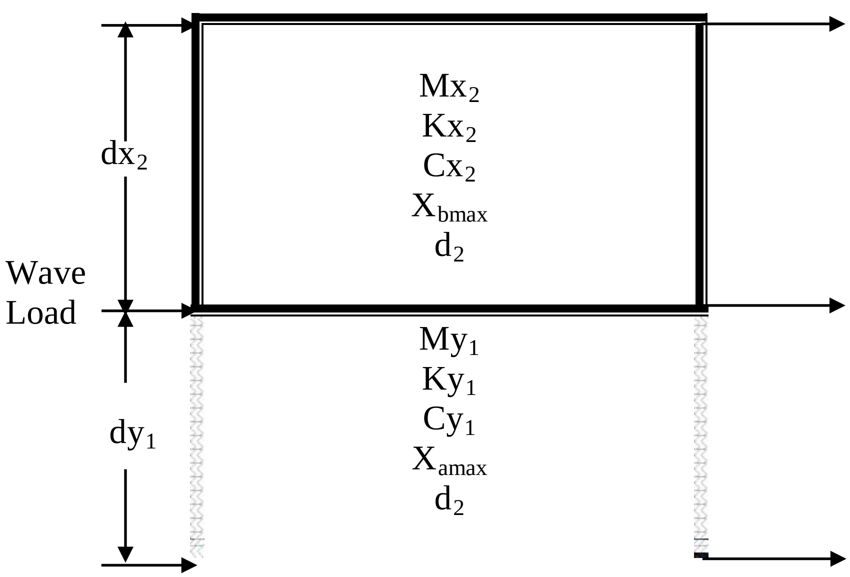

Figure 1. Analytical model of the remoteness structure.

Considering the parameters the following must be checked

$$\gamma t = \frac{T_d}{T_u} \quad \text{while} \quad Txy_u = \frac{\text{2Л}}{\int Kx_1 / (mx_1 + my_2)},$$

$$Txy_d = \frac{\text{2Л}}{\int Kx_{1}/ky_2}$$

Where; Txy_u = time effects of the component raised area without isolation of mitigating oscillation

Txy_d = time of the component above the remoteness point of reducing oscillation.

t = Impact of rigidity of the remoteness level on different structure

$X_{1\ max}$ = Maximum inter-structure flow of the remoteness point.

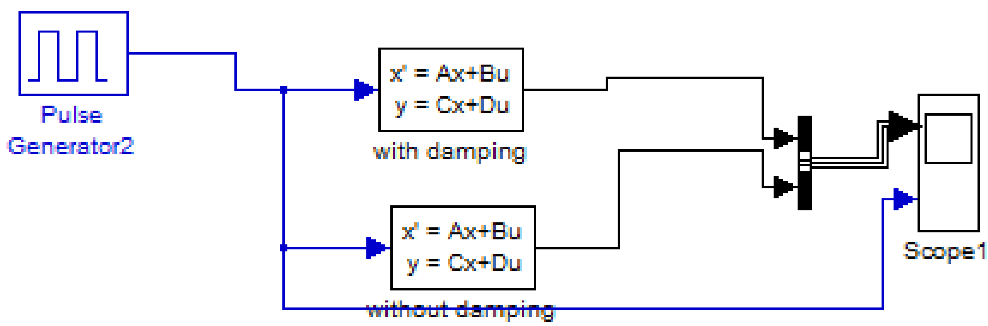

Figure 2: Model for the platform and the supports with damping and non- damping.

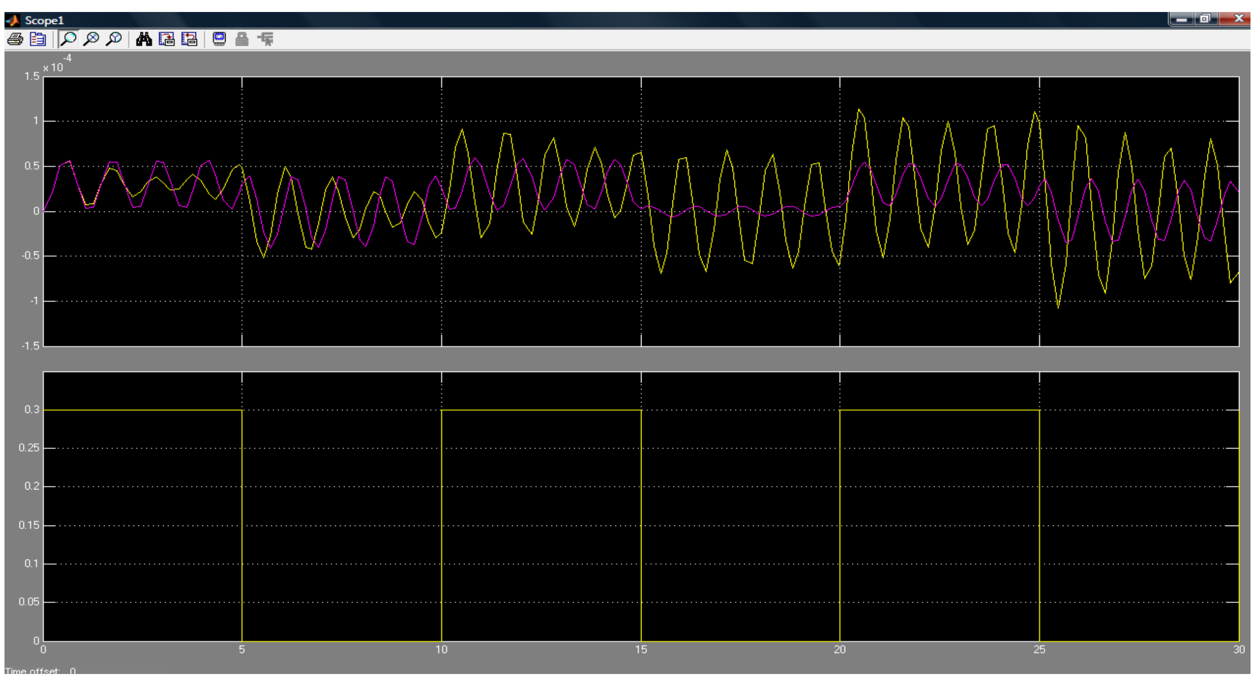

Figure 3: Response of model for damping and non-damping systems**.**

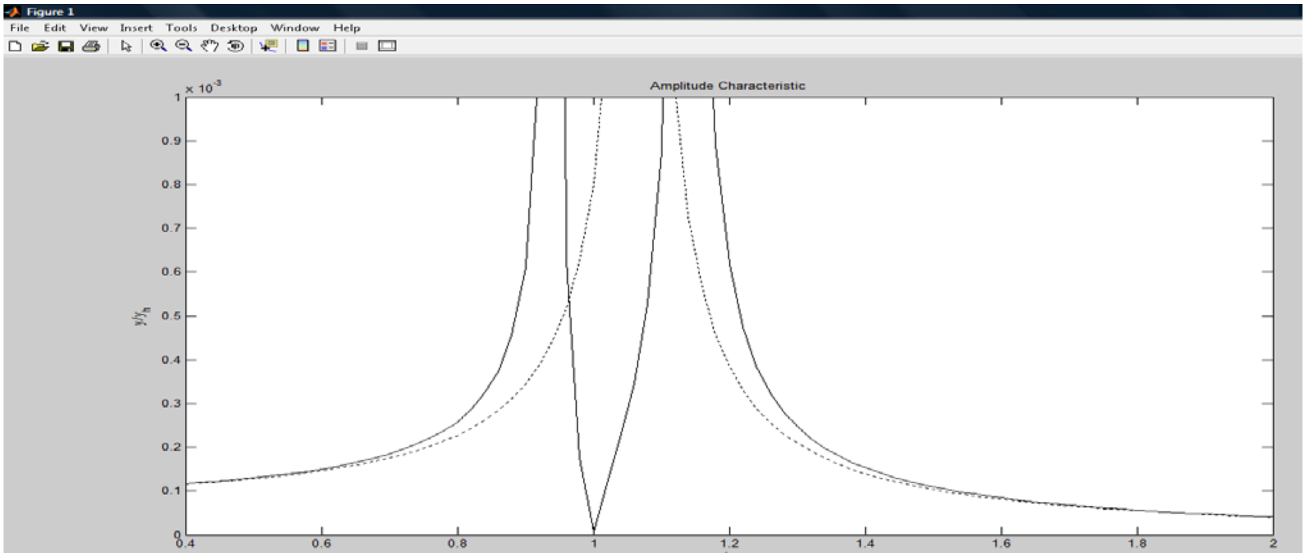

Figure 4: Response trha show the effect of damper on a system of vibration isolation.

3.0 DISCUSSION

The platform on the structures of offshore was considered as area of attention to examine the impact of vibration remoteness on damped and non-damped platform and the performance of mitigating technique on projected oscillation about an equilibrium point for offshore component raised area. Parametric study of the offshore platform with installation of the intermittent support to enhance remoteness system due to its attenuations ability over broad frequencies was considered. The load proportion with the rigidity of the remoteness point were elements hindering the performance of mitigating oscillation about an equilibrium point. The acceleration and the displacement at the peak of the structure specifically the peak multiple flow at the remoteness point under wave load excitation were also investigated. It was observed that the maximum acceleration of the platform $X_{1\ max}$ decreases as ξ_t increases and the maximum displacement at $X_{1\ max}$ increases as γ_t increases on the platform under wave load excitation gave maximum periodic effects at minimum inter-structure drift.

Acknowledgements

We acknowledge the financial support offered by Covenant University in actualization of this research work for publication.

REFERENCES

1. Abdel-Rohman, M., 1996. Structural control of steel jacket platform. Structural Engineering and Mechanics 4, 25–38.
2. Kawano, K., Venkataramana, K., 1992. Seismic response of offshore Platform with TMD. Proc. of 10th World Conference on Earthquake Engineering 4, 2241–2246.
3. Kawano, K., 1993. Active control effects on dynamic response of Offshore structures. Proc. of 3rd ISOPE Conference 3, 494–498.
4. Cveticanin L.and I. Kovacic I, "Parametrically excited vibrations of an Oscillator with strong cubic negative nonlinearity," *Journal of Sound And Vibration*, vol. 304, no. 1-2, pp. 201–212, 2007.
5. Soong L.D. 2002.Efficiency of a simple approach to damper allocation in MDOF structures. Journal of Structural Control 9, 19–30.
6. Afolalu, S. A., Asonaminasom, E. H., Ongbali, S. O., Abioye, A. A., Udo, M. O., & Salawu, E. Y. (2018). Dataset on experimental investigation of optimum carburizing temperature and holding time of bi-nano additives treatment of AISI 5130 steel. *Data in Brief*, *19*, 2279-2283.
7. Lee, H.H., 1997. Stochastic analysis for offshore structures with added mechanical dampers. Ocean Engineering 24, 817–834.
8. Mahadik, A.S., Jangid, R.S., 2003.Active control of offshore jacket platforms. InternationalShipbuildingProgress50, 277–295.
9. Malhotra, A.K., Penzien, J., 1970a. Response of offshore structures to random wave forces. Journal of Structural Engineering, 96, 2155–2173.
10. Malhotra, A.K., Penzien, J., 1970b. Nondeterministic analysis of offshore structures. Journal of Engineering Mechanics, ASCE 96, 985– 1003.
11. Afolalu, S. A., Okokpujie, I. P., Salawu, E. Y., Abioye, A. A., Abioye, O. P., & Ikumapayi, O. M. (2018, April). Study of the performances of nano-case treatment cutting tools on carbon steel work material during turning operation. In *AIP Conference Proceedings* (Vol. 1957, No. 1, p. 050001). AIP Publishing.
12. Yue, Q.J. and Bi, X.J. (2000). Ice Induced Jacket Structure vibration of Cold Regions Engineering. Vol.14, No.2. pp. 81-92.
13. Suneja, B.P., Datta, T.K., 1998. Active control of ALP with Improved performance function. Ocean Engineering 25, 817–835
14. Afolalu, S. A., Ajayi, O. O., Ikumapayi, O. M., & Adejuyigbe, S. B. (2015). Modeling and Simulation of Wave load on Periodic Support for Isolation system of offshore platform. *International Journal of Scientific & Engineering Research*, *6*(5), 441-447.
15. Okokpujie, I. P., Ikumapayi, O. M., Okonkwo, U. C., Salawu, E. Y., Afolalu, S. A., Dirisu, J. O., ... & Ajayi, O. O. (2017). Experimental and Mathematical Modeling for Prediction of Tool Wear on the Machining of Aluminium 6061 Alloy by High Speed Steel Tools. *Open Engineering*, *7*(1), 461-469.
16. Adetunji O.R., Adegbola A.O., & Afolalu, S.A. (2015). Comparative Study of Case-Hardening and Water-Quenching of Mild Steel Rod on Its Mechanical Properties. *International Journal of Advance Research,* 3(6), 1-9.